

# San Diego National Wildlife Refuge

Comprehensive Conservation Plan May 2017 Volume 3

## San Diego National Wildlife Refuge Comprehensive Conservation Plan

Volume 3 - Environmental Assessment

U. S. Fish and Wildlife Service Pacific Southwest Region 2800 Cottage Way, Room W-1832 Sacramento, CA 95825-1846

May 2017

Page Intentionally Left Blank

#### U. S. Department of the Interior Fish and Wildlife Service Region 8 - Pacific Southwest Region

### FINDING OF NO SIGNIFICANT IMPACT (FONSI)

#### Environmental Assessment for the San Diego National Wildlife Refuge Comprehensive Conservation Plan San Diego County, California

The U.S. Fish and Wildlife Service (Service) has completed the final Comprehensive Conservation Plan (CCP) and final environmental assessment (EA) for the San Diego National Wildlife Refuge (NWR), herein incorporated by reference. The final CCP (USFWS 2017) describes the Service's proposals for managing the Otay-Sweetwater and Del Mar Mesa Vernal Pool Units of the San Diego NWR over the next 15 years, while the final EA evaluates the associated effects of this management on the human environment.

#### Decision

Following a comprehensive review and analysis of the four management alternatives evaluated for San Diego NWR, as presented in the draft CCP/EA (USFWS 2014), and considering all public comments and our responses to them, the Service has selected a modified Alternative D for implementation, as described below. This decision also includes the approval of an Integrated Pest Management (IPM) Plan and Feral Pig Monitoring and Eradication Plan for the San Diego NWR (included as Appendix D and E of the final CCP, respectively). In addition, upland hunting, wildlife observation, photography, environmental education, interpretation, non-motorized recreational trail use, and research have been found compatible with Refuge purposes.

The Service has determined that the selected modified Alternative D best meets the purpose and need for the CCP and is consistent with the following criteria:

- Advances the mission of the National Wildlife Refuge System;
- Addresses the purposes for which the Refuge was established;
- Provides guidance for achieving the Refuge's vision and goals;
- Protects the Refuge's listed and sensitive species and the habitats that support them;
- Adheres to the scientific principles of sound fish and wildlife management and listed species recovery; and
- Complies with all applicable legal mandates.

#### **Alternatives Considered**

The following is a brief description of the four management alternatives evaluated for the San Diego NWR, as well as the selected alternative (modified Alternative D). For a complete description of the alternatives, including the selected alternative, see Chapter 4 of the final EA. Chapters 3 and 5 of the final CCP provide a description of how the selected alternative will be implemented.

#### Alternative A - No Action

Alternative A, the No Action Alternative, would propose no changes to the current wildlife and habitat management actions implemented on the Refuge, and no new public use programs would be initiated. This alternative represents the baseline from which other "action" alternatives were evaluated.

Wildlife and habitat management actions, many of which focus on the protection of listed and San Diego Multiple Species Conservation Program (MSCP)-covered plant and animal species, would continue at current levels under Alternative A. Such actions would include: restoration and/or enhancement of habitat to support listed and sensitive species, continuation of monitoring and targeted studies of specific species in accordance with applicable regional protocols, and control of invasive plant species. Additionally, the Refuge would continue current wildlife-dependent recreational uses (i.e., wildlife observation, photography, environmental education, interpretation), as well as support the continuation of research, non-motorized trail use, and walking of leashed dog, all at levels that are compatible with Refuge purposes.

This alternative was not selected because it did not include actions necessary to address the adaptive management of listed and sensitive species, integrated pest management, feral pig monitoring and potential actions to eradicate pigs from the Refuge in the future, expanded opportunities for wildlife-dependent recreational uses, and establishment of a designated trail system.

#### Alternative B - Maximize Habitat Values and Species Protection

Alternative B would include those actions described in Alternative A; in addition, new and expanded wildlife and habitat management activities would be implemented to protect, restore, and enhance habitat values for listed and sensitive species. This alternative also includes the implementation of an IPM Plan to address the control of invasive plants and other pests.

The wildlife-dependent recreational uses currently occurring on the Refuge (i.e., wildlife observation, photography, environmental education, interpretation) would be managed to minimize disturbance to plants and wildlife, while also providing opportunities for the public to observe and appreciate the native species and natural lands protected within the Refuge. Wildlife-dependent recreational uses would be restricted to a designated trail system, and large areas of the Refuge would remain closed to public access, minimizing disturbance to sensitive resources.

Within the Otay-Sweetwater Unit, the designated trail system would include some trail with uses limited to hiking and other trails open to non-motorized multiple uses (i.e., hiking, mountain biking, horseback riding). No dogs would be permitted on the Otay-Sweetwater Unit under this alternative. Public uses on the Del Mar Mesa Vernal Pool Unit would be permitted in accordance with the City of San Diego's Carmel Mountain and Del Mar Mesa Preserves Resource Management Plan (City of San Diego 2015), and such uses would be limited to the designated trail system on the Refuge.

This alternative was not selected because it does not address feral pig monitoring and eradication, nor does it provide an opportunity for hunting on a portion of the Refuge.

#### Alternative C - Expand Opportunities for Wildlife-dependent Recreational Uses

Alternative C would expand the opportunities for wildlife-dependent recreational use on the Otay-Sweetwater Unit, including providing hunting opportunities in three designated locations within this Unit. The wildlife and habitat management activities proposed for the Refuge under Alternative C would remain consistent with those described under Alternative B, including the implementation of an IPM Plan. Public uses and access on the Del Mar Mesa Vernal Pool Unit would be consistent with those proposals presented in Alternative B.

Under Alternative C, the designated trail system within the Otay-Sweetwater Unit would include additional trails not proposed in Alternative B and all trails would be designated for multiple use and specific trail alignments would be determined as part of a step-down trail plan. In addition,

interpretive and environmental education programs would be expanded; dogs would be permitted on the trails, provided they are maintained on a leash; and hunting, conducted in accordance with Refuge-specific regulations, would be permitted on portions of the following management areas: McGinty Mountain (400 acres), Las Montañas (300 acres), and Otay Mesa and Lakes (160 acres).

This alternative was not selected because the extent of hunting proposed under Alternative C is likely to create conflicts with other user groups in an urban area and disturb areas in habitat that supports numerous special status species. Unlike many other Refuges across the country, the San Diego NWR lies in the urban interface immediately adjacent to significant areas of urban residential development, with more development proposed to the east. This situation necessarily influences management decisions related to both resource protection and public use. After much consideration, it was determined that the extent of hunting proposed under this alternative would likely create conflicts with other users groups and with residents in the surrounding urban areas. In addition, this alternative does not address feral pig monitoring and eradication.

Alternative D - Optimize Species Protection, Provide Opportunities for Compatible Public Use Alternative D proposed to optimize species and habitat protection, while expanding opportunities for compatible public use over those currently provided on the Refuge. In addition to the wildlife and habitat management activities and implementation of an IPM Plan that are proposed under Alternative B, this alternative also proposes to implement a feral pig monitoring and eradication plan on the Refuge. No feral pigs are currently known to occur on the Refuge, but feral pigs and the damage to resources associated with feral pig activity have been identified in the San Diego region. The initial implementation of this plan by the Refuge would involve monitoring for the presence of pigs, with further action becoming necessary only if pigs are identified on Refuge lands.

Existing interpretive and environmental education programs would be expanded on the Otay-Sweetwater Unit as proposed under Alternative C. Hunting for big game, resident small game, and resident, and migratory upland game birds, subject to refuge-specific conditions, would occur on approximately 160 acres in the southeast portion of Otay-Sweetwater Unit, in an area that abuts State and BLM lands that are already open to hunting. The designated trail system would not include trails on Lot 707 or Mother Miguel Mountain, and the trails in the Las Montañas area would be open only to hikers. Specific trail alignments would be determined during step-down planning. Leashed dogs would only be permitted on those trails designated for multiple use.

Alternative D, as presented in the draft CCP/EA, was not selected for implementation because the proposed trail system did not take into account trail segments requested by the public during the public comment period. In addition, several proposed public uses described in the draft CCP/EA were determined to have a potential for adverse effects to the environment.

#### Selected Action (Modified Alternative D)

The selected action is a modification of Alternative D. As described in the final CCP, under this alternative, all of the wildlife and habitat management actions proposed under Alternative D, along with the proposal for hunting in a portion of the Otay Lakes and Mesa area of the Refuge, would be implemented per available funding and staffing. In addition, the actions to be implemented under Alternative D in the Del Mar Mesa Vernal Pool Unit would be implemented in coordination with the City of San Diego and other land managers within the Del Mar Mesa Preserve.

Modified Alterative D differs from Alternative D as follows:

• To minimize the potential for adverse effects to habitat quality, a vernal pool interpretive trail is not proposed.

- A trail will be provided on Lot 707, but it will not be developed as an interpretive trail.
- To avoid adverse effects related to parking, traffic safety, and sensitive species, the parking lot/trail staging area and associated trail access route proposed off Sloane Canyon Road in the vicinity of Model A Ford Lane is not included in selected action.
- A designated trail system, which takes into consideration that comments received during the public comment period, has been included and will not require the completion of a step-down trail plan.
- Some areas of the Refuge will require future trail planning once legal access to the area has been acquired.

Trail proposals addressed in the four action alternatives evaluated in the draft CCP/EA generated significant public comment during the public review period. As a result, additional meetings were held with trail advocates to receive input on specific trail proposals and gather additional input on the desire for a more interconnected trail system. With this information in hand, Refuge staff hiked over much of the Refuge to evaluate site conditions. We examined the various routes indicated on the maps prepared by trail users at public meetings, as well as proposals for specific trail routes that were received in letters or emails during the public comment period. The designated trail plan that has been incorporated into Modified Alternative D takes into consideration the results of this on-site analysis, along with data related to listed and sensitive species occurrences and the locations of sensitive habitat types. We also considered issues related to legal access onto the Refuge and concerns expressed by adjacent property owners, land managers, and utilities. The final trail plan is intended to ensure the protection of listed and sensitive species and habitats, while also meeting the public's desire for an interconnected trail system within the Refuge and to the regional trail network where legal access is available.

#### Effects of Refuge Management on the Human Environment

Implementing the selected alternative, which includes the implementation of an IPM Plan and a Feral Pig Monitoring and Eradication Plan, is not expected to have significant impacts on any of the environmental resources identified in the final EA. Presented below is a summary of the impacts of the modified Alternative D, along with our conclusions.

#### **Topography**

Wildlife and habitat management activities proposed on the Otay-Sweetwater Unit would require some site preparation (e.g., removal of invasive plants, minor soil disturbance). These actions would not however result in any substantive changes to the topographic character of the site. Other proposals, such as increased monitoring of species and habitat and implementation of an IPM Plan would have little, if any, effect on the existing landform, while actions to facilitate the reintroduction of one or more listed species could result in some small changes in the landform to improve habitat quality. These changes would most likely be limited to riparian areas where minor land alteration could be required to improve opportunities for water pooling to support certain life stages for arroyo toad and/or southwestern pond turtle. In some cases, this alteration of landform would be required to correct previous human alteration of the riparian system. Such changes would be minor and once the sites have revegetated, the alterations would be virtually undetectable. No significant adverse effects to topographic features are anticipated from the implementation of these activities.

The installation of kiosks and interpretive signs to support wildlife-dependent recreational uses would have no effect on the area's natural landform. Environmental education and interpretive programs would generally be conducted on designated trails, with limited activities, primarily those related to habitat restoration and enhancement, occurring off trail. Establishment of a designated, sustainable trail system within the Refuge is intended to reduce the effects to the landform of

scarring and erosion that have resulted from the proliferation of user-created trails in the area. Proposals to realign or close some trails within the Otay-Sweetwater Unit would, in most cases, have little, if any, effect on the natural landform. When an existing trail segment is proposed for realignment to eliminate erosion problems or avoid sensitive habitat areas, the new (realigned) trail segment would be designed and constructed to include appropriate minimum and maximum slopes and follow existing contours, thereby minimizing the initial and long-term effects of trail construction on the existing landform.

Two new trail staging/parking areas are proposed to accommodate Refuge visitors. These include a lot on the south side of Highway 94 to the west of Millar Ranch Road in the Sweetwater River area, and a site off Proctor Valley Road on the Refuge's Hidden Valley property. These locations are generally flat, requiring minimal landform alteration. In addition, no important topographic landmarks are present within or immediately adjacent these sites. Therefore, no significant adverse effects to topography are anticipated. A third lot may be developed in the future off Highway 94 onto the Las Montañas (south) area, that could require some landform alteration, however, this area was subject to previous grading prior to acquisition, therefore, no significant adverse effects to the existing landform are anticipated.

The relocation of the Refuge office onto Refuge land is proposed in the future per available funding. This facility would likely be constructed on a portion of a 2.4 acre area to the south of Highway 94 and west of Millar Ranch Road in the Sweetwater River area. The proposal would require site grading for a building pad and parking area. Because the area is relatively flat, no extensive landform alteration is anticipated. The specific design and layout of this site would be developed in the future along with additional environmental analysis in compliance with NEPA.

Also included under the selected alternative is the closure of abandoned mines shafts when discovered. These closures would involve minor disturbance at the entrance to the shafts to accommodate the installation of bat-compatible steel gates, when applicable, or to fill the shafts. Such disturbances would have virtually no effect on existing area topography. Other maintenance activities include the repair of a small dam in the San Miguel Mountain, removal of water tanks on Mother Miguel Mountain, removal of abandoned pump houses and wells in the Sweetwater River area, and removal or rehabilitation of fencing in the Hidden Valley area. These actions would have limited impacts to the existing topography.

Within the Del Mar Mesa Vernal Pool Unit, some trails would be closed, while others would be realigned in an effort to protect listed vernal pool species and sensitive vernal pool habitat. These efforts would be implemented in coordination with the City of San Diego and other Del Mar Mesa Preserve partners. Implementing these actions would result in only minor changes to the existing landform; therefore, no significant adverse effects to site topography in this area are anticipated.

No actions are proposed that would result in any substantive modifications to highly scenic areas nor would a locally or regionally important topographic landmark be affected. In addition, no grading to implement these actions would result in the substantial alteration of the existing landform by creating manufactured slopes higher than 10 feet or steeper than 2:1 (50 percent).

#### Visual Quality

Proposed management actions, such as expanded habitat restoration and enhancement efforts within the Otay-Sweetwater Unit, would alter the existing visual appearance of a site. Non-native, weedy vegetation on upland areas would be removed prior to revegetation with native plants. In riparian areas, non-native shrubs, reeds, and trees would be removed and ultimately replaced with native plants such as willows, mulefat, or sycamores. Although the visual character of

the restored or enhanced areas would be altered, this change is not considered a significant adverse effect. Other proposals, such as increasing monitoring of species and habitat and implementing an IPM Plan would have little, if any, effect on the visual character of the Refuge.

If it becomes necessary to implement feral pig eradication on the Refuge, temporary traps would be strategically placed in various areas on the Refuge. The number of traps would be limited, relatively small in size, and would not block viewsheds. Various types of traps including cage traps, box traps, and/or corral traps could be utilized in areas frequented by pigs. Traps would be installed in a manner that would avoid any degradation to the visual character of the site. To the extent practicable, traps would be placed in areas not visible from public trails or the public right-of-way, and would be removed as soon as they were no longer required. In most cases, traps would remain in use for no more than 30 days.

Establishing a designated trail system for the Refuge would result in the creation of some new trails and the closure of others. The proposal to realign or close some trails within the Otay-Sweetwater Unit would have no adverse effect on the existing visual quality of the area. New trail segments that may be created to replace eroded sections of trails would be aligned to follow existing contours, thereby minimizing the initial and long-term visual effects of the trail.

The new parking areas and associated amenities (e.g., information kiosks, interpretive signs) proposed to accommodate trail users would require the removal of existing vegetation and grading of currently undeveloped areas. These changes would necessarily alter the sites' visual quality. Project specific analysis in accordance with NEPA will be conducted when final design plans are completed. The potential for adverse effects to visual quality as a result of project implementation can be avoided through the implementation of design measures such as:

- For the parking lot surface, avoid the use of light-colored concrete and asphalt and instead use materials and colors that allow the parking surface to better blend into the existing environment;
- Minimize the removal of native trees and shrubs, revegetate disturbed areas with native plants and, where appropriate, plant native trees and shrubs to soften the view of the parking area and/or structures (e.g., restrooms, contact station, trash receptacles, trailhead kiosk) from the roadway; and
- Should retaining walls be required, plant appropriate native shrubs or other native vegetation in front of the retaining walls to screen them from view.

The effects to the visual quality of the area by providing a trail crossing at Highway 94 and the Sweetwater River would vary depending on whether an undercrossing, at-grade crossing, or overcrossing is selected. A fair weather undercrossing or at-grade crossing would have minimal effects on the visual quality of the area, while an overcrossing would have greater visibility from the edges of the Refuge and the public right-of-way. The project site is located in proximity to urban development; therefore, the visual effects of an overcrossing at this location would depend on the final design. When funding is identified to address the trail connection across Highway 94, the Service would solicit additional public input and conduct additional environmental analysis in accordance with NEPA prior to determining the trail crossing.

The construction of a Refuge office to the south of Highway 94 and west of Millar Ranch Road would alter the existing visual character of the site but would not significantly change the overall character of the views observed along Highway 94, which include a mix of open native habitat and urban development. View corridors from Highway 94 onto the Refuge would be maintained, and

the site design for this refuge facility would take into consideration views from Highway 94 of the riparian woodlands that parallel the roadway, as well as the need to maintain the open rural character of the community. Through appropriate design features, the use of materials and colors that complement the setting, and the strategic use of native plants, the effect of the structures on the visual character of the area can be minimized. The Service would solicit additional public input on the Refuge office design and additional environmental analysis under NEPA would be required.

#### Geology, Soils, and Geological Hazards

Restoration and enhancement projects will incorporate the use of short and long-term best management practices (BMPs), as described in section 5.9.3 (Erosion Control Measures) of the final CCP, into the project design to minimize the potential for erosion and downstream sedimentation. Therefore, these activities are not expected to trigger or accelerate substantial slope instability, subsidence, ground failure, or erosion, nor would they make the Refuge and its facilities any more susceptible to geological hazards, such as liquefaction, settlement, ground rupture, or lateral spreading.

Expanded habitat restoration and enhancement activities would require some site preparation (e.g., removal of invasive plants, minor soil disturbance) that could expose moderate to highly erosive soils to the forces of wind and runoff. However, the implementation of appropriate BMPs would minimize runoff and the potential for erosion from these sites.

Another action proposed that is affected to some extent by the types of soils that overlay the site is the implementation of an IPM Plan—in particular, the use of herbicides. To ensure maximum effectiveness, while minimizing the amount of chemical being applied to a site, it is important to consider the types of soils present in an area proposed for treatment. Some active ingredients respond differently depending upon the soil type (sandy soils versus clay soils) and soil permeability. To minimize the amount of product applied to a site, chemicals being considered for use in a specific area will be evaluated based on volatility, mobility in soil, and water solubility.

To minimize the potential for impacts related to rock fall, in addition to requiring all trail users to stay on designated trails, periodic monitoring (every few years) of potential rock fall areas would be conducted to identify any potential hazards that may warrant the closure of a particular trail segment. Additionally, monitoring would occur following a severe rainstorm event or a wildfire that exposes large rock crops to increased erosional forces.

The establishment of a designated trail system will require some land disturbance either to construct new trail segments, rehabilitate existing trail segments, or close and rehabilitate highly eroded trails. The types of soils present on the Refuge will influence trail development, including closures, realignments, and rehabilitation. Clay soils are present in certain areas of the Refuge. When wet, these soils can hold water, resulting in soggy trail treads. Use of wet trails can create large holes in the trail that exacerbates the problem the next time it rains, or users may create new pathways around the wet trail, damaging native habitat on either side of the trail. Clay soils are very slippery when wet and may present a safety hazard to hikers and riders, or at least make the experience less pleasant. To address these soil-related problems, as well as the erosion hazards associated with the vast majority of the soils on the Otay-Sweetwater Unit, trail layout and design would incorporate measures to ensure a sustainable trail practices that would be implemented as part of trail rehabilitation, trail realignment, or new trail construction would include but are not limited to adequately outsloped tread, sustainable grades, frequent grade reversals, erosion resistance, special treatments in areas where soil is prone to retaining moisture, and rolling contours.

To minimize the potential for erosion as a result of parking lot and refuge office construction, BMPs would be incorporated into the future design and engineering plans.

Management activities proposed in the Del Mar Mesa Vernal Pool Unit will be limited to habitat maintenance, monitoring, and trail maintenance, all requiring limited ground disturbance. Implementation of the conservation measures included in section 5.9.3 of the final CCP would ensure that no impacts related to geology or soils would result from these activities.

#### Paleontological Resources

Although there is the potential for paleontological resources to be present within the Sweetwater River and San Miguel Mountain areas of the Otay-Sweetwater Unit and within the Del Mar Mesa Vernal Pool Unit, the nature of the actions proposed, which are generally limited to habitat conservation and compatible public uses, would result in a minor amount of excavation on the Refuge. Therefore, no adverse effects to subsurface paleontological resources are anticipated. Protection of these resources, should they be inadvertently discovered, would occur in compliance with all applicable policies and regulations. In addition, regulations that prohibit the collection of paleontological resources on Federal lands would be enforced on the Refuge.

#### **Mineral Resources**

Portions of the Otay-Sweetwater Unit include areas where adequate information indicates that significant deposits of aggregate resources are present or are likely to be present. These areas occur primarily within the Sweetwater River floodplain, generally upstream of the Sweetwater Reservoir. The potential for impacts to the reservoir in terms of water quality and increased siltation makes it unlikely that these resources would be available for extraction even if they were not located within the Refuge. The activities proposed for implementation within the Refuge would not represent a significant reduction in aggregate resources available for commercial use in the county. In addition, the Refuge would not result in the irrevocable loss of aggregate resources, as they would continue to be preserved on Refuge property.

Although there is evidence of past mining activity on the Refuge for minerals other than aggregate material, most of the evidence indicates that mining was generally exploratory in nature or of limited scale. Only Peg Leg Mine seems to have been in production for an extended time. None of the activities proposed for implementation on the Refuge would result in adverse effects to the region's mineral resources.

#### **Agricultural Resources**

Most of the lands within the Refuge have been identified as having value for grazing, but do not support soils that are classified as prime farmland or farmland of statewide importance. The California Department of Conservation does identify areas within the McGinty Mountain area and the Sweetwater River area as Farmland of Local Importance. In addition, portions of the non-contiguous mitigation parcels recently added to southwestern end of the San Miguel Mountain area are identified as Farmland of Local Importance. These parcels are not however of adequate size to support agriculture and all are located immediately adjacent to urban development. In the case of the McGinty Mountain area, only a small portion of the area classified as Farmland of Local Importance soil candidates for classification as Prime Farmland or Farmland of Statewide Importance soil candidates. In addition, this portion of the Refuge, although located within the San Diego County Water Authority service boundary, contains no waterlines or water meters.

The Sweetwater River area includes several areas overlain with soils that are candidates for Prime Farmland or Farmland of Statewide Importance, and the locations of these soils generally coincide with the areas on the Refuge that have been classified by the California Department of Conservation (2010) as Farmland of Local Importance but these areas are relatively narrow and occur along major riparian corridors (i.e., Sweetwater River, Steele Canyon Creek) within the Refuge. The configuration of these areas (i.e., long and narrow) along with the lack of any infrastructure to support irrigation severely limits the value of this area for agricultural use.

The implementation of the CCP would not result in any irrevocable loss of important farmland. Further, the management actions and public uses proposed would have no effect on any existing or future agricultural activities occurring in proximity to the Refuge, therefore no direct or indirect impacts to agricultural resources are anticipated.

#### **Hydrology and Water Quality**

Proposed actions, such as improving habitat quality (i.e., removing invasive shrubs and trees, restoring native vegetation, managing some vegetation to mimic a natural flood regime) within the Sweetwater River and some of its tributaries, would not significantly alter the existing hydrologic conditions within the Refuge. Actions are not proposed that would impact existing groundwater levels and the rehabilitation and/or construction of trail segments, development of trail parking areas, and construction of a new Refuge office would not alter existing surface water flows.

Potential impacts to water quality from the implementation of the selected action, including grading for parking lots, construction of a new Refuge office, and erosion associated with trail use, would be addressed through sensitive project design, the implementation of temporary and long-term BMPs (as presented in section 5.9.3 - Water Quality Conservation Measures), rehabilitation of eroding trails, minimizing trail access in proximity to streambeds, enforcing requirements to clean up dog waste, working with equestrian volunteers to remove horse manure from trails located in proximity to the Sweetwater River and Sweetwater Reservoir, and when required, implementation of a Storm Water Pollution Prevention Plan.

The construction of any new trails on the Refuge, as well as trail rehabilitation and/or realignment projects, would occur in accordance with standard sustainable trail practices, such as those implemented by the California Department of Parks and Recreation. Adhering to these practices would minimize the potential for erosion and downstream siltation. The implementation of the Feral Pig Monitoring and Eradication Plan will substantially reduce the potential for water quality impacts related to coliform bacteria and protozoan parasite pathogens often present in the feces of feral pigs, as well as soil erosion, should feral pigs become established on the Refuge.

Pesticides considered for use on the Refuge are evaluated through the Pesticide Use Proposal System (PUPS) process, an internal Service program, using scientific information and analyses that is documented in Chemical Profiles (Appendix D, Attachment B). These profiles provide quantitative assessment/screening tools and threshold values to evaluate potential effects to water quality. PUPS are approved where the Chemical Profiles provide scientific evidence that potential impacts to the Refuge's physical environment are likely to be only minor, temporary, or localized in nature. The potential for impacts are further reduced through the implementation of product specific BMPs.

#### Air Quality

The selected action includes activities that would result in the generation of emissions from combustion engines, herbicide application, and grading. To reduce the generation of such emissions to the maximum extent practicable, the CCP, in section 5.9.3 (Conservation Measures to be

Incorporated into Future Projects) lists measures that must be included in all construction specifications for projects implemented on the Refuge to reduce the generation of fugitive dust and minimize the amount of air pollutants generated by construction equipment. Through the implementation of these measures, short-term emissions generated during construction and/or site preparation would not adversely affect regional air quality. In addition, the emissions from these activities are not expected to exceed San Diego Air Pollution Control District thresholds and Federal de minimis levels.

To avoid air quality impacts related to the use of pesticides, all herbicides must be applied in accordance with label requirements, all Federal, State, and local pesticide use laws and regulations, and DOI, Service, and NWRS pesticide-related policies. This includes compliance with the Federal Insecticide, Fungicide, and Rodenticide Act, which requires all pesticides to be applied at the rates and with the application equipment specified on the pesticide label. The IPM Plan (Appendix D) includes a number of BMPs that would be implemented in association with pesticide use of the Refuge to further minimize potential effects to air quality.

Although new opportunities for public use would be available that would generate a long-term increase in visitor trips to the Refuge, as well as short-term construction related emissions, vehicular emissions generated by increased visitor trips to the Refuge would represent relatively low numbers when considered in the context of the larger San Diego air basin. To reduce total emissions generated from public use activities, carpooling to Refuge events will be encouraged, and, to the extent possible, special events will be schedule outside of peak traffic periods to avoid incremental increases in existing traffic congestion in the region, a contributing factor to degraded air quality.

No significant adverse effects to air quality are anticipated from the implementation of the selected action.

#### **Greenhouse Gas Emissions**

The consumption of gas by additional staff traveling to and from work would represent an estimated 30 metric tons of  $CO_2$  equivalent annually. Even with the implementation of the various construction projects proposed under the selected action, the greenhouse gas (GHG) emissions would not begin to approach the 25,000 metric tons or more of  $CO_2$  equivalent annually that the Council on Environmental Quality suggests would warrant analysis to determine significance.

Nevertheless, the Service has a mandate to reduce the total GHG emissions generated from the operation and maintenance of the Refuge. Therefore, as vehicles are replaced, new vehicles will be selected that have better fuel economy; wherever possible, tasks requiring off-Refuge travel will be combined to reduce the total number of miles driven by Refuge staff; office equipment, including light fixtures, will be evaluated and replaced as necessary with "Energy Star" qualified products; power management features on all computers and monitors will be activated, laptop power cords will be unplugged when not in use; and all equipment and lights will be turned off at the end of the day. Future structures, such as a Refuge office, would also incorporate the use of solar panels to minimize GHG emissions from the Refuge.

GHG emissions anticipated to result from the implementation of the selected action are not expected to represent a significant direct or indirect impact on the environment.

#### **Contaminants**

Evaluation of potential sources of environmental contaminants on the Refuge would continue to be overseen by the Service's Contaminants Program at the Carlsbad Fish and Wildlife Office to ensure that potential contaminants issues are appropriately addressed as part of the Refuge's overall management plan and do not result in any significant adverse effects to Refuge resources, visitors, or personnel.

The control feral pigs on the Refuge, should it become necessary, will require disposal of pig carcasses, particularly when pigs are dispatched within corral traps. In most cases, pig carcasses will be transported off the Refuge. Transport and disposal would occur in accordance with applicable laws and regulations. Because the intent is to identify and dispatch pigs as soon as they are identified on the Refuge, the number of carcasses to be removed is expected to be small. If a pig is shot in a very remote location, the carcass may be left in place, where it would provide food for a range of native species (e.g., vultures, mountain lion, coyote, bobcat). Animal carcasses are not considered hazardous waste by the U.S. EPA; therefore, if a carcass must be left in remote locations, it would not result in any impacts related to contaminants.

#### Habitat and Vegetation Resources

The implementation of wildlife and habitat management activities (e.g., conducting surveys and implementing monitoring protocols, control of invasive species, conducting Refuge cleanups to remove trash, debris, and illegal camps, maintaining access roads, fencing, and signage) proposed in the selected action could result in some temporary impacts to native habitat from trampling or minor vegetation clearing. These impacts would be limited in scope and would not result in any significant adverse impacts to native vegetation.

Actions will also be taken to minimize impacts related to illegal activities occurring on the Refuge including illegal motorized off-road activities and illegal off-trail activities. These actions include a combination of fencing, signage, public outreach, monitoring, and law enforcement. The effectiveness of these actions is sometimes limited given the size and fragmented nature of the Refuge. To increase the effectiveness of these measures, particularly with respect to control of off-road vehicle use, the Refuge will continue to work in partnership with adjacent land managers and private property owners to share patrol responsibilities and add fencing and other deterrents along major access points where historically vehicles were crossing other properties to access the Refuge.

The primary impacts to native vegetation on the Refuge from public use activities include continued expansion of the user-created trail system and off-trail activities such as cross country hiking and riding, illegal fishing, geocaching, and general "exploring." All of these activities result in the trampling of vegetation, the removal of vegetation, particularly shrub species, soil compaction, and general degradation of habitat quality. These impacts would be minimized through the establishment of a designated trail system and the closure of trails that extend into sensitive habitat areas and/or are poorly aligned and are experiencing extensive erosion, rutting, and braiding.

Opening a portion of the Otay Mesa and Lakes area to hunting would involve hunting conducted on foot by individuals or small groups, often accompanied by a hunting dog. Since hunting is not limited to designated trails, direct impacts to vegetation could occur from trampling. However, because hunters tend to travel in dispersed patterns over wide areas rather than utilizing the same pathway over and over again, the effects of trampling would be limited and short term. In addition, hunting in most of the designated hunt area would be a seasonal activity, generally occurring in the fall and winter months when limited growth, particularly of forbs, is occurring. As a result, impacts to Refuge vegetation by hunters would be expected to be minimal and insignificant. All prospective hunters will be required to attend a training session before they can hunt on the Refuge. As part of this training session, the need to protect habitat quality within the hunting area will be addressed.

The selected action would permit leashed dogs on Refuge trails. If dogs are leashed and their activities are confined to the trail, no adverse effects to vegetation are anticipated. If, however, leash regulations are not adhered to by users, impacts to vegetation are likely to occur. If such impacts are identified, the right to bring dogs onto the Refuge could be suspended to protect sensitive Refuge resources.

Beneficial effects to native vegetation from the implementation of the selected action will include reductions in human disturbance from unauthorized use of the Refuge for habitation or dumping, elimination of competition for nutrients and water once invasive weeds are removed, and avoidance of impacts to vegetation from unauthorized trespass or off-road vehicle activity following installation of fencing and signage.

Implementing a range of monitoring and management actions throughout the Refuge to address the restoration, enhancement, and protection of native vegetation and habitat will ensure that no significant adverse effects to habitat and vegetation will occur.

#### <u>Wildlife</u>

Implementing the selected action will result in some impacts to wildlife, including temporary disturbance related to noise and human activity and direct loss of individuals due to trampling, inadvertent damage to nests or burrows, hunting, or other causes. None of the actions to be implemented would result in a substantial reduction in the quantity or quality of available habitat to support the Refuge's native wildlife species. To minimize the potential for direct and indirect impacts to wildlife, care will be taken to avoid entering sensitive habitat areas whenever possible. When entry is required, it would be timed to avoid the sensitive life stages such as breeding seasons, dispersal periods, or hibernation, unless the objective of the monitoring or research is to investigate specific species during this time. Monitoring activities that must occur within sensitive habitat during the breeding season will only be conducted by qualified personnel to avoid any unintentional impacts to listed or sensitive species. The knowledge gained in monitoring and research will mitigate associated impacts by better informing and directing current and future management efforts.

The potential effects to Refuge resources from the proposed site-, time-, and target-specific use of current and potentially future pesticides on the Refuge would be evaluated using scientific information and analyses documented in Chemical Profiles. These profiles provide quantitative assessment/ screening tools and threshold values to evaluate potential effects to species groups (e.g., birds, mammals, fish). A PUP (including appropriate BMPs) would be approved where the Chemical Profile provides scientific evidence that potential impacts to biological resources are likely to be only minor, temporary, or localized in nature. Along with the selective use of pesticides, the IPM Plan proposes other appropriate strategies (i.e., biological, physical, mechanical, cultural methods) to eradicate, control, or contain pest species to achieve resource management objectives. Based on scientific information and analyses documented in Chemical Profiles, pesticides allowed for use on the Refuge would be of relatively low risk to non-target organisms, due to their low toxicity or short-term persistence in the environment. Thus, no adverse effects to wildlife from pesticide application are anticipated.

Refuge biologists participated in the identification of specific trail alignments to assist in determining which areas can best support public use, while minimizing impacts to sensitive Refuge

resources. Establishing appropriate trail alignments included, but was not limited to, consideration of the proximity of trails to sensitive wildlife habitat such as riparian areas, wetlands, and habitats occupied by listed species and the effects of the alignment on habitat connectivity. The consolidation of trails throughout the Refuge will reduce the fragmentation of large interior blocks of habitat, maintaining undisturbed areas for breeding birds, as well as mule deer and other mammals that tend to avoid areas of frequent human use. Although disturbance to wildlife cannot be completely avoided, the proposal to establish a designated trail system that takes into account the needs of the Refuge's wildlife would benefit Refuge resources over current conditions.

The construction of facilities to support Refuge visitors (e.g., parking lots, Refuge office, trail crossings, information kiosks, interpretive sign, photography blind) would result in both temporary and long-term impacts to wildlife as a result of increased human activity in the affected areas. To minimize adverse effects on wildlife, project sites would be located outside of sensitive habitat areas to the extent feasible; adequate buffers would be provided between visitor facilities and sensitive habitat areas such as riparian corridors and habitats that support listed species such as least Bell's vireo and California gnatcatcher; and the design of proposed facilities would take into consideration the need to minimize noise, lighting, and human access into sensitive habitat areas. In addition, construction proposed near sensitive habitat areas would occur outside of the bird breeding season. The boundaries of all construction sites would be flagged and construction activities would be monitored to ensure that potential impacts to wildlife are minimized. Additional analysis of potential impacts in accordance with NEPA would be required for these types of activities, and if impacts are identified, appropriate mitigation measures would be implemented.

Hunting would result in the direct loss of some wildlife and indirect impacts to other wildlife. Human disturbance associated with hunting includes loud noises, such as those produced by shotguns, and rapid movement. This disturbance, especially when repeated over time, can cause some wildlife species to change foraging habits, feed only at night, or relocate. These impacts would be reduced by providing adjacent non-hunting areas where wildlife can feed and rest relatively undisturbed. Although recreational hunting will result in the removal of individual targeted animals, it not expected to negatively affect overall wildlife populations on the Refuge or in the region.

The implementation of actions associated with feral pig control could result in disturbance to wildlife due to monitoring activity, as well as disturbance associated with the presence of marksmen and dogs, and the discharge of firearms, if pigs are found on the Refuge. In addition, if trapping becomes necessary, non-target wildlife could be attracted to traps set up for corralling feral pigs. Because of the trap design, deer can easily escape by leaping over the perimeter fencing. Smaller wildlife would be able to escape through the paneling. These traps would be open and monitored for several days before setting. Should control of feral pigs become necessary, the trap design would minimize impacts to non-target wildlife.

#### Federal and State Listed Species and Other Species of Concern

A total of 16 species listed as threatened or endangered under the Federal Endangered Species Act (ESA) and/or the California Endangered Species Act (CESA) are known to occur on the Refuge or have occurred there within the last 20 years. Many other species of concern, including at least 35 species covered by the San Diego Multiple Species Conservation Program (MSCP), have been documented on the Refuge. Activities related to surveying and monitoring of listed and sensitive species can result in temporary disturbance, particularly if implemented during the nesting season (e.g., least Bell's vireo, which nests from about March 15 to September 15; coastal California gnatcatcher, which nests from about February 15 to August 15). To reduce the potential for disturbance, monitors adhere to species-specific monitoring protocols, such as limiting the number and duration of visits to areas supporting nesting birds. Past experiences have demonstrated that

when these protocols are followed, the benefits of the data provided as a result of monitoring outweigh the minor temporary adverse effects that occur during monitoring. There is also the potential for trampling of listed plants and butterfly larvae during surveys; therefore, only qualified individuals are permitted to survey sites when listed or sensitive species are most vulnerable to impacts from human activity.

Other activities such as restoration and enhancement, invasive species removal, trash cleanups, fencing, posting, fuel break creation/maintenance, trail work, and construction activities will be scheduled to occur outside of the nesting season to avoid impacts to listed and sensitive bird species. To avoid impacts to sensitive insect, reptile, and plant species, potential work areas are surveyed prior to implementing any of these activities in an effort to identify and, if necessary, flag areas supporting listed or sensitive species. All activities are limited in areas known to support or have the potential to support sensitive butterfly species (i.e., Quino checkerspot, Hermes copper).

Herbicides will continue to be used on the Refuge to control invasive, weedy species. Prior to the use of any herbicide on the Refuge, the product is reviewed and approval for use through the PUP process, and chemical profiles are prepared to assess the potential effect of each pesticide on Refuge-specific species, including listed species. This assessment may result in the identification of product specific BMPs that must be implemented during application and/or requirements for application rates that are lower than those permitted on the product label. This review process is described in the IPM Plan (Appendix D of the final CCP). Adherence to the review process and product specific BMPs will ensure that no adverse effects to listed or sensitive species will occur as a result of herbicide use.

Control and/or eradication of invasive aquatic organisms within the Sweetwater River and ponds of the Otay-Sweetwater Unit would benefit the recovery of listed and sensitive species such as arroyo toad, California red-legged frog, and southwestern pond turtle if one or more of these species were to be reestablished either intentionally or naturally on the Refuge.

Impacts to listed and sensitive species from compatible public use activities and the implementation of the Feral Pig Monitoring and Eradication Plan (Appendix E of the final CCP), would not be significant for the reasons described above under Vegetation and Habitat and Wildlife.

#### **Cultural Resources**

Many of the activities required to implement the selected action will involve some extent of ground disturbance; therefore, the implementation of these activities has the potential to adversely affect cultural resources. To avoid adverse effects to cultural resources, when a ground disturbing action is proposed, Refuge staff will implement the procedures established by the Service's Cultural Resources Program to ensure that no adverse effects to known or unknown cultural resources occur as a result of Refuge activities. These procedures include compliance with the National Historic Preservation Act (NHPA) of 1966, as amended (PL 89-665; 50 STAT 915; 16 USC 470 et seq. 36 CFR 800), and all other applicable regulations and Executive Orders related to the protection of cultural resources. The NHPA sets inventory, nomination, protection, and preservation responsibilities for federally-owned cultural properties and directs Federal agencies to take into account the effects of their actions on items or sites listed or eligible for listing in the National Register of Historic Places (NRHP). Prior to implementing an action, tribal consultation in accordance with Section 106 of the NHPA will be initiated. In addition, a survey of a proposal's Area of Potential Effects (APE) will be conducted or, if a survey has been previously conducted, a review of the results of that survey will be conducted to determine if any resources identified are eligible for inclusion in the NRHP.

The potential for archaeological resources to be present within a specific portion of the Refuge varies depending upon the topography, soil types, proximity to water, proximity to food resources, and many other factors. Overall, the potential for yet undiscovered buried deposits to be present on the Refuge is considered high. Based on this information and any input provided by the tribes in response to the Section 106 notification, the Service's Cultural Resource staff will determine the appropriate measures to be implemented to protect cultural resources. For example, for projects involving ground disturbance that are determined to be located in an area of sensitivity for an archaeological resource, an archaeological monitor, meeting the Secretary of the Interior's Guidelines, and a qualified Kumeyaay monitor would be present during grading, digging, coring, or any other activity that would affect subsurface materials.

If any cultural resources are discovered during excavation, all earthwork on the site would be halted and the Regional Historic Preservation Officer would be contacted to review the materials and recommend a treatment that is consistent with applicable laws and policies. The treatment plan would likely require the boundaries of the site to be defined before excavation could be reinitiated in an area well away from the discovered resource. The site would also be recorded and evaluated for eligibility to the NRHP. Once this work is completed, additional measures may be required depending upon the results of the eligibility determination. If any site is encountered that is determined to be eligible to the NRHP, the Service would consult with the State Historic Preservation Officer, federally recognized tribes, and interested parties.

When archaeological resources are encountered, the Refuge will comply with Federal regulations regarding curation (36 CFR 79). Specifically, the Refuge will ensure proper care of federally owned and administered archaeological collections, including ensuring that significant prehistoric and historic artifacts, and associated records, are deposited in an institution with adequate long-term curatorial capabilities that can provide professional, systematic, and accountable curatorial services on a long-term basis.

To identify and preserve traditional cultural properties and sacred sites and to determine the level of confidentiality necessary to protect them, the Refuge will work with interested tribal groups to establish government-to-government relationships that would ensure meaningful consultation with tribal governments during the planning phase of projects.

The Refuge Complex has initiated discussions with interested tribal groups to create a Memorandum of Understanding (MOU) to implement the inadvertent discovery clause of Native American Graves Protection and Repatriation Act (NAGPRA). Development of this MOU would involve identifying the Native American tribes, groups, and direct lineal descendants that may be affiliated with these Refuge lands, initiating consultation with the affiliated parties, developing procedures to follow for intentional and inadvertent discoveries, and identifying the persons to contact for the purposes of NAGPRA. The final CCP also addresses the establishment of relationships with interested tribes, the Kumeyaay Heritage Preservation Committee, and the Kumeyaay Diegueño Land Conservancy to develop a better understanding of the cultural resources present on Refuge lands and the Native American's unique perspective on the cultural landscape in which these resources exist.

The implementation of the actions outlined in the final CCP and summarized above would avoid adverse impacts cultural resources listed in or eligible for listing in the NRHP or identified as an Indian trust resource or a sacred site.

#### Land Use

The effects to surrounding land uses of implementing the activities in the selected action, such as expanding current monitoring of listed and sensitive species, restoring habitat, fencing and posting

Refuge boundaries, and controlling invasive species, will have little, if any, effect on adjacent properties. Continued maintenance of established fire breaks will provide benefits to adjacent properties. Other proposals, such as the construction of parking lots, the establishment of a designated trail system, and construction of a Refuge office would have the potential to affect adjacent land uses as a result of changes in traffic and use patterns. Two new parking lots are proposed on the Refuge under the selected action, these include a parking lot along Proctor Valley Road and a parking lot to the south of Highway 94 and the west of Millar Ranch Road. A third parking area was previously considered off Sloane Canyon Road, but that proposal has not been incorporated into the selected action due to the potential for significant adverse effects to land use, traffic safety, and sensitive resources. The Service will continue to work with the County and others to identify an appropriate parking/staging area for access to the McGinty Mountain area from communities to the north.

To minimize the impact of activities within the proposed parking/trail staging areas on adjacent property owners, the lots will only be open during Refuge hours of sunrise to sunset. The parking lot off Highway 94 is currently being designed and will include roadway improvements on Highway 94, including acceleration and deceleration lanes to accommodate right turns, and a left-turn lane onto Miller Ranch Road. These improvements, for which subsequent NEPA review will be conducted, will mitigate any impacts related to traffic and access for surrounding land owners for both the parking lot and a potential Refuge office on that site. Based on preliminary designs, the Service does not anticipate any adverse land use effects related to the parking/trail staging areas proposed in the CCP these parking areas. However, project specific environmental analysis under NEPA would be conducted for each of the proposals, including the Proctor Valley Road parking/staging area. The effects to surrounding land uses would be one of the effects to be evaluated during NEPA review.

To avoid any adverse effects to adjacent property owners, the designated trail system has been designed to minimize the potential for trespass onto private property or onto other areas for which there are no approved access rights. All access points onto the Refuge are designed to take access from the public right-of-way, from an existing county trail, or via a dedicated trail easement or other legal access route. In addition, adequate separation has been provided between proposed trail routes and adjacent private lands. These measures, along with fencing and signage, are intended to ensure that uses on the Refuge are compatible with the land uses that abut the Refuge.

The hunting program proposed for the southern portion of the Otay Mesa and Lakes area would occur on lands that abut existing State and Federal lands that permit hunting. Therefore, this proposal would not be introducing a new use into the area; but rather would expand hunting opportunities in an area of the county where hunting is already occurring. No land use impacts are anticipated.

#### **Recreational Opportunities**

The lands included within the San Diego NWR were acquired for the purpose of conserving listed and sensitive species and the habitats that support these species. As a contribution to the development of the San Diego MSCP, the focus of the San Diego NWR is to conserve and manage wildlife habitats to offset impacts from development. Compatible public uses will however be supported on the Refuge under the selected action. These uses include hunting, wildlife observation, environmental education, photography, interpretation, and non-motorized trail use. The trail system provides connections to existing County trails and connections between different parts of the Refuge. The Service is working with the County of San Diego, Sweetwater Authority, Sycuan Band of the Kumeyaay Nation, the Kumeyaay-Diegueño Land Conservancy, San Diego Gas & Electric (SDG&E), California Department of Fish and Wildlife, and other parties to resolve trail connection and alignment issues associated with the Sweetwater River Regional Trail, the McGinty Mountain area, and other areas within and adjacent to the Refuge boundary. The implementation of the selected action will have no adverse effects on recreational opportunities in the region.

#### **Traffic Circulation and Parking**

Implementing the various wildlife and habitat management activities and other Refuge operations actions proposed as part of the selected plan would have little impact on current and future traffic volumes on the roads surrounding the Refuge. The expansion of public uses on the Refuge will not result in a significant increase in the number of vehicle trip generated by the Refuge. In addition, these trips will generally occur outside of peak traffic hours. Therefore, no direct or cumulative impacts to traffic circulation from Refuge activities are anticipated.

Improvements to the travel lanes on Highway 94 to be implemented in association with the development of a parking lot/trail staging area will minimize any potential impacts to traffic circulation along this portion of Highway 94. These improvements will also improve ingress and egress conditions for residents along Millar Ranch Road.

#### **Public Utilities and Easements**

The selected action will have no effect on the existing utility maintenance and management activities that occur within the Refuge, and no facilities or uses are proposed that would obstruct or otherwise adversely affect access over existing easements and access roads maintained on the Refuge by SDG&E, AT&T, Otay Water District, and Sweetwater Authority. In addition, the CCP does not preclude the potential for the extension of utility easements through the Refuge; however, any such proposals would require evaluation of potential impacts to the environment, including sensitive Refuge resources, in accordance with NEPA and—because of the presence of listed species on the Refuge—consultation under the Endangered Species Act would also be required.

#### **Economics and Employment**

The Refuge will continue to provide compatible recreational opportunities for Refuge visitors, including naturalists, students, hikers, dog walkers, mountain bikers, and equestrians. Conducting these uses on the Refuge would provide a small benefit to the economy. The economic benefits of outdoor recreation are well understood and have been documented in publications such as *Banking on Nature: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation*. Benefits from the visitation experienced on the Refuge come in the form of retail expenditures, which in turn generate additional revenues and jobs.

Additional economic benefits to the local and regional economy would also result from temporary construction jobs and the purchase of materials to implement the various facilities proposed to accommodate Refuge operations and visitor services. The jobs created from these projects would be temporary but would still contribute to the overall regional effort to create jobs, particularly in the construction industry. The establishment of a hunting program on the Refuge would also generate economic benefits, as the purchase of hunting licenses generates significant revenue for the State. In addition, the economic contributions provided by hunting activities benefit all outdoor recreationalists, with significant funding coming via the Pittman-Robertson Act excise tax on firearms and ammunition. Those funds are distributed through the Department of Interior to the States annually to provide for enhanced hunter education programs, land and wetland acquisition, outdoor education, research, habitat management, and other purposes.

#### **Environmental Justice**

The goal of environmental justice in the United States is to afford the same degree of protection from environmental and health hazards to all individuals and communities throughout the nation. Environmental justice is defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The environmental justice strategy of the Service is to seek to ensure that all segments of the human population have equal access to America's fish and wildlife resources, as well as equal access to information that will enable them to participate meaningfully in activities and policy shaping.

The Refuge occurs at the urban interface with rural development to the north and east and urban development to the south and west. Both the communities of Spring Valley and El Cajon support larger populations of lower income households than the other communities in the immediate vicinity of the Refuge. The programs and public uses proposed on the Refuge under the selected action would be equally accessible to all visitors, and through the Urban Refuge program, actions will be taken to improve accessibility onto the Refuge for the region's urban communities. Within the spirit and intent of Executive Order 12898, no minority or low-income populations would be impacted by implementing the selected action; and equal access to Refuge resources and Refuge programs will be afforded to all visitors.

#### **Public Review**

Public involvement has been an essential component of the CCP and NEPA process, and the San Diego NWR has been engaged in public involvement since the San Diego NWR CCP was initiated in 2006. This initial public involvement included the distribution of two planning updates in 2006 to over 650 landowners, organizations, agencies, Tribes, and individuals. Two public scoping meetings were held in 2006, a public use workshop was held in 2007, and a trails workshop was held in 2008. Following these meetings, the comments received were compiled and preliminary management alternatives were prepared. These preliminary alternatives were described and comments solicited in a Planning Update, distributed in March 2008.

The draft CCP/EA for the San Diego NWR was released for public comment on June 19, 2014 for a 60-day comment period. Also on June 19, a Notice of the Availability of the draft CCP/EA was published in the Federal Register (79 FR 35183). More than 1,500 notices were distributed to individuals, agencies, local community groups, and interested organizations announcing both the availability of the draft CCP and the opportunity to attend a public meeting on July 15, 2014. During the initial public comment period, Refuge staff also presented the proposals in the draft CCP to the five San Diego County community planning groups whose community boundaries overlap the Refuge boundaries.

Based on the level of interest in the draft CCP/EA, the comment period was extended for an additional 30 days. Approximately 1,500 postcards were mailed out to inform the public of the time extension and a notice was published in the Federal Register on September 2, 2014 (79 FR 52037) announcing the reopening of the comment period until September 17, 2014.

As a result of concerns raised about the trail proposals included in the draft CCP/EA, four additional community meetings were held specifically to gather public input on trails. These meetings were held on August 20 (focusing on trails in the Jamul community), August 25 (focusing on trails in the Spring Valley/Rancho San Diego/Valle de Oro communities), August 26 (focusing on trails in the Bonita/Sweetwater area), and September 10 (focusing on trails in the

Dehesa/Sloane Canyon area). Although each of these trail meetings was focused on a specific area, comments were accepted for any area within the Refuge boundaries.

The Refuge received more than 35,800 written communications on the draft CCP/EA, including 637 original letters and emails and 35,189 organized email petition responses (related to hunting) from two different sources. In addition, a petition, signed by numerous individuals (some of whom also submitted separate comments) was submitted to the Refuge office that addressed concerns about the trail plans presented in the alternatives. Revisions to the information provided and the management actions proposed in the draft CCP/EA were made in response to comments received during the public comment period (refer to the Appendix F-3 of the final EA [Response to Comments]). Revised text and graphics have been incorporated into the appropriate sections of the final CCP and EA.

The final CCP, Environmental Assessment, approved step-down plans, and other accompanying documents are available to the public and can be reviewed at the U.S. Fish and Wildlife Service, San Diego National Wildlife Refuge Complex, 1080 Gunpowder Point Drive, Chula Vista, CA 91910 (telephone 619-476-9150 extension 103), as well as at the Bonita-Sunnyside Branch Library (4375 Bonita Road, Bonita, CA 91902); Rancho San Diego Branch Library (11555 Via Rancho San Diego, El Cajon, CA 92019); Spring Valley Branch Library (836 Kempton Street, Spring Valley, CA 91977); and Carmel Valley Library (3919 Townsgate Drive, San Diego, CA 92130). These documents can also be downloaded from the Refuge Web site at: https://www.fws.gov/refuge/San\_Diego/what\_we\_do/planning.html.

#### Conclusions

Based on review and evaluation of the information contained in the final CCP, EA, and other supporting references, I have determined that implementing a modified Alternative D for management of the San Diego NWR, as described in the final CCP and EA, along with the implementation of the IPM Plan and Feral Pig Monitoring and Eradication Plan, would not represent major Federal actions that would significantly affect the quality of the human environment, within the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969, as amended. Accordingly, the Service is not required to prepare an Environmental Impact Statement.

This Finding of No Significant Impact and supporting references are on file at the U.S. Fish and Wildlife Service, San Diego NWR Complex, 1080 Gunpowder Point Drive, Chula Vista, CA 91910 (telephone 619-476-9150 extension 103) and the U.S. Fish and Wildlife Service, Pacific Southwest Region, 2800 Cottage Way, Suite W2606, Sacramento, CA 95825 (telephone 916-414-6500). These documents are available for public inspection. Interested and affected parties are being notified of this decision.

Regional Director, Parific Southwest Region Sacramento, California

5-16-17 Date

#### **Supporting References**

California Department of Conservation, Division of Land Resource Protection. 2010. San Diego County Important Farmland 2008. Map published October 2010. Available at: ftp://ftp.consrv.ca.gov/pub/dlrp/FMMP/pdf/2008/sdg08\_west.pdf.

City of San Diego. 2015. Carmel Mountain and Del Mar Mesa Preserves Resource Management Plan.

U. S. Fish and Wildlife Service. 2014. Draft Comprehensive Conservation Plan/Environmental Assessment for the San Diego National Wildlife Refuge. San Diego NWR Complex. Chula Vista, California.

U. S. Fish and Wildlife Service. 2017. Final Comprehensive Conservation Plan for the San Diego National Wildlife Refuge (Volumes 1, 2, and 3). San Diego NWR Complex. Chula Vista, California.

## **Table of Contents**

1 INT	RODUCTION	1-1
1.1	Introduction and Background	
1.2	Purpose and Need	
1.3	U.S. Fish and Wildlife Service and National Wildlife Refuge System	
	1.3.1 U.S. Fish and Wildlife Service	
	1.3.2 National Wildlife Refuge System	
1.4	Legal and Policy Guidance	
	1.4.1 National Wildlife Refuge System Improvement Act of 1997	1-11
	1.4.2 National Environmental Policy Act (NEPA) of 1969	1-12
1.5	San Diego National Wildlife Refuge	
	1.5.1 Location	
	1.5.2 Physical Setting	1-15
	1.5.3 Ecosystem Context	
	1.5.4 Refuge Purposes	
	1.5.5 Refuge Vision Statement and Goals	
	1.5.6 History of Refuge Establishment	1-19
2 TH	E PLANNING PROCESS	2-1
2.1	Preparing a Comprehensive Conservation Plan	
2.2	Preplanning	
2.3	Public Involvement in Planning	
2.4	Overview of Issues and Public Scoping Comments	
2.5	Management Concerns and Opportunities	
2.6	Development of a Refuge Vision	
2.7	Development of Refuge Goals, Objectives, and Strategies	
2.8	Development of Alternatives	
2.9	Selection of the Proposed Action	2-10
2.10	Plan Implementation	
3 AF	FECTED ENVIRONMENT	
31	Environmental Setting	3-1
0.1	3.1.1 Location and Property Description	
	3.1.2 Regional Context	

3.2	Physic	eal Environment	3-2
	3.2.1	Topography and Visual Quality	
	3.2.2	Geology and Soils	
	3.2.3	Geological Hazards	3-14
	3.2.4	Paleontological Resources	3-17
	3.2.5	Mineral Resources	3-18
	3.2.6	Agricultural Resources	
	3.2.7	Hydrology and Water Quality	3-26
	3.2.8	Climate and Climate Change	3-35
	3.2.9	Air Quality	3-38
	3.2.10	Greenhouse Gas Emissions	3-40
	3.2.11	Contaminants	3 <b>-</b> 41
3.3	Biolog	ical Resources	
	3.3.1	Regional Species and Habitat Conservation Planning	
	3.3.2	Vegetation Communities	
	3.3.3	Plants	
	3.3.4	Wildlife	
	3.3.5	Invasive and Exotic Species	
	3.3.6	Federal and State Listed Endangered and Threatened Species	3-91
	3.3.7	MSCP-Covered Species and Other Special Status Species	3-139
3.4	Cultur	ral Resources	3-146
3.4	Cultur 3.4.1	ral Resources Introduction	3-146 3-146
3.4	Cultur 3.4.1 3.4.2	ral Resources Introduction Cultural Setting	3-146 3-146 3-146
3.4	Cultur 3.4.1 3.4.2 3.4.3	ral Resources Introduction Cultural Setting Ethnohistory	
3.4	Cultur 3.4.1 3.4.2 3.4.3 3.4.4	ral Resources Introduction Cultural Setting Ethnohistory Historic Period	
3.4	Cultur 3.4.1 3.4.2 3.4.3 3.4.4 3.4.5	ral Resources Introduction Cultural Setting Ethnohistory Historic Period Cultural Resources Investigations and Research	3-146 3-146 3-146 3-147 3-147 3-148 3-150
3.4	Cultur 3.4.1 3.4.2 3.4.3 3.4.4 3.4.5 3.4.6	ral Resources Introduction Cultural Setting Ethnohistory Historic Period Cultural Resources Investigations and Research Sacred Sites	3-146 3-146 3-146 3-147 3-147 3-148 3-150 3-152
3.4	Cultur 3.4.1 3.4.2 3.4.3 3.4.4 3.4.5 3.4.6 3.4.7	ral Resources Introduction Cultural Setting Ethnohistory Historic Period Cultural Resources Investigations and Research Sacred Sites Information Gaps	3-146 3-146 3-146 3-147 3-147 3-148 3-150 3-152 3-152
3.4 3.5	Cultur 3.4.1 3.4.2 3.4.3 3.4.4 3.4.5 3.4.6 3.4.7 Social	ral Resources Introduction Cultural Setting Ethnohistory Historic Period Cultural Resources Investigations and Research Sacred Sites Information Gaps and Economic Environment	3-146 3-146 3-146 3-147 3-147 3-148 3-150 3-152 3-152 3-152 3-153
3.4 3.5	Cultur 3.4.1 3.4.2 3.4.3 3.4.4 3.4.5 3.4.6 3.4.7 Social 3.5.1	ral Resources Introduction Cultural Setting Ethnohistory Historic Period Cultural Resources Investigations and Research Sacred Sites Information Gaps and Economic Environment Land Use	3-146 3-146 3-146 3-147 3-147 3-148 3-150 3-152 3-152 3-152 3-153 3-153
3.4 3.5	Cultur 3.4.1 3.4.2 3.4.3 3.4.4 3.4.5 3.4.6 3.4.7 Social 3.5.1 3.5.2	ral Resources Introduction Cultural Setting Ethnohistory Historic Period Cultural Resources Investigations and Research Sacred Sites Information Gaps and Economic Environment Land Use Recreational Opportunities	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
3.4 3.5	Cultur 3.4.1 3.4.2 3.4.3 3.4.4 3.4.5 3.4.6 3.4.7 Social 3.5.1 3.5.2 3.5.3	ral Resources Introduction Cultural Setting Ethnohistory Historic Period Cultural Resources Investigations and Research Sacred Sites Information Gaps and Economic Environment Land Use Recreational Opportunities Traffic Circulation and Parking	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
3.4 3.5	Cultur 3.4.1 3.4.2 3.4.3 3.4.4 3.4.5 3.4.6 3.4.7 Social 3.5.1 3.5.2 3.5.3 3.5.4	ral Resources Introduction Cultural Setting Ethnohistory Historic Period Cultural Resources Investigations and Research Sacred Sites Information Gaps and Economic Environment Land Use Recreational Opportunities Traffic Circulation and Parking Public Utilities and Easements	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
3.4 3.5	Cultur 3.4.1 3.4.2 3.4.3 3.4.4 3.4.5 3.4.6 3.4.7 Social 3.5.1 3.5.2 3.5.3 3.5.4 3.5.5	ral Resources Introduction Cultural Setting Ethnohistory Historic Period Cultural Resources Investigations and Research Sacred Sites Information Gaps and Economic Environment Land Use Recreational Opportunities Traffic Circulation and Parking Public Utilities and Easements Economics and Employment	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
3.4 3.5	Cultur 3.4.1 3.4.2 3.4.3 3.4.4 3.4.5 3.4.6 3.4.7 Social 3.5.1 3.5.2 3.5.3 3.5.4 3.5.5 3.5.6	ral Resources Introduction Cultural Setting Ethnohistory Historic Period Cultural Resources Investigations and Research Sacred Sites Information Gaps and Economic Environment Land Use Recreational Opportunities Traffic Circulation and Parking Public Utilities and Easements Economics and Employment Environmental Justice	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
3.4 3.5 4 AL7	Cultur 3.4.1 3.4.2 3.4.3 3.4.4 3.4.5 3.4.6 3.4.7 Social 3.5.1 3.5.2 3.5.3 3.5.4 3.5.5 3.5.6 <b>FERNA</b>	ral Resources Introduction Cultural Setting Ethnohistory Historic Period Cultural Resources Investigations and Research Sacred Sites Information Gaps and Economic Environment Land Use Recreational Opportunities Traffic Circulation and Parking Public Utilities and Easements Economics and Employment Environmental Justice	3-146 3-146 3-146 3-147 3-147 3-148 3-150 3-152 3-152 3-152 3-153 3-153 3-155 3-158 3-158 3-161 3-162 3-163 4-1
3.4 3.5 <b>4 AL</b> <sup>7</sup>	Cultur 3.4.1 3.4.2 3.4.3 3.4.4 3.4.5 3.4.6 3.4.7 Social 3.5.1 3.5.2 3.5.3 3.5.4 3.5.5 3.5.6 <b>FERNA</b>	ral Resources Introduction Cultural Setting Ethnohistory Historic Period Cultural Resources Investigations and Research Sacred Sites Sacred Sites Information Gaps and Economic Environment Land Use Recreational Opportunities Traffic Circulation and Parking Public Utilities and Easements Economics and Employment Environmental Justice	$\begin{array}{c} 3 \cdot 146 \\ 3 \cdot 146 \\ 3 \cdot 146 \\ 3 \cdot 146 \\ 3 \cdot 147 \\ 3 \cdot 147 \\ 3 \cdot 148 \\ 3 \cdot 150 \\ 3 \cdot 152 \\ 3 \cdot 152 \\ 3 \cdot 152 \\ 3 \cdot 152 \\ 3 \cdot 153 \\ 3 \cdot 153 \\ 3 \cdot 155 \\ 3 \cdot 155 \\ 3 \cdot 158 \\ 3 \cdot 161 \\ 3 \cdot 162 \\ 3 \cdot 163 \\ 4 \cdot 1 \\ 4 \cdot 1 \\ 4 \cdot 1 \end{array}$
3.4 3.5 4 AL7 4.1	Cultur 3.4.1 3.4.2 3.4.3 3.4.4 3.4.5 3.4.6 3.4.7 Social 3.5.1 3.5.2 3.5.3 3.5.4 3.5.5 3.5.6 <b>FERNA</b> Introd	ral Resources Introduction Cultural Setting Ethnohistory Historic Period Cultural Resources Investigations and Research Sacred Sites Information Gaps and Economic Environment Land Use Recreational Opportunities Traffic Circulation and Parking Public Utilities and Easements Economics and Employment Environmental Justice	3-146   3-146   3-146   3-146   3-147   3-147   3-148   3-150   3-152   3-152   3-152   3-153   3-153   3-153   3-155   3-158   3-161   3-162   3-163   4-1

4.3	Past a	and Current Refuge Management on the San Diego NWR	4-2
	4.3.1	Background	
	4.3.2	Current Ownership Pattern and Acquisition History	4-3
	4.3.3	Existing Management Plans	4-4
	4.3.4	Management History and Past Refuge Actions	4-4
	4.3.5	Current Refuge Management Activities	4-10
4.4	Propos	sed Management Alternatives	4-10
	4.4.1	Alternatives for the San Diego NWR	4-10
4.5	Altern	natives Considered but Eliminated from the Detailed Analysis	4-112
	4.5.1	Comparison of the Alternatives for the San Diego NWR by Issue	4-116
5 EN	VIRON	IMENTAL CONSEQUENCES	5-1
5.1	Introd	luction	5-1
5.2	Effects	s to the Physical Environment	
	5.2.1	Effects to Topography	
	5.2.2	Effects to Visual Quality	
	5.2.3	Effects to Geology, Soils, and Geological Hazards	
	5.2.4	Effects to Paleontological Resources	5-19
	5.2.5	Effects to Mineral Resources	5-20
	5.2.6	Effects to Agricultural Resources	5-20
	5.2.7	Effects to Hydrology	5-21
	5.2.8	Effects to Water Quality	5-24
	5.2.9	Effects from Climate Change	5-35
	5.2.10	Effects to Air Quality	5-37
	5.2.11	Effects Related to Greenhouse Gas Emissions	5-42
	5.2.12	Effects Related to Contaminants	5-44
5.3	Effects	s to Habitat and Vegetation Resources	5-45
	5.3.1	Alternative A – No Action	5-45
	5.3.2	Alternative B	5-47
	5.3.3	Alternative C	5-53
	5.3.4	Alternative D	5-55
	5.3.5	Modified Alternative D	5-56
5.4	Effects	s to Wildlife	5-57
	5.4.1	Alternative A – No Action	5-57
	5.4.2	Alternative B	5-60
	5.4.3	Alternative C	5-64
	5.4.4	Alternative D	5-75
	5.4.5	Modified Alternative D	5-76

5.5	Effect	s to Federally and State Listed Endangered and Threatened Sp	ecies and Other
	Specie	s of Concern	
	5.5.1	Alternative A – No Action	
	0.0.Z	Alternative B	
	0.0.3 E E 4	Alternative C	
	0.0.4 5 5 5	Alternative D	
• 0	0.0.0		
5.6	Effect	s to Cultural Resources	
	5.6.1	Alternatives A, B, C, D, and Modified D	5-90
5.7	Effect	s to the Social and Economic Environment	5-92
	5.7.1	Effects to Land Use	5-93
	5.7.2	Effects to Recreational Opportunities	5-96
	5.7.3	Effects to Traffic Circulation and Parking	5-96
	5.7.4	Effects to Public Utilities and Easements	5-98
	5.7.5	Effects to Economics and Employment	5-99
	5.7.6	Effects to Environmental Justice	5-100
5.8	Unavo	vidable Adverse Impacts	5-101
5.9	Irreve	rsible and Irretrievable Commitments of Resources	5-101
5.10	Short-	term Uses versus Long-term Productivity	5-101
5.11	Cumu	lative Effects	5-101
	5.11.1	Cumulative Effects to the Physical Environment	5-102
	5.11.2	Cumulative Effects to Biological Resources	5-104
	5.11.3	Cumulative Effects to Cultural Resources	5-105
	5.11.4	Cumulative Effects to the Social and Economic Environment	5-106
5.12	Select	ed Action	5-106
5.13	Summ	nary of Effects	5-108
	5.13.1	Physical Environment	5-108
6 IM	PLEME	INTATION	6-1
7 DE	ггргл		7-1
( IVE	T. TATCIAL		····· ··· ··· ··· ··· ··· ··· ··· ···
APPE	NDIX I	F-1: List of Preparers and Person/Agencies Consulted	

#### APPENDIX F-2: Response to Comments

## List of Figures

Figure 1-1. Location Map - San Diego National Wildlife Refuge	1-2
Figure 1-2. Refuge Acquisition Boundaries – San Diego National Wildlife Refuge	1-3
Figure 1-3. Location Map - Otay-Sweetwater Unit	1-4
Figure 1-4. Lands Conserved within the Otay-Sweetwater Unit Acquisition Boundary	1-5
Figure 1-5. USFWS-Owned Lands within the Vernal Pool Stewardship Project	1-7
Figure 1-6. Management Areas of the Otay-Sweetwater Unit	1 <b>-</b> 14
Figure 2-1. Comprehensive Conservation Planning Process	2-2
Figure 3-1. Topographic Character of the McGinty Mountain Area	3-3
Figure 3-2. Topographic Character of the Las Montañas Area	3-5
Figure 3-3. Topographic Character of the Sweetwater River Area	3-6
Figure 3-4. Topographic Character of the San Miguel Mountain Area	3-8
Figure 3-5. Topographic Character of the Otay Mesa and Lakes Area	3-9
Figure 3-6. Topographic Character of the Del Mar Mesa Vernal Pool Unit	3-11
Figure 3-7. Earthquake Faults in the Vicinity of the San Diego NWR	3-16
Figure 3-8. Potential Aggregate Materials in the Vicinity of the Otay-Sweetwater Unit	3-20
Figure 3-9. Boundaries of the Historic Rancho Jamacha Land Grant	3-23
Figure 3-10. San Diego County Important Farmland, as mapped by the California Department of Conservation	3-25
Figure 3-11. Watersheds included within the San Diego NWR	3-27
Figure 3-12. Vegetation Types Present on the McGinty Mountain Area	3-59
Figure 3-13. Vegetation Types Present on the Las Montañas Area	3-61
Figure 3-14. Vegetation Types Present on the Sweetwater River Area	3-62
Figure 3-15. Vegetation Types Present on the San Miguel Mountain Area	3-63
Figure 3-16. Fire History for the Otay-Sweetwater Unit	3-64
Figure 3-17. Vegetation Types Present on the Otay Mesa and Lakes Area	3-66
Figure 3-18. Vegetation Types on the Del Mar Mesa Vernal Pool Unit	3-67
Figure 3-19. Designated Critical Habitat on the Otay-Sweetwater Unit	3-93
Figure 3-20. Designated Critical Habitat - Del Mar Mesa Vernal Pool Unit	3-94
Figure 3-21. Land Uses Surrounding the Otay-Sweetwater Unit	3-156
Figure 3-22. Land Uses Surrounding the Del Mar Mesa Vernal Pool Unit	3-157
Figure 4-1. Alternative A - McGinty Mountain Area, Otay-Sweetwater Unit	4-16
Figure 4-2. Alternative A - Las Montañas Area, Otay-Sweetwater Unit	4-17
Figure 4-3. Alternative A - Sweetwater River Area, Otay-Sweetwater Unit	4-18

Figure 4-4.	Alternative A – San Miguel Mountain Area, Otay-Sweetwater Unit
Figure 4-5.	Alternative A - Otay Mesa and Lakes Area, Otay-Sweetwater Unit
Figure 4-6.	Alternative A - Del Mar Mesa Vernal Pool Unit
Figure 4-7.	Alternative B - McGinty Mountain Area, Otay Sweetwater Unit
Figure 4-8.	Alternative B - Las Montañas Area, Otay Sweetwater Unit
Figure 4-9.	Alternative B - Sweetwater River Area, Otay Sweetwater Unit
Figure 4-10.	Alternative B - San Miguel Mountain Area, Otay Sweetwater Unit4-44
Figure 4-11.	Alternative B – Otay Mesa and Lakes Area, Otay Sweetwater Unit
Figure 4-12.	Alternatives B, C, and D - Del Mar Mesa Vernal Pool Unit
Figure 4-13.	Alternative C – McGinty Mountain Area, Otay-Sweetwater Unit
Figure 4-14.	Alternative C - Las Montañas Area, Otay-Sweetwater Unit
Figure 4-15.	Alternative C – Sweetwater River Area, Otay-Sweetwater Unit
Figure 4-16.	Alternative C -San Miguel Mountain Area, Otay-Sweetwater Unit
Figure 4-17.	Alternatives C & D – Otay Mesa and Lakes Area, Otay-Sweetwater Unit
Figure 4-18.	Alternative D – McGinty Mountain Area, Otay-Sweetwater Unit
Figure 4-19.	Alternative D - Las Montañas Area, Otay-Sweetwater Unit
Figure 4-20.	Alternative D – Sweetwater River Area, Otay-Sweetwater Unit
Figure 4-21.	Alternative D -San Miguel Mountain Area, Otay-Sweetwater Unit
Figure 4-22	$Modified \ Alternative \ D-McGinty \ Mountain \ Area, \ Otay-Sweetwater \ Unit \$
Figure 4-23.	Modified Alternative D - Las Montañas Area, Otay-Sweetwater Unit
Figure 4-24.	$Modified \ Alternative \ D-Sweetwater \ River \ Area, \ Otay-Sweetwater \ Unit \$
Figure 4-25.	Modified Alternative D - San Miguel Mountain Area, Otay-Sweetwater Unit
Figure 4-26.	Modified Alternative $D-Otay$ Mesa and Lakes Area, $Otay\-Sweetwater\-Unit\4\-102$
Figure 4-27.	Modified Alternative D – Del Mar Mesa Vernal Pool Unit
Figure 4-28.	Uses and Ownerships Surrounding the Area Proposed for Hunting in Modified Alternative D4-104
Figure 4-29.	Modified Alternative D – Trail Plan for the McGinty Mountain Area
Figure 4-30.	Modified Alternative D – Trail Plan for the Otay-Sweetwater Unit South of McGinty Mountain

## List of Tables

Table 1-1	Federal Laws and Executive Orders Applicable to the Management of the San Diego National Wildlife Refuge1-10
Table 1-2	Key Service Policies Related to the Management of National Wildlife Refuges
Table 1-3	Approximate Acreages within the San Diego NWR Management Areas in 20131-13
Table 3-1	Beneficial Uses of Surface and Ground Waters in the Vicinity of the San Diego NWR .3-31
Table 3-2	Descriptions of the Beneficial Uses from the Basin Plan
Table 3-3	Priority Bird Species within the Californian Coasts and Mountains Region of the Sonoran Joint Venture Present on the San Diego NWR
Table 3-4	Summary of Vegetation Types Present on the San Diego NWR <sup>1</sup>
Table 3-5	Targeted Invasive Plant Species Identified on the Refuge in 2011
Table 3-6	Federal and/or State Listed and Candidate Species Currently Present or Suitable Habitat Present on the San Diego NWR
Table 3-7	San Diego MSCP-covered Species Observed or Expected to Occur within the San Diego NWR
Table 3-8	Birds of Conservation Concern Documented on the San Diego NWR
Table 3-9	California Special Status Species Observed or with the Potential to Occur on the San Diego NWR
Table 3-10	Existing Traffic Volumes and Street Capacities in the Vicinity of the Refuge
Table 3-11	Estimated Household Incomes for the Communities <sup>1</sup> around the Refuge in 20103-165
Table 4-1	Current Monitoring Methodology for MSCP-Covered Species on the San Diego NWR4-24
Table 4-2	Pesticides Currently Used on the San Diego NWR
Table 4-3	Species and Habitat Management Actions for the Del Mar Mesa Vernal Pool Unit4-49
Table 4-4	Pesticides Proposed for Use on the San Diego NWR under Alternative B
Table 4-5	Comparison of Alternatives for the San Diego NWR CCP
Table 5-1	Environmental Fate of Herbicides Presently Used on the Refuge (Alt. A) (Factors Specific to Air and Water Quality)
Table 5-2	Environmental Fate of Herbicides Proposed For Use on the Refuge (Alt. B) (Factors Specific to Air and Water Quality)
Table 5-3	Ecological Risks of Pesticides Proposed for Use under the Integrated Pest Management Plan
Table 5-4	CDFW Hunting Seasons, Daily Bag Limits, and Possession Limits for 2013/20145-66

Page Intentionally Left Blank

## 1 Introduction

#### 1.1 Introduction and Background

The U.S. Fish and Wildlife Service (Service or USFWS) has prepared this Comprehensive Conservation Plan (CCP) to guide the management of the San Diego National Wildlife Refuge (NWR or Refuge) over the next 15 years. It provides long-range management direction for achieving Refuge purposes, while also providing important background information related to the history of the Refuge, the resources being conserved, past management activities, and any anticipated future conditions that could affect Refuge resources and management.

The San Diego NWR is located in southwestern San Diego County, California (Figure 1-1). Managed by the Service as part of the National Wildlife Refuge System (NWRS or Refuge System), the Refuge protects a variety of native upland and wetland habitats, and plays a critical role in the regional effort to maintain the high biological diversity of southwestern San Diego County. More than 16 species currently listed as threatened or endangered under the Federal Endangered Species Act (ESA) and/or the California Endangered Species Act (CESA) are either known to occur on the Refuge or have occurred here within the last 20 years. Many other species of concern, including at least 35 species covered by the San Diego Multiple Species Conservation Program (MSCP) (City of San Diego 1998a) have also been documented on the Refuge.

In 1997, the Service approved a Land Protection Plan (LPP) and acquisition boundary for the San Diego NWR's Otay-Sweetwater Unit, as well as the Vernal Pools Stewardship Project (Figure 1-2). The Land Protection Plan for the Otay-Sweetwater Unit established an acquisition boundary that has the potential to protect up to 43,860 acres of native habitat (Figure 1-3). Acquisition within this boundary from willing sellers is intended to contribute to the conservation of listed species within southwestern San Diego County and sustain native diversity by conserving large contiguous blocks of undisturbed native habitat (USFWS 1997a).

In the years since the LPP was approved, several large areas within the Otay-Sweetwater acquisition boundary have been acquired by the Service for inclusion in the Refuge and acquisition efforts will continue per available funding. It should be noted that because the Service's land acquisition program is based on willing sellers, it is likely that some lands within the approved acquisition boundary will never be acquired. As of August 2013, the Otay-Sweetwater Unit included about 11,470 acres of USFWS-owned lands (refer to Figure 1-3). Over the next few years, an additional 337 acres of land owned by the California Department of Transportation (Caltrans) are expected to be transferred to the Service for inclusion in the Refuge (Figure 1-4).

In addition to the Refuge's 11,470 acres, there are more than 25,000 acres within the Otay-Sweetwater acquisition boundary that are owned by other Federal, State, and local agencies, tribes, and non-profit conservation organizations (refer to Figure 1-4). Most of this acreage is already managed for habitat conservation and/or watershed protection; therefore, it is unlikely that the majority of these lands will ever be incorporated into the Refuge.



Figure 1-1. Location Map - San Diego National Wildlife Refuge



Figure 1-2. Refuge Acquisition Boundaries – San Diego National Wildlife Refuge



Figure 1-3. Location Map - Otay-Sweetwater Unit



Figure 1-4. Lands Conserved within the Otay-Sweetwater Unit Acquisition Boundary
The LPP for the Vernal Pools Stewardship Project established an approved project boundary (refer to Figure 1-2) to conserve up to 8,220 acres through a variety of habitat protection methods for the purpose of protecting sensitive vernal pool habitat and the rare species this habitat supports (USFWS 1997b). As illustrated in Figure 1-2, some portions of the Vernal Pools Stewardship Project boundary overlap with the acquisition boundary for the Otay-Sweetwater Unit. Between 1997 and 2013, two areas within the Vernal Pools Stewardship Project boundary were incorporated into the Refuge. These areas include 17 acres located near the southeastern end of the Sweetwater Reservoir, which are collocated within the boundaries of the Otay-Sweetwater Unit, and 60 acres located the Del Mar Mesa area (Figure 1-5). Approximately 360 acres of the Caltrans lands to be transferred to the Service are collocated within the boundary of the Vernal Pool Stewardship Project and the acquisition boundary of the Otay-Sweetwater Unit.

## 1.2 Purpose and Need

The purpose and need for the San Diego NWR CCP is to provide guidance to the Refuge Manager and others for how this Refuge should be managed to best achieve the purposes for which it was established and to contribute to the mission of the NWRS. This CCP, when completed, is intended to provide a 15-year management plan for addressing the conservation of wildlife and plant resources and their related habitats, while also presenting the opportunities on the Refuge for compatible wildlife-dependent recreational uses. It is through the CCP process that the overarching wildlife, public use, and management needs for the Refuge, as well as any issues affecting the management of Refuge resources and public use programs, are identified. Through this process, various strategies for meeting Refuge needs and/or resolving issues that may be impeding the achievement of Refuge purposes are evaluated and ultimately presented for implementation.

The CCP is intended to:

- Ensure that Refuge management is consistent with the NWRS mission and Refuge purposes and that the needs of wildlife come first, before other uses;
- Provide a scientific foundation for Refuge management;
- Establish a clear vision statement of the desired future conditions for Refuge habitat, wildlife, visitor services, staffing, and facilities;
- Communicate the Service's management priorities for the Refuge to its neighbors, visitors, partners, State, local, and other Federal agencies, and to the general public;
- Ensure current and future Refuge uses are compatible with Refuge purposes;
- Provide long-term continuity in Refuge management; and
- Provide a basis for budget requests to support the Refuge's needs for staffing, operations, maintenance, and capital improvements.

The development of this CCP is also required to fulfill legislative obligations of the Service. Its preparation is mandated by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (the Improvement Act) (Public Law 105-57). The Improvement Act requires that a CCP be prepared for each refuge or related complex of refuges within 15 years of the law's enactment. In accordance with the Act, the Service is developing a CCP for each refuge included within the NWRS.



Figure 1-5. USFWS-Owned Lands within the Vernal Pool Stewardship Project

Currently, there is no overarching management plan in place for the San Diego NWR. Those documents that are available, such as the Conceptual Management Plan for the San Diego National Wildlife Refuge (USFWS 1997b) and the San Diego MSCP Plan (City of San Diego 1998a), provide general direction and guidance, but do not address the full range of activities and strategies that should be considered in managing a national wildlife refuge. The Conceptual Management Plan provides a broad overview of the Service's proposed approach for managing Refuge resources and operations, while the MSCP Plan provides general guidance for habitat and species management and monitoring within the larger MSCP preserve.

As the first comprehensive management plan for the San Diego NWR, the CCP will set forth Refuge goals and objectives and describe the specific strategies to be implemented to achieve these goals and objectives. The guidance provided will be based on specific Refuge purposes, Federal laws, NWRS goals, and Service policies. Although the CCP will address all management actions and activities occurring or proposed to occur on the Refuge, some of these actions or activities, such as hunting, may be broadly stated. In such cases, the Refuge staff will prepare detailed stepdown plans to further describe how a specific management strategy or activities will be implemented. These step-down plans provide specific strategies and implementation schedules for meeting the various goals and objectives identified in the CCP. The step-down plans to be prepared for the San Diego NWR following CCP approval are outlined in Chapter  $5 \text{ of the Final} \underline{CCP}$ .

# 1.3 U.S. Fish and Wildlife Service and National Wildlife Refuge System

### 1.3.1 U.S. Fish and Wildlife Service

The Service is the primary Federal agency responsible for conserving and enhancing the Nation's fish and wildlife populations and their habitats. Although this responsibility is shared with other Federal, State, tribal, local, and private entities, the Service has specific responsibilities for migratory birds, threatened and endangered species, interjurisdictional fish, and certain marine mammals. The Service also has similar trust responsibilities for the lands and waters it administers to support the conservation and enhancement of fish and wildlife. The mission of the Service is: "Working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people."

### 1.3.2 National Wildlife Refuge System

The NWRS is the largest system of lands and waters in the world specifically dedicated to the conservation of fish and wildlife. Operated and managed by the Service, the NWRS currently includes more than 150 million acres, consisting of over 560 national wildlife refuges and other units of the Refuge System and more than 35 wetland management districts. The majority of Refuge System lands (over 77 million acres) are in Alaska. The remaining acreage is scattered across the other 49 states and several island territories. About 21 million acres are managed as wilderness under the Wilderness Act of 1964.

The NWRS started in 1903, when President Theodore Roosevelt established Pelican Island as the Nation's first bird sanctuary. With this action, pelicans, herons, ibis, and roseate spoonbills nesting on a small island in Florida's Indian River were given protection from feather collectors who were decimating their colonies. President Roosevelt went on to establish many other sanctuaries for wildlife during his tenure. This small network of sanctuaries continued to expand, later becoming the NWRS. In contrast to other public lands, which are managed under a multiple uses mandate (e.g., national forests managed by the U.S. Forest Service, and lands administered by the U.S.

Bureau of Land Management [BLM]), the lands within the NWRS are managed primarily for the benefit of fish, wildlife, and plant resources and their habitats.

The mission of the NWR System is "to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (the Improvement Act).

The administration, management, and growth of the NWRS are guided by the following goals (Service Manual, Part 601 FW1, NWRS Mission and Goal, and Refuge Purposes):

- Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.
- Develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that is strategically distributed and managed to meet important life history needs of these species across their ranges.
- Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts.
- Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).
- Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

## 1.4 Legal and Policy Guidance

Refuges are guided by the purposes of the individual refuge, the mission and goals of the Refuge System, Service policy, various Federal laws, and international treaties. Relevant guidance includes the Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4), the National Wildlife Refuge System Administration Act of 1966 (Refuge Administration Act), which was significantly amended by the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act, 16 U.S.C. 668dd-668ee), and selected portions of the Code of Federal Regulations and the U.S. Fish and Wildlife Service Manual (Service Manual). Refuges are also governed by a variety of other Federal laws, Executive orders (EOs), treaties, interstate compacts, regulations, and policies pertaining to the conservation and protection of natural and cultural resources (see Service Manual 602 FW 1 (1.3)). Federal laws and Executive orders relevant to the management of the San Diego NWR are summarized in Table 1-1 and addressed in more detail in Appendix <u>K</u>.

Table 1-1: Federal Laws and Executive Orders Applicable to the Management			
of the San Diego National Wildlife Refuge			
Endangered Species Act of 1973 (16 U.S.C. §1531 et seq.), as amended (ESA) National Environmental Policy Act of 1969 (42 U.S.C. §4321 et seq.) (NEPA) Fish and Wildlife Act of 1956 (16 U.S.C. §742a-743j, not including 742d-742l) Fish and Wildlife Conservation Act of 1980 (16 U.S.C. §661-667e), as amended Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. Jan. 10, 2001 Executive Order 13112, Invasive Species Bald and Golden Eagle Protection Act of 1940 (16 U.S.C. §668 et seq.) Migratory Bird Treaty Act of 1918, as amended (MBTA) Fish and Wildlife Coordination Act of 1958 Federal Noxious Weed Act of 1990 Emergency Wetlands Resources Act of 1986			
Land Use Refuge Recreation Act of 1962, as amended Fish and Wildlife Improvement Act of 1978 National Wildlife Refuge System Administration Act of 1966 (16 USC 668dd-668ee), National Wildlife Refuge System Improvement Act of 1997 (PL 105-57) Executive Order No. 12996, Management and General Public Use of the National Wildlife Refuge System			
Cultural ResourcesAntiquities Act of 1906Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. §3001 et seq.) Executive Order13007, Indian Sacred Sites. 24 May 1996Executive Order No. 11593, Protection and Enhancement of the Cultural EnvironmentArchaeological Resources Protection Act of 1979 (16 U.S.C. §470aa-47011), as amendedAmerican Indian Religious Freedom Act 1978 (42 U.S.C. 1996)National Historic Preservation Act of 1966 (16 U.S.C. §470 et seq.; 36 CFR 800), as amendedArchaeological and Historic Preservation Act of 1974 (16 U.S.C. 469)Curation of Federally owned and Administered Archaeological Collections (36 CFR 79)			
<b>Tribal Coordination</b> Executive Order 13175, Consultation and Coordination with Indian Tribal Governments			
Paleontological Resources Paleontological Resources Preservation Act of 2009 (P.L. 111-11, Title VI, Subtitle D)			
<b>Farmland Protection</b> Farmland Protection Policy Act (7 U.S.C. §4201 et seq.)			
<b>Contaminants and Hazardous Materials</b> Comprehensive Environmental Response, Compensation, & Liability Act of 1980 (42 U.S.C. §9601) Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (P.L. 80-104; 7 U.S.C. § 136 et seq.)			
<b>Air Quality</b> Clean Air Act of 1970, as amended (P.L. 91-604; 42 U.S.C. §1857 et seq.)			
Water Protection and Wetland Management Clean Water Act of 1972, as amended (Sections 401 and 404) Executive Order No. 11990, Protection of Wetlands Executive Order No. 11988, Floodplain Management			
Human Rights Executive Order 12898, Environmental Justice Rehabilitation Act of 1973, as amended (Section 504) Architectural Barriers Act of 1968, as amended (42 U.S.C. §4151 et seq.)			
<b>Agency Coordination</b> Executive Order No. 12372, Intergovernmental Review of Federal Programs			

### 1.4.1 National Wildlife Refuge System Improvement Act of 1997

Statutory authority for Service management and associated habitat management planning on units of the Refuge System is derived from the National Wildlife Refuge System Administration Act of 1966 (Refuge Administration Act), as amended by the National Wildlife Refuge System Improvement Act of 1997. The Improvement Act directs the Service to manage each refuge to fulfill the mission of the Refuge System, as well as the specific purposes for which that refuge was established. The Improvement Act also states that the, "purposes of the refuge and purposes for each refuge mean the purposes specified in or derived from law, proclamation, Executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit."

The Improvement Act provides clear standards for management, use, planning, and growth of the NWRS. Its passage followed the promulgation of Executive Order 12996 (April 1996), "Management of Public Uses on National Wildlife Refuges," reflecting the importance of conserving natural resource for the benefit of present and future generations of people. The Improvement Act recognizes that wildlife-dependent recreational uses involving hunting, fishing, wildlife observation and photography, and environmental education and interpretation, when determined to be compatible with the mission of the NWRS and purposes of the Refuge, are legitimate and appropriate public uses of the Refuge System.

Section 5 of the Improvement Act directs the Secretary of the Interior to ensure or conduct 14 actions in administering the NWRS. In addressing these actions, a number of policies have been developed to help guide the administration of Refuge lands. Refuge System policies are found in the land use management series (600) of the U.S. Fish and Wildlife Service Manual. These policies, which are available online at http://www.fws.gov/policy/manuals, are summarized in Table 1-2.

Table 1-2   Key Service Policies Related to the Management of National Wildlife Refuges			
Policy	Purpose		
Refuge System Mission and Goals and Refuge Purposes (601 FW 1)	Reiterates and clarifies the Refuge System mission and how it relates to the Service mission; explains the relationship between the NWRS mission, goals, and purpose(s). It also includes the decision making process for determining refuge purposes.		
Comprehensive Conservation Planning (602 FW 3)	Describes the requirements and processes for developing refuge comprehensive conservation plans.		
Biological Integrity, Diversity, and Environmental Health (601 FW 3)	Provides guidance for maintaining and restoring, where appropriate, the biological integrity, diversity, and environmental health of the NWRS.		
Appropriate Use (603 FW 1)	Describes the initial decision process the Refuge Manager follows when first considering whether or not to allow a proposed use on a refuge. For uses other than the six wildlife-dependent recreational uses of the Refuge System, the Refuge Manager must first find the use appropriate before undertaking a compatibility review. Appropriateness reviews of existing and proposed uses are located with the compatibility determinations in Appendix C of this CCP.		

Table 1-2 Key Service Policies Related to the Management of National Wildlife Refuges			
Policy	Purpose		
Compatibility (603 FW 2)	Details the formal process for determining if a use proposed on a NWR is compatible with the Refuge System mission and the purposes for which the refuge was established. Units of the Refuge System are legally closed to all public access and use, including economic uses, unless and until they are officially opened through a compatibility determination. Appendix C contains the compatibility determinations prepared for proposed uses on San Diego NWR.		
Wildlife-Dependent Recreation (605 FW 1-7)	Provides specific information and guidance for each of the six priority wildlife- dependent uses (hunting, fishing, wildlife observation, photography, environmental education, and interpretation): the policy for the use; guiding principles for the use; guidelines for program management; and guidelines for opening the specific program.		
Wilderness Stewardship (610 FW 1-5)	Provides guidance on conducting wilderness reviews for Refuge System lands and waters to determine if these lands and waters should be recommended for wilderness designation; establishes policy for managing wilderness study areas and recommended and proposed wilderness; and prescribes how refuge managers will preserve the character and qualities of designated wilderness while managing for refuge establishing purpose(s). The wilderness review prepared for the San Diego NWR is provided in Appendix L.		

## 1.4.2 National Environmental Policy Act (NEPA) of 1969

As the basic national charter for the protection of the environment, the National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190, 42 U.S.C. 4321-43470), as amended, requires Federal agencies to consider the environmental effects of all actions (i.e., policies, plans, programs, or projects that are implemented, funded, permitted, or controlled by a Federal agency or agencies) they undertake. Agencies must also consider the environmental effects of all reasonable and feasible alternatives to a proposed action and must make public the environmental effects of the proposed action and possible alternatives. If adverse environmental effects cannot be entirely avoided, NEPA requires an agency to show evidence of its efforts to reduce these adverse effects and to restore and enhance environmental quality as much as possible. The contents of an environmental assessment (EA) or Environmental Impact Statement (EIS) document that an agency has addressed these issues.

Each CCP process must comply with the provisions of NEPA through the concurrent preparation of an EA or EIS that can accompany or be integrated into the draft CCP. The San Diego NWR CCP has been prepared consistent with the requirements of NEPA, the Council on Environmental Quality (CEQ) NEPA regulations (40 CFR \$1500 et seq.), and the Department of Interior's NEPA procedures (43 CFR Part 46). To comply with CEQ NEPA regulations and ensure the NEPA process to be integrated into the CCP process at the earliest possible time, an EA <u>was</u> integrated directly into the draft CCP document for the San Diego NWR. In <u>the draft</u> document, the primary components of the EA (Section 1508.9 of the CEQ NEPA regulations) included Chapter 1, which addressed the purpose and need for the proposed action; Chapter 3, which described the affected environment; Chapter 4, which presented the proposed action and the alternatives to the proposed action; and Chapter 5, which analyzed the environmental consequences of the proposed action and the alternatives. Appendix <u>F-1</u> lists the agencies and persons consulted.

# 1.5 San Diego National Wildlife Refuge

#### 1.5.1 Location

The San Diego NWR is one of four refuges that comprise the San Diego NWR Complex (Complex). In addition to the San Diego NWR, the Complex includes the Tijuana Slough NWR, San Diego Bay NWR, and Seal Beach NWR (refer to Figure 1-1). The Complex, which provides oversight and administrative functions for its four refuges, is headquartered on the Sweetwater Marsh Unit of the San Diego Bay NWR in Chula Vista, California.

In August 2013, the San Diego NWR included approximately 11,530 acres distributed among several non-contiguous land areas (refer to Figure 1-2). The majority of these Refuge lands are concentrated along the southeastern edge of San Diego County's metropolitan area within the Otay-Sweetwater Unit. For ease of description, we have divided the Otay-Sweetwater Unit into five management areas: McGinty Mountain; Sweetwater River; Las Montañas; San Miguel Mountain; and Otay Mesa and Lakes (Figure 1-6). An additional 60 acres of Refuge land is located at the northern edge of the City of San Diego (refer to Figure 1-5). For planning purposes, this area is described as the Del Mar Mesa Vernal Pool Unit.

The Otay-Sweetwater Unit, which in August 2013 included about 11,470 acres (Table 1-3), are generally located to the southeast of Highway 54 between Otay Mesa to the south and the unincorporated community of Crest to the north. The Del Mar Mesa Vernal Pool Unit is located south of State Route 56 and west of Interstate 15 in northern San Diego.

Table 1-3 Approximate Acreages within the San Diego NWR Management Areas in 2013			
Management Area	Acreage (approximate)		
Otay-Sweetwater Unit			
McGinty Mountain Area	2,080 acres		
Las Montañas Area	1,035 acres		
Sweetwater River Area	1,950 acres		
San Miguel Mountain Area	5,765 acres		
Otay Mesa and Lakes Area	640 acres		
Subtotal	11,470 acres		
Del Mar Mesa Vernal Pool Unit	60 acres		
Approximate Acreage of the San Diego NWR	11,530 acres		



Figure 1-6. Management Areas of the Otay-Sweetwater Unit

### 1.5.2 Physical Setting

The Otay-Sweetwater Unit of the San Diego NWR abuts the southeastern edge of the San Diego metropolitan area. These refuge lands lie to the northeast of the City of Chula Vista, to the southeast of the City of El Cajon, to the west of the unincorporated community of Jamul, to the south of the unincorporated community of Crest, and to the west and north of the undeveloped lower slopes of the San Ysidro Mountains.

The lands within the Otay-Sweetwater Unit are characterized by a striking diversity of landforms. The Sweetwater River and its associated floodplain extend through or adjacent to the McGinty Mountain, Sweetwater River, and San Miguel Mountain areas of the Refuge. Smaller drainages, such as those found in Steele Canyon and Coon Canyon, have created steep canyon walls within the Las Montañas and San Miguel Mountain areas. Moderately steep to very steep slopes associated with McGinty Mountain, San Miguel Mountain, Mother Miguel Mountain, and the Jamul Mountains, as well as other more gently sloping foothills, characterize much of the remaining lands. Flatter topography is found within the Otay Mesa area. The variety of topographic features, drainage patterns, underlying geologic formations, and overlaying soil types present within the Refuge boundary support a diverse assemblage of habitat types and species.

The Del Mar Mesa Vernal Pool Unit, located in the northern portion of the City of San Diego, is included within the 980-acre Del Mar Mesa Preserve (Preserve), of which all but 169 acres are in public ownership. The largest landowner within the Preserve is the City of San Diego. Other landowners include the County of San Diego, California Department of Fish and Wildlife, and USFWS. The Refuge lands in this area are characterized by level mesa tops, steep slopes, deep canyons, and undulating mima mounds with intervening depressions referred to as vernal pools. Vernal pool habitat supports extremely sensitive plant and animal species.

### 1.5.3 Ecosystem Context

To the extent possible, the CCP will assist in meeting the conservation goals established in existing national and landscape-level plans, California's Wildlife Action Plan, and other regional and species and habitat specific plans covering the same watersheds or ecosystems in which the Refuge resides (602 FW 3.3). In the State of the Birds 2011 (North American Bird Conservation Initiative 2011), a report that addresses the status of birds on public lands and waters in the United States, effective management is identified as essential to healthy bird populations. The report states that "Although birds benefit in part because most public lands are protected from residential and commercial development, increased protections and more effective management of habitats and bird populations are essential. Natural processes must be restored to ensure functional and resilient ecosystems through management actions such as control of nonnative species and diseases, prescribed cuts and burns to reinvigorate forests and grasslands, and water delivery and management to sustain wetlands. Many of these needs are expected to intensify because of climate change. All agencies are faced with the challenge of balancing needs for resource extraction, energy development, recreation, and other uses with the growing urgency to conserve birds and other wildlife. To succeed, they will need additional resources and greater public support to increase land protection and management. Better collaboration among agencies will also increase the effectiveness of public lands management for birds that migrate across political boundaries." These concerns and recommendations also apply to the other wildlife, plants, and habitat protected within the San Diego NWR.

### Landscape Conservation Cooperatives

To achieve better collaboration among agencies, conservation organizations, foundations, academia, and commercial enterprises, conservation science partnerships have been formed through the establishment of Landscape Conservation Cooperatives (LCCs). LCCs have two

main functions: to provide the science and technical expertise needed to support conservation planning at landscape scales, and to promote collaboration among their members in defining shared conservation goals. LCCs, which are applied conservation science partnerships between the Service and other Federal agencies, states, tribes, non-governmental organizations, universities, and stakeholders within a geographically defined area, are generating the tools, methods, and data that managers need to design and deliver informed landscape conservation planning.

The San Diego NWR is included within the California LCC. The California LCC has been divided into several subunits, and the San Diego NWR is located within the Coastal Southern California subunit. This subunit covers the coastal mountain ranges of central California, southern California, and northern Mexico; lands between the Mojave Desert and the Pacific Ocean; and numerous offshore islands. Like other LCCs, the California LCC will provide a forum for information exchange and feedback among partners and, secondarily, among other interested parties (e.g., organizations, scientists, managers). LCC partners will jointly decide on the highest priority needs and interests of the LCC and will have a role in helping partners identify common goals and priorities.

#### Sonoran Joint Venture Bi-national Bird Conservation

Another landscape-level planning effort involves the Sonoran Joint Venture (SJV), a partnership of diverse organizations and individuals from the southwestern United States and northwestern Mexico. The Strategic Plan for the SJV presents a regional strategy for protecting, conserving, restoring, and enhancing bird populations and their habitats. This effort is intended to address and integrate the conservation recommendations of the North American Waterfowl Management Plan, Partners in Flight North American Landbird Conservation Plan, and North American Waterbird Conservation Plan, as well as habitatspecific bird conservation plans (e.g., Coastal Scrub and Chaparral Bird Conservation Plan [CalPIF 2004], Oak Woodland Bird Conservation Plan [CalPIF 2002], Riparian Bird Conservation Plan [Riparian Habitat Joint Venture 2004], draft Grassland Bird Conservation Plan [CalPIF 2000]).

The San Diego NWR is located within the Californian Coast and Mountains Region of the SJV Bird Conservation Plan (SJVBCP) and has been identified as one of 36 focus areas within this region (SJV Technical Committee 2006). Focus areas are locations that have been identified as having significant bird populations and habitat values and/or the potential to be restored to a condition that supports bird populations. The primary conservation needs identified in the SJVBCP for the lands within the Refuge include protecting coastal scrub and chaparral shrublands from fragmentation and human disturbance related primarily to recreational uses and restoring riparian habitat and the associated natural riparian processes that support this habitat.

#### California Wildlife Action Plan

The California Wildlife Action Plan (Action Plan), prepared by the California Department of Fish and Wildlife (CDFW) (formerly the Department of Fish and Game [CDFG]) (CDFG 2005) identifies the species and habitats at greatest risk in California, describes the major stressors affecting wildlife and habitats, and presents statewide and regional conservation actions needed to restore and conserve ecosystems and wildlife populations. The Action Plan divides the State into nine regions, with the San Diego NWR included within the South Coast Region, a region acknowledged as one of the world's hotspots for biological diversity. The areas within this region are home to some 476 vertebrate animal species and of these species, 14 are endemic to the South Coast Region (that is, found nowhere else in the world), and 14

other species found here are endemic to California. According to the Action Plan, the juxtaposition of outstanding biological resources and urbanization on a vast scale has made the South Coast Region the most threatened biologically diverse area in the continental United States. More than 150 vertebrate animal species (of the 476 total vertebrates) and 200 species of plants are either listed as protected or considered sensitive by wildlife agencies and conservation groups (CDFG 2005).

Urban development, water management conflicts, degradation of aquatic ecosystems, invasive species, altered fire regimes, and recreational pressures are identified as major stressors affecting wildlife and native habitats. Of these stressors, habitat loss and fragmentation that occur in association with development are considered the most significant. The Action Plan's recommended conservation actions for the South Coast Region that are applicable to and have been considered in the development of San Diego NWR CCP include:

- a. Ensuring that staffing and funding for the wildlife agencies (Service and CDFW) are adequate to conserve habitat and species in the region's rapidly urbanizing areas, as set forth in approved NCCPs;
- b. Providing greater resources and coordination efforts to eradicate or control existing occurrences of invasive species and to prevent new introductions;
- c. Establishing appropriate fire management policies and practices to restore the ecological integrity of the region's ecosystems while minimizing loss of property and life through a collaborative effort among Federal and State land managers and non-governmental partners; and
- d. Developing a comprehensive, region-wide program to evaluate which public land areas are most appropriate for different forms of recreation, to develop recreational opportunities in these areas, and to direct inappropriate recreational uses away from biologically sensitive areas and important wildlife habitats.

The Service requires the States to update their wildlife action plans every 10 years, and CDFW is working to complete their update by 2015. CDFW's objectives for the updated plan include:

- creating a vision for fish and wildlife conservation in California;
- providing an accounting of accomplishments;
- stratifying analysis of impacts and stressors by ecoregions;
- incorporating climate change impacts and adaptation strategies;
- updating species at risk, vulnerable species, and species of greatest conservation need; and
- recommending conservation actions consistent with planning documents developed by other agencies.

### 1.5.4 Refuge Purposes

The San Diego NWR was established in 1996 under the authorities of the Fish and Wildlife Act of 1956, as amended (16 U.S. C. 742(a)-754), Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1544, 87 Stat. 884), and Refuge Recreation Act of 1962, as amended (16 U.S.C. 460k-460k-4) (USFWS 1995a). Establishment occurred on April 10, 1996, when approximately 1,826 acres of land (referred to at the time as Rancho San Diego) were conveyed to the Service for management as a national wildlife refuge.

The purposes for this initial acquisition included:

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species ... or (B) plants..." 16 U.S.C. § 1534 (Endangered Species Act of 1973);

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. § 742f(a)(4) "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956); and

"...(1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species and threatened species ..." 16 U.S.C. § 460k-460k-4 (Refuge Recreation Act of 1962).

Subsequent acquisitions have been made to meet these and other refuge purposes outlined in the Land Protection Plan (LPP) for the Otay-Sweetwater Unit of the San Diego NWR, approved in April 1997. In accordance with the LPP, "The purpose of the San Diego National Wildlife Refuge is to protect, manage, and restore habitats for federally listed endangered and threatened species and migratory birds and to maintain and enhance the biological diversity of native plants and animals" (USFWS 1997a).

### 1.5.5 Refuge Vision Statement and Goals

Our vision for the future of the San Diego NWR is:

Large, connected, healthy stands of southern California coastal lowland and foothill habitats, including coastal sage scrub, maritime succulent scrub, native grassland, chaparral, riparian woodland, and vernal pools, are conserved through an ecosystem approach to management and monitoring that draws on the talents of Federal, State, and local agencies and other conservation partners to leverage and maximize funds and staffing. Listed and sensitive plant and animal species are protected, and species that historically occurred on Refuge lands are reestablished. One of the last expanses of open space in coastal southern California, with exceptional biological, social, historical, and economic values, is protected as a sanctuary not just for plants and animals but also for people.

The goals for the San Diego NWR include:

- Goal 1: Protect, manage, and, where appropriate, enhance or restore habitat to support the recovery of the federally and State listed endangered and threatened species and other species of concern currently or historically present on the Refuge.
- Goal 2: Protect, manage, and restore the Refuge's native habitats, MSCP-covered species, and other species of concern for their inherent value and to contribute to the regional effort of conserving the biological diversity of southwestern San Diego County.
- Goal 3: Engage in partnerships and provide leadership in coordinating land management and acquisition efforts throughout southwestern San Diego County in support of the Multiple Species Conservation Program (MSCP) and other resource protection objectives developed for the Region.

Goal 4: Provide safe and high-quality opportunities for compatible wildlife-dependent recreational uses that foster public appreciation of the unique natural heritage of the San Diego region.

#### 1.5.6 History of Refuge Establishment

The events that led to the establishment of the San Diego NWR in 1996 can be traced back to the adoption of the Clean Water Act (CWA) (33 U.S.C. §1251 et seq.) in 1972. Included in the CWA was a provision requiring wastewater treatment plants to provide a minimum of secondary treatment before discharging the effluent back into the environment. An exception to this provision was provided in CWA Section 301(h), which allowed those wastewater treatment plants discharging into a marine environment to request a waiver from these secondary treatment standards (City of San Diego 2009a). In 1979, the City of San Diego applied for such a waiver for its Point Loma Wastewater Treatment Plant, which was discharging primary treated wastewater into the Pacific Ocean. The city subsequently withdrew, revised, and then resubmitted its application in 1983. In 1986, the U.S. Environmental Protection Agency (USEPA) tentatively denied the request for waiver due in part to the city's lack of compliance with the California Ocean Plan. As a result, the city withdrew its application and in 1987, USEPA sued the City of San Diego for numerous violations of the CWA (National Research Council 1993).

In the midst of the court battle over CWA violations, the San Diego City Council, in 1988, established the "Clean Water Program" (subsequently reorganized as the City of San Diego Metropolitan Wastewater Department) to assist with the lawsuit, as well as to develop a program to meet the water and sewage treatment needs of the City through water reclamation and reuse (National Research Council 1993). From 1988 through 1990, the Clean Water Program prepared plans for the construction and operation of a secondary treatment plant composed of two wastewater treatment plants, an additional ocean outfall, four water reclamation systems, associated pipeline conveyance systems, and proposals for regional sludge processing and disposal (Harper 1991). The potential environmental impacts of implementing this proposal, referred to as the Greater San Diego Secondary Treatment System and Associated Sludge Management Facilities Project, were described in a joint Environmental Impact Report/Environmental Impact Statement issued for public review and comment in the fall of 1990. Included in the draft was an analysis of the project's potential for inducing growth within the region, as well as an evaluation of the secondary impacts to the environment, including native habitats and listed species, that would result from such growth.

The Service, in considering the implications of this growth inducement on wildlife and habitat, concluded that a countywide mitigation program would be necessary to address the extensive loss of habitat projected to occur as a result of implementing the city's expanded sewage treatment proposals (Saldaña 1993). In 1991, the City of San Diego agreed to prepare a Multiple Species Conservation Program (MSCP) as partial mitigation to offset impacts resulting from the secondary growth related effects of the city's Clean Water Program. The purpose of the MSCP was to

develop a program for the conservation of federally endangered, threatened, or key candidate species and their habitats (Opdycke 1991) within the Metropolitan Sewerage System Services Area of the Clean Water Program, encompassing approximately 900 square miles in southwestern San Diego County (City of San Diego 1998a). Further, the MSCP was to be designed to identify, evaluate, and delineate a network of lands that, if acquired and properly managed, would conserve habitat and provide for wildlife movement on a large scale in an effort to ensure the long-term protection of the biodiversity within the greater San Diego area.

Also at this time, proposals for habitat conservation planning were being discussed at the State level. In April 1991, California Governor Pete Wilson unveiled an environmental initiative entitled "Resourceful California." This initiative included a proposal to develop a regional habitat conservation plan for southern California (Pollak 2001). Legislation that would implement the proposals in this initiative was introduced in the form an amendment to AB 2172. After several revisions, the legislation was signed into law in October 1991. The intent of the legislation (the Natural Community Conservation Planning [NCCP] Act, was to foster voluntary collaboration between CDFW, then further to as CDFG, and the Service, local governments, and private development interests in addressing species and habitat protection and providing a predictable, streamlined regulatory process (Pollak 2001).

The NCCP Act authorized CDFW to enter into agreements with other public agencies or private interests for the purpose of preparing habitat conservation plans "to provide comprehensive management and conservation of multiple wildlife species, including but not limited to" species listed as endangered or threatened under California Endangered Species Act (CESA) (Pollak 2001). The primary objective of the NCCP program was and continues to be conservation of natural communities at the ecosystem level while at the same time accommodating compatible land use.

In accordance with the NCCP Act, a pilot program was initiated in southern California to address the protection of coastal sage scrub habitat and the species it supports, including the coastal California gnatcatcher (*Polioptila californica californica*). In December 1991, the Service and the CDFW agreed in a Memorandum of Understanding (MOU) to jointly undertake habitat conservation planning for the Southern California Coastal Sage Scrub NCCP.

On March 30, 1993, the Service published a Final Rule in the *Federal Register* listing the coastal California gnatcatcher as threatened under the provisions of the Federal Endangered Species Act (ESA). This action was followed on December 10, 1993, with a special rule allowing incidental take of the gnatcatcher if, among other conditions, the take results from activities conducted pursuant to the State's NCCP and in accordance with a NCCP plan for the protection of coastal sage scrub habitat (Federal Register Vol. 58, No. 236, December 10, 1993). It was the approval of this special rule the allowed the integration of the California's NCCP program into the Habitat Conservation Plan/incidental take requirements of Section 10(a)(1)(B) of the EAS.

To develop a habitat conservation plan for southwestern San Diego County that complied with both Section 10 of the ESA and the NCCP Act required cooperation among a full range of participants, including local, State, and Federal agencies, developers, private conservation groups, and private landowners. Initiated in 1991, the MSCP, which represents the first large-scale, proactive and ecosystem-based conservation planning effort of its kind in the Nation, was approved by the participating agencies in 1998 (City of San Diego 1998a, Conservation Biology Institute and The Nature Conservancy 2007). Developed to conserve the diversity and function of the natural ecosystem within the planning area, the MSCP proposed the preservation of large blocks of interconnected habitat, as well as smaller areas of habitat that support rare vegetation communities such as vernal pools.

An important component in the preparation of the MSCP was defining a Multiple Habitat Planning Area (MHPA) within which preserve planning could be focused (City of San Diego 1997). In defining the MHPA, core biological areas and associated habitat linkages were identified throughout the study area. Core areas were defined as areas supporting high concentrations of sensitive biological resources that, if lost or fragmented, could not be replaced. The location and

configuration of these core areas provided the framework for ultimately identifying a regional preserve network.

In addition to the development of the subregional MSCP, local jurisdictions and special districts within the MSCP planning area were required to implement their portions of the plan through subarea plans (City of San Diego 1998a). The MSCP Subarea Plan for the City of San Diego and the County of San Diego's Subarea Plan were both approved in 1997. An Incidental Take Permit under the MSCP for the County's Subarea Plan was issued on March 17, 1998.

Along with the approval of the subarea plans and Incidental Take Permits, Implementing Agreements by and between the Service, CDFW, and the participating jurisdiction were also issued. The City of San Diego's Implementing Agreement was signed in 1997 and the County's was signed in 1998. As part of the Implementing Agreements, the Service and CDFW agreed to "apply their best efforts to contribute public lands and funds to the acquisition and management, maintenance, and monitoring of habitat lands within the MHPA."

Per the Service's commitment to provide a contribution towards the implementation of the MSCP, studies to establish the San Diego NWR were initiated in 1995 when a Concept Plan for the San Diego NWR was distributed to government agencies, tribes, interested citizens, and landowners within and adjacent to the planning areas for the proposed Refuge, including the Vernal Pools and Otay-Sweetwater planning areas (USFWS 1997a, 1997c). The planning proposed for the Otay-Sweetwater Unit represented the largest expanse of undeveloped land in the MSCP planning area and was considered one of the cornerstone conservation areas in the MSCP.

In the midst of the MSCP planning process, the Nation's savings and loans were in crisis due in part to high interest rates, high gasoline prices, and misconduct as a result of deregulation. In 1992, approximately 1,840 acres of undeveloped land owned by Home Federal Savings and Loan were placed in Federal receivership under the control of the Resolution Trust Corporation (RTC). The RTC was responsible for liquidating this property, referred to as Rancho San Diego, as well as other real estate assets owned by Home Federal.

The Rancho San Diego parcels had been identified as a core biological resource area in the draft MSCP. These parcels contained large blocks of high value coastal sage scrub supporting approximately 25 pairs of coastal California gnatcatchers. In addition, a significant riparian woodland corridor extended through the parcels that supported approximately 30 pairs of the endangered least Bell's vireo (*Vireo bellii pusillus*). The Service recognized that the acquisition of these lands would prevent the loss of habitats critically important to the recovery of listed species and would represent an important contribution by the Federal government to the MSCP. Based on the sensitivity of the biological resources present on the parcels, as well as the importance of this area to the implementation of the MSCP, the Service entered into a purchase agreement with the RTC, and on April 10, 1996, approximately 1,826 acres within the Rancho San Diego area were acquired by the Service. (This agreement included the establishment of the Rancho San Diego Mitigation Bank, which is discussed in Chapter <u>3 of the Final CCP</u>.) Although the Service was still in the process of preparing Land Protection Plans for the Otay-Sweetwater Unit and Vernal Pools Stewardship Project, this acquisition boundary for the Otay-Sweetwater Unit (refer to Figure 1-2).

To complement the MSCP and assist in the recovery of vernal pool species, the Service also approved the Vernal Pools Stewardship Project in April 1997. The approved acquisition boundary encompassed approximately 8,220 acres, of which about half could be acquired by the Service from willing sellers for inclusion in the Refuge and half would be managed by the Department of the Navy at MCAS Miramar under existing authorities and through the development of a cooperative agreement with the Service and CDFW under the Sikes Act (USFWS 1997b). The intent of this action was to allow the Service to establish a Vernal Pool Unit of the San Diego NWR (USFWS 1997b) for the purpose of providing for the long-term conservation of the San Diego region's vernal pool habitats and their associated flora and fauna. The Vernal Pools Stewardship Project includes a number of non-contiguous land areas extending from Del Mar Mesa, located just south of Highway 56, to Otay Mesa, located to the east of Interstate 805 and abutting the U.S./Mexico border (refer to Figure 1-5). Specific areas include Del Mar Mesa, Lopez Ridge, Miramar, Montgomery Field, Otay Mesa, and areas adjacent to Sweetwater Reservoir and the Otay Lakes.

When the Conceptual Management Plan for the San Diego NWR was initially prepared, the Refuge was described as including three areas, the Otay-Sweetwater Unit, Vernal Pools Stewardship Project, and the South San Diego Bay Unit (USFWS 1997c). When the South San Diego Bay Unit was established in 1999, it was still a part of the San Diego NWR. However, on July 13, 2004, the South San Diego Bay Unit and the Sweetwater Marsh NWR were reorganized to become the San Diego Bay NWR. The San Diego Bay NWR is now made up of the South San Diego Bay Unit and Sweetwater Marsh Unit; the San Diego NWR is made up of the Otay-Sweetwater Unit and the Vernal Pools Stewardship Project. This change was made to streamline management and facilitate public understanding and recognition of the two Refuge areas (USFWS 2006a).

In May 2012, a refuge boundary expansion was approved for the San Diego NWR by the Service's Region 8 Regional Director. As a result of this action, the boundary of the Otay-Sweetwater Unit was expanded by approximately 327 acres to accommodate four parcels of land to be donated by Caltrans for inclusion in the Refuge. The largest parcel, about 237 acres, is located to the south of Proctor Valley Road and west of Highway 125 (refer to Figure 1-4). When donated, this parcel will become part of the San Miguel Mountain management area. Several parcels located to the south of Highway 94 and west of Jamacha Road (totaling approximately 79 acres) and another parcel (2.4 acres), located to the south of Highway 94 and west of Millar Ranch Road, will become part of the Sweetwater River management area. The remaining 25.75-acre parcel located south of Highway 94 and east of Steele Canyon Road will become part of the Las Montañas management area.

# 2 The Planning Process

## 2.1 Preparing a Comprehensive Conservation Plan

The purpose of the CCP for the San Diego NWR (Otay-Sweetwater Unit and Del Mar Mesa Vernal Pool Unit) is to guide the management of the Refuge over the next 15 years. The CCP was developed in association with the preparation of an accompanying EA to meet the dual compliance requirements of the Improvement Act and NEPA. Preparation of the CCP was guided by the Improvement Act, as well as the Service's Refuge Planning Policy, as outlined in Part 602, FW 1, 3, and 4 of the Service Manual. Service policy, the Improvement Act, and NEPA each provide specific guidance for how the CCP process and/or the associated environmental analysis of alternatives should be conducted. For example, the Service is required to actively seek public involvement in the preparation of CCPs and associated environmental documents, such as EAs. In addition, the associated environmental document must provide equal and full analysis of a "reasonable" range of alternatives, or different approaches to refuge management, that can reasonably be implemented to achieve refuge purposes and goals and help fulfill the Refuge System mission. The range of management alternatives must include a "no action" alternative that reflects current conditions and management strategies on the Refuge. The management alternatives analyzed in the draft CCP/EA, including the proposed action (Alternative D), are described in detail in Chapter 4. Refer to Chapter 3 of the Final CCP for information regarding the selected action.

Key steps in the CCP and parallel NEPA processes include:

- preplanning;
- public scoping and involvement;
- identifying issues, opportunities, and concerns;
- defining and revising vision statement and refuge goals;
- developing and evaluating alternatives;
- identifying the preferred alternative;
- preparing the draft CCP/EA;
- revising draft documents and releasing the Final CCP;
- implementing the CCP; and
- monitoring and adapting management practices as necessary.

Figure 2-1 shows the overall CCP process in a linear cycle, but this process is actually a non-sequential movement among the steps, with many revisions occurring during plan development.

## 2.2 Preplanning

Preplanning for this CCP began in July 2005 with the establishment of a core planning team. The team consists of the Refuge Manager, Refuge Planner, Refuge Wildlife Biologist, and other members of the San Diego NWR Complex. <u>Appendix A of the Final CCP</u> lists the members of the planning team, as well as other participants who provided important insight regarding planning issues and ongoing Refuge management. The State was invited to participate as a core team member, but was not available to participate at this level due to time constraints. However, the State did participate as part of an extended planning team that also included biologists from the Carlsbad Fish and Wildlife Office and the Regional Office (Region 8) of Fish and Wildlife, the Sweetwater Authority biologist, and representatives from the U.S. Geological Survey (USGS).



Figure 2-1. Comprehensive Conservation Planning Process

One of the first tasks of the core planning team was to identify preliminary issues, concerns, and opportunities. To do this, the team relied on information derived from wildlife and habitat monitoring and field experience associated with the past management of the Refuge. Through this process, three primary areas of focus were identified: habitat management, endangered species recovery, and wildlife-dependent recreation. These areas of focus were presented to the public during the scoping process to encourage input regarding the future management of the Refuge.

# 2.3 Public Involvement in Planning

Public involvement is an essential component of the CCP and NEPA process. The public is invited to participate from the initiation of the planning effort through plan implementation. The planning effort for the San Diego NWR CCP began in May 2006 when over 1,000 newsletters (referred to as "Planning Updates") were distributed to local, State, and Federal agencies; special districts; tribes; interested organizations; adjacent property owners; potential user groups; and other interested members of the public. The Planning Update described the planning process and requested input regarding the future management of the Refuge. The CCP was officially initiated on May 24, 2006, when the Notice of Intent to prepare a CCP for the San Diego NWR was published in the *Federal Register* (71 FR 100 [24 May 2006]).

Two public scoping meetings were held in June 2006 to further develop and ascertain Refuge planning issues. More than 70 individuals, representing the interests of public agencies, private property owners, hunters, trail users, environmental organizations, land conservancies, and others, attended these meetings. Many others contributed written comments either electronically or by mail in response to the *Federal Register* notice, the appeal for input provided in the Planning Update, and the press release that was issued regarding the planning effort and the scoping meetings. More than 150 different issues ranging from law enforcement and fire management to public use and habitat protection were addressed in these comment letters. Once all of these issues were compiled, a second Planning Update was distributed in December 2006 to provide the public with the results of the initial scoping process.

Many of the comments received during the scoping process focused on public use, particularly trail use and hunting. Due to the considerable public interest related to these topics, a Public Use Workshop was held on January 6, 2007, and a follow-up Trail Planning Workshop was held in February 2008.

A third Planning Update was issued in March 2008 to solicit public input related to the draft Refuge goals and preliminary management alternatives that were developed as a result of the initial scoping process. Throughout the planning process, Refuge staff has also attended meetings held by various organizations interested in learning more about the San Diego CCP; coordinated with representatives from the County and City of San Diego, City of Chula Vista, CDFW, Caltrans, Bureau of Land Management (BLM), U.S. Forest Service, various special districts, and interested tribes; and met with various elected officials regarding the CCP.

The draft CCP/EA was the next step in the public involvement process, which provided the public with the opportunity to provide comments and suggestions for how the Refuge should be managed.

# 2.4 Overview of Issues and Public Scoping Comments

The planning team identified issues, concerns, and opportunities internally and through discussions with other Federal, State, and local agencies; wildlife and habitat professionals; and other key contacts. In addition, a wide range of issues, concerns, and recommendations were expressed during the public scoping process and at subsequent public workshops. All of this input was compiled by the Service and taken into consideration during the development of management alternatives described in the draft CCP/EA. This input was also used to further refine Refuge goals.

The issues raised and comments received during the scoping process fall into several categories, including wildlife and habitat management, public use, cultural resources, Refuge operations (e.g., law enforcement, fire management, regulatory signage, maintenance), and the approved Refuge boundary and future acquisitions. A summary of the key issues and comments compiled during the public scoping process and subsequent public workshops is provided here and presented in detail in Appendix <u>F-5</u>.

### Wildlife/Habitat Management

- Comprehensively plan for habitat and wildlife conservation, management, and monitoring within the Refuge acquisition boundary, regardless of ownership.
- Incorporate as appropriate the statewide and South Coast Region conservation actions described in the California Wildlife Action Plan.
- Restore and/or enhance native habitats and expand or reintroduce populations of listed and sensitive species that are supported by these habitats.
- Control invasive plant and animal species.
- Monitor water quality and quantity.
- Ensure adequate water availability to support Refuge resources.

#### Listed and Sensitive Species Conservation

- Restore and enhance habitat for listed species currently or historically present on the Refuge.
- Conduct systematic mapping of the rare plant species present on the Refuge.
- Identify the actions that should be taken to sustain and restore priority species and the habitats that support these species over the next 15 years.

#### Public Use

- Open the Refuge to a full range of wildlife-dependent recreational uses.
- Designate as multiple use trails those trails that support the county's regional trail system.
- Develop a trail sign plan for all designated trails within the Refuge to ensure adequate wayfinding and to provide information related to trail accessibility, length, permitted uses, and appropriate trail conduct.
- Consider wildlife needs, conflicts with other users, and the proximity of the Refuge to developed areas when evaluating requests to allow hunting and other uses on the Refuge.
- Provide a visitor center to accommodate educational and research activities.

#### Cultural Resources

• Identify and protect important cultural resources.

#### **Refuge Operations**

- Improve conditions on Millar Ranch Road through the Refuge to reduce safety issues for adjacent residents and other road users.
- Clearly post all Refuge boundaries, and identify and secure entry points being used for unauthorized access onto the Refuge.
- Work in cooperation with other agencies to address off-road vehicle trespass, homeless and migrant encampments, illegal dumping, and other law enforcement issues.
- In partnership with private property owners, implement actions that will prevent vehicular access onto Refuge lands through adjacent private parcels.

- Consider including prescribed burns as an appropriate action for facilitating habitat restoration and maintenance and reducing hazardous fuels.
- Develop a volunteer program to assist the Refuge in habitat enhancement and restoration projects, trail maintenance, and conducting environmental education programs.
- Encourage research within the Refuge that will benefit Refuge resources and management, including research that focuses on wildland-urban interface issues.
- Ensure that adequate staffing and funding is available to implement the Refuge's obligations for habitat conservation, maintenance, and monitoring under the MSCP.
- Ensure that any new Refuge facilities are designed to be energy efficient.

#### Approved Refuge Boundary/Future Acquisitions

- Consider amending the acquisition boundary to address changes in development patterns and habitat conditions.
- Acquire and protect wildlife corridors to ensure continued wildlife movement between protected habitat areas.
- Accelerate the acquisition of properties within the approved acquisition boundary to avoid the permanent loss of potential Refuge lands to development.
- Set acquisition priorities to ensure that adequately sized contiguous blocks of native habitat are acquired to support native plants and wildlife, as well as to better support priority public uses such as hunting and wildlife observation.
- Analyze the effect of continued acquisition within the approved Refuge boundary on essential public facilities and planned public roadways within the region.
- Consider the impacts of continued land acquisition on the availability of aggregate mineral resources.

## 2.5 Management Concerns and Opportunities

In addition to the issues raised during the public scoping process, the planning team, with input from other partners, also identified several challenges, threats, and/or opportunities that will likely affect Refuge management over the next 15 years and beyond. These challenges include a number of factors of global or regional significance (e.g., climate change, the increasing prevalence of invasive plant species in the San Diego region, degraded air quality, uncertainty over the long-term availability of surface water and groundwater within riparian areas, increased wildfire frequency) that cannot be altered simply by the actions taken on an individual Refuge. Instead, individual Refuge responses to these factors will have to be evaluated from time to time to determine if adjustments in current management practices are required to adapt to changing conditions. Additional challenges identified by the planning team include the lack of connectivity among the various Refuge landholdings and the lack of direct access to many of the Refuge lands from dedicated public streets. All of these challenges, which are described in the following text, were considered during the development of the alternatives, presented in Chapter 4 of the draft <u>CCP/EA</u>.

#### **Climate Change**

The Intergovernmental Panel on Climate Change (IPCC) defines climate change as "a change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer" (IPCC 2007). Based on long-term, independent records of weather data from various sources, scientists have confirmed that the earth is warming, precipitation patterns are changing, sea level is rising, and extreme weather events are increasing. These records indicate that the average temperature in the U.S. has increased by about 1.5°F since 1895 (Menne et al. 2009). This increase however has not been constant over time. Temperatures generally rose until about 1940 and then declined until about 1980 when a rapid increase in temperature was observed with 80 percent of the total increase occurring after 1980. In its Summary for Policymakers (IPCC 2007), the IPCC states "warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level." Such temperature

changes can have different consequences worldwide from sea-level rise to greater meteorological fluctuations.

Increases in minimum, average, and maximum temperatures, changes in total precipitation, and increased storm intensity can have significant effects on species and habitat quality. These changes can influence fire frequency, ground and surface water elevations, invasive plant presence, soil stability, and vegetation and species composition. Recognizing that changing climate will have a variety of effects on the natural resources being conserved on refuges, the Secretary of the Interior (Secretarial Order 3289) has directed the Service to consider the effects of climate change on Refuge management, particularly during the CCP planning process. Anticipated effects may include species range shifts, species extinctions, phenological changes, and increases in primary productivity. The effects of climate change on refuge management activities are critical components of all refuge management decisions.

Addressing the effects of climate change requires coordination among a variety of agencies at all levels of government. The Service, in its strategic plan for responding to climate change (USFWS 2010a), has established a basic framework for how we will work as part of the larger conservation community to help ensure the sustainability of fish, wildlife, plants, and habitats in the face of accelerating climate change. The three major strategies in the plan for addressing climate change are:

- 1) Adaptation: Minimizing the impact of climate change on fish and wildlife through the application of cutting-edge science in managing species and habitats;
- 2) Mitigation: Reducing levels of greenhouse gases in the Earth's atmosphere; and
- 3) **Engagement**: Joining forces with others to seek solutions to the challenges and threats to fish and wildlife conservation posed by climate change.

As part of the Service's strategy, the NWRS initiated a national inventory and monitoring program to compile data that can be used to develop a long-term understanding of the effects of changing climate on fish and wildlife. The data will also be available for assessing the success of conservation actions taken on the ground to address the effects of climate change on fish and wildlife. Additional discussion of climate change is provided in Chapter <u>4 of the Final CCP</u>.

#### Invasive Species

Non-native plant and animal species introduced into areas where conditions are favorable for their establishment have the potential to affect native species in many ways, including predation, competition (in which exotic species outcompete native species when natural predators and/or competitors are not present), changing the physiognomy of the habitat in such a way as to interfere with essential behavior such as foraging, or altering ecological processes (e.g., exotic annual grasses and unnaturally frequent fire exacerbating one another in a positive feedback loop). Under these circumstances, non-native species can cause harm to the environment, the economy, or human health. Non-native species that cause harm are collectively referred to as invasive species (National Invasive Species Council 2008). Invasive species are considered one of the most pervasive threats to habitat management in the NWRS. The Service recently established a pilot program to map selected invasive plant species on several refuges in the NWRS, including the San Diego NWR. Conducting inventories of priority invasive species is an integral component of invasive species management and is critical to improving our understanding of, confronting, and deterring the invasive species threat. Without inventory data, we will not be able to address the full extent of the problem, nor can we fully understand how and at what locations management will be most effective.

The types of invasive plant species occurring on the San Diego NWR range from non-native annual grasses and annual weeds that invade burned areas and other disturbed sites to non-native woody shrubs that displace native willows (*Salix* sp.). Invasive animal species of concern include a wide range of vertebrates, including feral pigs (*Sus scrofa*); invertebrates of several phyla; and aquatic and terrestrial species, such as bullfrogs (*Rana catesbeiana*). More information about the various invasive species that threaten habitat quality on the Refuge is provided in Chapter <u>4 of the Final CCP</u>.

#### Air Quality

Various research studies indicate that there may be a connection between degraded air quality and the persistence of invasive plant species in native habitat areas. Studies on the effects of elevated levels of carbon dioxide (CO<sub>2</sub>) indicate that the long-term success of exotic annual grass may be enhanced in the presence of elevated levels of CO<sub>2</sub> (Smith et al. 2000), and nitrogen deposition resulting from emissions of oxides of nitrogen (NO<sub>x</sub>) from fossil fuel combustion may enhance the growth of invasive plants in coastal sage scrub vegetation (Allen et al. 1998, Fenn et al. 2003). In addition, research indicates that air pollution, along with other factors, appears to be a predictor of species distribution in coastal sage scrub (Westman 1981). Westman found a decreased presence of white sage (*Salvia apiana*) and wishbone plant (*Mirabilis californica*) in areas subject to high levels of oxidants, while also identifying an increased presence of the invasive, non-native grass *Schismus barbatus* in these same areas. Developing a better understanding of how air quality may be influencing the distribution of species in certain habitats will be important as we attempt to manage the wide range of invasive plants present on the Refuge.

#### **Wildland Fires**

The vast majority of the wildlife habitat on San Diego NWR consists of highly flammable vegetation, both native and exotic. Fires occurring in wildlife habitat directly kill animals and plants, and they greatly modify the vegetation community and thus the quality and quantity of habitat for wildlife. Fire has historically been a natural phenomenon in arid shrublands of southern California, and the native plants and animals have evolved life history strategies to enable their populations to persist despite large areas of periodic devastation of habitat. However, the effects of fire in southern California today are more deleterious to wildlife and habitats than they were prior to European colonization of the area for three reasons. The first is that fires occur more frequently today than they did prehistorically (Keeley and Fotheringham 2001). Unnaturally frequent fires do not allow sufficient time for plants to accumulate resources to survive a subsequent fire or for seed banks to repopulate an area after fire. Additionally, the burned habitat may not have time to develop sufficiently between fires to support animals that require relatively mature habitats.

A second reason stems from the fact that non-native annual plants now dominate large areas of the landscape. Such non-native plant communities recover more quickly than native plant communities, outcompeting native perennial plants, suppressing their recruitment and growth, and facilitating the conversion of the vegetation community from coastal sage scrub or chaparral to non-native grassland.

Finally, movement of animals and plants from one area to another is greatly constrained by habitat loss due to development in southern California, such that likelihood of recolonization of burned habitat from non-burned habitat is reduced. San Diego NWR's current and proposed fire management practices, policies, personnel, and facilities are described in Chapter <u>3 of the Final CCP</u>.

#### Human Activity

San Diego NWR is located within San Diego County, which supports a human population of just over three million people. Several million of these people live within easy driving distance of the Refuge, which receives a significant but unquantified amount of visitation (estimated at 22,000 visitors annually) by a variety of recreationists. Some of the Refuge visitors participate in permitted recreational activities such as trail use and organized Refuge events, while others participate in unpermitted activities such as fishing, off-roading, geocaching, paint-ball shooting, and allowing dogs to roam unleashed. The proximity of the Refuge to development also results in other illegal activities such as dumping trash and other waste, releasing unwanted pets, habitation (homeless camps), encroachment of backyard gardens from adjacent residential lots onto the Refuge, vandalism of facilities and habitat, and theft of Refuge equipment. All of these activities are potentially or actually deleterious to wildlife and habitats. San Diego's human population will continue to increase, and it is reasonable to assume that deleterious activities are likely to continue and could potentially increase. Completion of this plan will assist in enabling Refuge staff to manage these activities more effectively and thus reduce their harmful effects.

#### **Refuge Connectivity and Access**

As illustrated in Figures 1-2 and 1-3, the San Diego NWR currently consists of a combination of a few large blocks of non-contiguous land, along with several smaller isolated parcels. These disconnected lands that comprise the Refuge are separated by private property and/or lands being conserved by other public or non-profit entities. The management problems associated with the current assemblage of Refuge lands (e.g., reduced defensibility, fragmentation of habitats, increased edge effects, and inadequate habitat linkages between various conserved habitats) are compounded by limited accessibility to these lands from existing public roads. This accessibility issue adversely affects the ability of Refuge staff to efficiently manage and monitor sensitive habitats and species, as well as to provide defined access points for accommodating compatible public use.

The extent of wildland-urban interface within the San Diego NWR, which is due in large part to the number of non-contiguous parcels that constitute the Refuge, provides opportunities for unauthorized access onto the Refuge by adjacent residents and others. This situation exacerbates illegal actions, including dumping, trail cutting, vandalism, fires, homeless camps, and disturbance of wildlife by people and pets.

#### **Opportunities**

Despite the issues and threats described here, opportunities exist for protecting the Refuge's habitat quality, listed species populations, and other trust species. These opportunities include:

- 1) the potential to cooperatively manage conserved lands in the vicinity of the Refuge involving, as appropriate, other Federal, State, and local agencies; tribes; land conservancies; and private landowners to reduce overall costs, improve the ability to control illegal access, and share knowledge that will result in more effective management of habitat and species; and
- 2) the potential to partner with other agencies and educational and research institutions to conduct research on specific species, species interactions, methods for optimizing restoration, better control of invasive plants, and other topics that would provide information essential for the management of the highly diverse habitats included within the Refuge.

While climate change and degraded air quality are difficult to address at the Refuge level, adaptive management provides an important tool for adjusting current management practices in response to changes on the Refuge related to these issues. Information learned and shared by other partners or acquired through research projects will assist Refuge staff in determining how best to address changing management needs on the Refuge.

# 2.6 Development of a Refuge Vision

A vision statement, which is developed or reviewed for each individual refuge unit as part of the CCP process, is defined as "A concise statement of what the planning unit should be, or what we hope to do, based primarily upon the Refuge System mission and specific refuge purposes, and other mandates" (Service Manual, 602 FW 1.5 (Z)). The Refuge vision provides a descriptive picture of how the Refuge will look in the future and describes the desired future conditions in the long term (more than 15 years). The Refuge vision is presented in Chapter 1 of the Final CCP.

# 2.7 Development of Refuge Goals, Objectives, and Strategies

Goals and objectives are the unifying elements of successful Refuge management. They identify and focus management priorities, provide a context for resolving issues and concerns raised during the scoping process, guide specific projects, provide rationale for decisions, and offer a defensible link among management actions, Refuge purpose(s), Service policy, and the NWRS mission. In developing goals and objectives, there is a natural progression from the general to the specific. Goals define general targets in support of the Refuge vision, while objectives address the incremental and measurable steps to be taken to achieve the goals. Finally, strategies identify specific tools, actions, or techniques that would be implemented to accomplish project objectives.

The goals and objectives provide long-term guidance to Refuge managers and staff and help integrate science, improve management practices, and justify compatible use decisions. The Refuge System defines goals as a "…descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units" (Service Manual, 602 FW 1). The goals for the San Diego NWR are presented in Chapter 1 <u>of the Final CCP</u>.

Each goal is subdivided into one or more objectives. Objectives are defined as "concise statements of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work" (Service Manual, 602 FW 1). The number of objectives per goal can vary depending upon the number needed to satisfy a particular goal. In cases where there are many objectives, an implementation schedule may be developed to better define when and how the strategies presented under each objective would be implemented to ensure that each objective

and the overarching goals can be effectively and efficiently achieved. The <u>final</u> objectives and strategies for the San Diego NWR are presented in Chapter <u>3 of the Final CCP</u>.

# 2.8 Development of Alternatives

As indicated earlier, each CCP must comply with the provisions of NEPA. To facilitate compliance, the analysis of environmental effects, as required by NEPA, have been integrated directly into the overall CCP process. This includes the requirement to analyze a reasonable range of alternatives or approaches to Refuge management that could be reasonably undertaken to achieve Refuge goals and refuge purposes; help fulfill the Refuge System mission; maintain and, where appropriate, restore the ecological integrity of each refuge and the Refuge System; and resolve identified issues. These alternatives are to consist of different sets of objectives and strategies for management of the Refuge. NEPA also requires analysis of a "no action" alternative, which constitutes a continuation of current conditions and management practices.

The process of developing alternatives involves analyzing current conditions, identifying various measures that—if implemented—would help achieve Refuge goals, and incorporating, as appropriate, input provided during the public scoping process and other information gathered during subsequent meetings and workshops and from various interested individuals, agencies, and organizations. In Chapter 4 <u>of the draft CCP/EA</u>, a range of alternatives for the San Diego NWR CCP, including a no action and three action alternatives, <u>were</u> presented, and an equal and full assessment of the environmental effects of each of these alternatives <u>was</u> presented in Chapter 5 <u>of the draft CCP/EA</u>. The four alternatives described in Chapter 4 differ in the extent and focus of the wildlife and habitat management actions to be implemented on the Refuge, as well as in the types and levels of public use opportunities to be provided.

# 2.9 Selection of the Proposed Action

<u>Alternative D was identified</u> as the preferred alternative in the draft CCP/EA based on our preliminary analysis of environmental effects and Refuge issues, goals, and objectives. Following consideration of all the comments received from the public, agencies, tribes, and/or other stakeholders during the public review period, we choose to implement <u>a modified Alternative D</u>, as <u>described in Chapter 3 the Final CCP</u>. The selected alternative described in the Final CCP <u>was</u> <u>determined to be</u> the management alternative that <u>can</u> best achieve the Refuge purposes, vision, and goals; help fulfill the Refuge System mission; maintain and, where appropriate, restore the ecological integrity of the Refuge; is consistent with principles of sound fish and wildlife management; and minimizes adverse effects on the environment.

# 2.10 Plan Implementation

During the 15 years following CCP approval, the CCP will serve as the primary reference document for all Refuge planning, operations, and management. <u>Chapter 5 of the Final CCP</u> describes how the approved CCP will be implemented and presents the various wildlife and habitat management and visitor services (public use) objectives and strategies for achieving the Refuge goals and purposes. In addition to management priorities, Chapter <u>5 of the Final CCP</u> also addresses personnel and project funding, current and potential partnerships, step-down management plans needed to implement the CCP, and the monitoring framework that will be used to assess the effectiveness of the plan strategies in achieving Refuge goals and objectives.

# 3 Affected Environment

This chapter presents relevant information about the physical, biological, cultural, and socioeconomic environment within and surrounding the San Diego NWR.

# 3.1 Environmental Setting

### 3.1.1 Location and Property Description

The San Diego NWR, including the Otay-Sweetwater Unit and Del Mar Mesa Vernal Pool Unit, is located in southwestern San Diego County (refer to Figure 1-1). The largest unit within the Refuge boundary is the Otay-Sweetwater Unit, which as of August 2013 consisted of 11,470 acres of several noncontiguous blocks of undeveloped land (refer to Figure 1-3). For planning and environmental assessment purposes, we have grouped these blocks of land into five distinct management areas: McGinty Mountain, Las Montañas, Sweetwater River, San Miguel Mountain, and Otay Mesa and Lakes (refer to Figure 1-6). These management areas are characterized by a striking diversity of landforms associated with the southwestern terminus of the Peninsular Range. The Sweetwater River extends through northern and western portions of the Otay-Sweetwater Unit, while the eastern and southern boundaries of this Unit are border by the rolling foothills and incised canyons of Sycuan Peak, Jamul Mountains, and Otay Mountain.

The 60-acre Del Mar Mesa Vernal Pool Unit is located approximately 20 miles north of downtown San Diego and four miles east of the Pacific Ocean (refer to Figure 1-5). These parcels include areas of level mesa top and deeply eroded canyons with steep slopes.

### 3.1.2 Regional Context

The lands included within the San Diego NWR are identified as core biological resource areas in the MSCP Plan (City of San Diego 1998a) prepared for a 900-square-mile area in southwestern San Diego County. This regional habitat conservation planning effort is anticipated to result in the creation of a regional habitat preserve network that includes approximately 172,000 acres of conserved lands (City of San Diego 1998a) managed by a variety of agencies and non-governmental organizations. The large expanses of undeveloped land that have been preserved to date include much of the remaining intact coastal lowland southern California habitats that support significant populations of endangered, threatened, and sensitive plants and wildlife.

Conservation of the lands, major watercourses, and smaller drainages within the Refuge boundary is an essential component of the regional effort to protect the water quality in San Diego County's bays and estuaries. The Del Mar Mesa Vernal Pool Unit is located within the Peñasquitos Watershed, with water from this area draining into Los Peñasquitos Lagoon. The lands within the Otay-Sweetwater Unit are included within the Sweetwater River and Otay River watersheds, both of which are included within the greater San Diego Bay watershed.

# 3.2 Physical Environment

Elements of the physical environment include topography, visual quality, geology and soils, agricultural resources, mineral resources, paleontology, hydrology and water quality, climate and climate change, air quality, greenhouse gas emissions, and contaminants.

### 3.2.1 Topography and Visual Quality

The landforms that currently characterize southwestern San Diego County are the result of millions of years of geological processes ranging from erosion and sediment deposition to crustal uplifting and seismic and volcanic activity (Walawender no date). Two of the three distinctive geographic regions of San Diego County are represented within the Refuge: the low-lying coastal plain and the mountainous Peninsular Range (County of San Diego 2011). The flat mesa and steep canyon formations common along the coastal plain characterize the Del Mar Mesa Vernal Pool Unit, while the Otay-Sweetwater Unit is characterized by the broad floodplain created by the Sweetwater River and rolling to steep and often rocky foothills of the Peninsular Range.

Elevations on Del Mar Mesa range from about 320 feet above mean sea level (MSL) in the canyon bottoms to about 400 feet above MSL on the mesa. Within the more topographically diverse Otay-Sweetwater Unit, the elevations range from 300 feet above MSL along the Sweetwater River floodway to just over 2,300 feet above MSL near the top of San Miguel Mountain.

### 3.2.1.1 Site Topography

### **Topography of the McGinty Mountain Area**

The McGinty Mountain area includes approximately 2,080 acres in the northern portion of the Otay-Sweetwater Unit. The major topographic feature within this area is, of course, McGinty Mountain, but there are other topographic features that help define this portion of the Refuge. The northernmost property included within the Refuge's McGinty Mountain area is located to the north of Dehesa Road and east of Willow Glen Drive, near a major bend in the Sweetwater River (Figure 3-1). This 74-acre parcel preserves a portion of the lower southwestern slopes of Dehesa Mountain. These generally steep, south-facing slopes, which support southern mixed chaparral vegetation, range from 1,100 feet above MSL at the northern property line to about 480 feet above MSL at the edge of Dehesa Road.

Just to the south, along the southern edge of the Sweetwater River floodplain, are the steep lower slopes of McGinty Mountain. McGinty Mountain, the most prominent feature in this area, is fairly steep with a major north-south trending ridge reaching a peak elevation of 2,183 feet above MSL. The McGinty Mountain area is generally bordered on the north and west by the Sweetwater River, on the east by Sloane Canyon and Beaver Hollow, and on the south by Jamacha Valley and residential development within the community of Jamul. Another prominent feature in the area is a nearly level mesa that occupies the northwestern portion of the mountain at about 1,100 feet above MSL. McGinty Mountain is transected by several north-south and northwest-southeast oriented seasonal drainages that flow into the Sweetwater River. The steepest slopes in this area tend to be located at the lower elevations of the mountain, about 800 to 900 feet above MSL, in an area adjacent to the Sweetwater River drainage. The slopes drop quickly to about 400 feet above MSL at the edge of the floodplain.

Following south, down the ridge from the mountain peak, is a 19-acre parcel (the Peg Leg parcel) that includes the northern end of a narrow ridge at about 1,500 feet above MSL. This ridge is flanked by relatively steep slopes to the east and west. To the south of the Peg Leg parcel is another Refuge parcel located adjacent to Jamul Drive. The drainages on this parcel ultimately merge downstream to form Mexican Canyon.



Figure 3-1. Topographic Character of the McGinty Mountain Area

#### Topography of the Las Montañas Area

To the south and separated from the McGinty Mountain area by Jamacha Valley and Mexican Canyon is the Las Montañas area. This part of the Refuge is bisected by Highway 94 (Figure 3-2). The northern portion of this 1,035-acre management area is characterized by predominately west-facing, steeply sloping terrain that extends down to Mexican Canyon. Elevations range from just over 1,200 feet above MSL in the east to about 700 feet above MSL in the west.

The terrain in the southern portion of Las Montañas consists of a series of rocky hillsides that extend down to a prominent drainage, Steele Canyon Creek, that flows along the south side of Highway 94. Another steep drainage that extends through this area begins at the south end of the property, flowing northwest through the parcel until it joins Steele Canyon Creek.

More than half of the Las Montañas area consists of slopes with gradients in excess of 25 percent. The area with the highest percentage of slopes exceeding a 50 percent slope gradient is located to the north of Highway 94 (Dudek & Associates 1996). Rock outcrops are common in the steeper portions of the site, and stands of coast live oak are present along some of the major drainages. Prior to acquisition by the Service, portions of the site to the south of Highway 94 were graded in accordance with county-approved plans for a golf course. Natural recruitment of native vegetation has occurred in many of these areas, but evidence of prior grading activity remains.

#### **Topography of the Sweetwater River Area**

Near the western terminus of Steele Canyon is the Sweetwater River area of the Otay-Sweetwater Unit (Figure 3-3). This portion of the Refuge encompasses about 1,950 acres and is located to the north and south of Highway 94 along the Sweetwater River drainage. The 475 acres located to the north of Highway 94 are characterized by an east to west trending ridge that extends to about the center of the property where it reaches a high point of 836 feet above MSL. The steep north, south, and west-facing slopes of the ridge are also included within the Refuge. To the north and west of these steep slopes, the Refuge includes portions of the Sweetwater River floodplain (an area often referred to as Jamacha Valley).

The Sweetwater River area located to the south of Highway 94 is characterized by steep sloping terrain that is bisected by the Sweetwater River. The slopes to the east of the river, the lower slopes of San Miguel Mountain, range from about 800 feet above MSL at the high point down to about 300 feet above MSL at the base of the slope. The terrain to the west of the river is characterized by a narrow ridge surrounded by steep slopes to the northwest and southeast. The elevations along the ridge vary from a high point of about 780 feet above MSL to about 600 feet above MSL in the eroded saddles between the high ridge tops. Elevations in the Sweetwater River drainage range from 300 feet above MSL at Highway 94 to about 280 feet above MSL at the upper end of the Sweetwater Reservoir.

Also in this area is a 28-acre parcel located to the northwest of Jamacha Boulevard and to the south of Highway 94. The parcel consists of east facing slopes that extend from about 600 feet above MSL down to about 500 feet above MSL at the edge of Jamacha Boulevard. Further to the north, in an area of the county referred to as Monte Vista Ranch, is an isolated 25.88-acre area of the Refuge (referred to as Lot 707) that consists of a knoll that, at its peak, measures approximately 600 feet above MSL.



Figure 3-2. Topographic Character of the Las Montañas Area



Figure 3-3. Topographic Character of the Sweetwater River Area

#### Topography of the San Miguel Mountain Area

To the south and east of the Sweetwater River area is the largest management area within the Otay-Sweetwater Unit—the San Miguel Mountain management area (Figure 3-4). This part of the Otay-Sweetwater Unit, which as of August 2013 included approximately 5,765-acre, is generally characterized by the steep, rugged slopes of both San Miguel and Mother Miguel Mountains, with some very gently sloping hillsides present along the area's western boundary, which is flanked by the Sweetwater Reservoir. Although a significant portion of the western slopes and portions of the north-, south-, and east-facing slopes of San Miguel Mountain are included within the Refuge, the peak of the mountain, situated at about 2,565 feet above MSL, has been retained in private ownership. The areas of the mountain within the Refuge range in elevation from about 2,400 feet above MSL down to 300 feet above MSL near the Sweetwater Reservoir. Mother Miguel Mountain is situated in the southeast corner of this area, with a peak elevation of approximately 1,527 feet above MSL.

Portions of San Miguel Mountain's southernmost slopes, which extend down into Proctor Valley, are also included within the Refuge. Here, the elevations range from about 920 feet above MSL to about 570 feet above MSL within the main drainage in Proctor Valley.

Approximately 1,900 acres of land including some very steep north- and east-facing slopes of San Miguel Mountain were added to the Refuge in 2012. This area is referred to as Hidden Valley because of the narrow valley that extends northwest out of Proctor Valley along the northeastern base of San Miguel Mountain. The highest elevation in this area measures about 2,300 feet above MSL near the peak of San Miguel Mountain, while the floor of Hidden Valley ranges from about 900 to 1,000 feet above MSL.

#### **Topography of the Otay Mesa and Lakes Area**

As of August 2013, the Otay Mesa and Lakes Area includes two non-contiguous blocks of Refuge land, including about 255 acres on the southern slopes of the Jamul Mountains, to the north of Dulzura Creek, and another 300 acres located to the south of Jamul Creek on the foothills of Otay Mountain (Figure 3-5). The "V" shaped Jamul Mountains parcel conserves the steep slopes that surround the southernmost extent of a north to south trending ridge. Elevations range from 1,900 feet above MSL in the north to about 700 feet above MSL at the southeastern and southwestern corners of the parcel. The area to the south of Dulzura Creek within the Otay Mountain foothills is characterized by steep hillsides in the western portion of the site and gentler slopes throughout the remainder of the site. Little Cedar Canyon extends through the northeastern corner of the site.

Additional parcels currently managed by Caltrans and located to the northeast of Brown Field are expected to be added to this area in the future (refer to Figure 1-4). These areas include about 200 acres in and around Johnson Canyon that consist of steep canyon slopes and mesa top with distinctive mimamound microtopography. The mesa averages about 500 feet above MSL, while the bottom of the canyon is about 300 feet above MSL. Another 162 acres, located on Otay Mesa, include relatively flat lands situated at about 510 feet above MSL.



Figure 3-4. Topographic Character of the San Miguel Mountain Area



Figure 3-5. Topographic Character of the Otay Mesa and Lakes Area
## Topography of the Del Mar Mesa Vernal Pool Unit

Within the Del Mar Mesa Vernal Pool Unit there are four noncontiguous parcels totaling about 60 acres (Figure 3-6). These parcels, located just south of Deer Canyon and north of Los Peñasquitos Canyon, are characterized by mesas, steep slopes, and major drainages. Covering portions of the mesa are undulating mimamounds (hummocks) and intervening depressions that support rare vernal pool habitat (City of San Diego 2011). Elevations range from 440 feet above MSL on the mesa to just under 300 feet above MSL within the major drainages.

## 3.2.1.2 Site Visibility

The higher portions of the Otay-Sweetwater Unit are visible from great distances, with the upper slopes of San Miguel Mountain visible from the coastal areas of southern San Diego County. Other portions of the Otay-Sweetwater Unit are visible from Highway 94, Jamacha Boulevard, Dehesa Road, Proctor Valley Road, Otay Lakes Road, and several adjacent residential areas. Views of the Del Mar Mesa Unit are more limited, with glimpses of the land available from a portion of SR-56, as well as from some of the surrounding residential developments located in the Rancho Peñasquitos community of the City of San Diego.

#### 3.2.1.3 Designated Scenic Highways

Portions of the San Miguel Mountain area form the backdrop of the long views across the county that are often available from the southern end of SR-75, a highway that travels along the Silver Strand between the cities of Coronado and Imperial Beach. SR-75 is one of two officially designated State Scenic Highways in the county, and the view over San Diego Bay to San Miguel Mountain is one of the factors that contributed to the highway's scenic designation.

The portion of Highway 94 that extends from SR-125 to Interstate 8 is also considered by Caltrans to be eligible for designation as a State Scenic Highway, but no action to officially elevate this segment of highway to State Scenic Highway status has been taken. As described by the County of San Diego, "A highway may be designated as 'scenic' depending upon how much of the natural landscape can be seen by travelers, the aesthetic quality of the landscape, and the extent to which development intrudes upon the traveler's enjoyment of the view. A highway's status changes from 'eligible' to 'officially designated' when the local jurisdiction adopts a scenic corridor protection program, applies to Caltrans for scenic highway approval, and receives notification from Caltrans that the highway has been designated as an official State Scenic Highway" (County of San Diego 2011).

Portions of Highway 94 are included within the county Scenic Highway System and views of the Otay-Sweetwater Unit are available along this stretch of highway. Parts of the Otay-Sweetwater Unit are also visible from three other county scenic highway segments:

- Willow Glen Drive (scenic highway designation from Jamacha Road to Dehesa Road),
- Otay Lakes Road (scenic highway designation from the Chula Vista city limits to Highway 94), and
- Proctor Valley Road (scenic highway designation from the Chula Vista city limits to Highway 94) (County of San Diego 2011).



Figure 3-6. Topographic Character of the Del Mar Mesa Vernal Pool Unit

# 3.2.2 Geology and Soils

Understanding the variety of soils present within the San Diego NWR and where they occur is important when making decisions related to the siting of facilities, as well as when making habitat management decisions, including where and how to protect, enhance, and restore sensitive plant species. Soils can influence the type of vegetation present in a given area and, in some cases, the presence of a particular soil (e.g., gabbro soils, Linne clay) indicates a potential for rare plants.

Soil properties such as erodibility and runoff potential must be considered when designing trails or siting facilities such as a trail bridge, parking lot, or visitor contact station. A summary of the geological formations and soil conditions present within Refuge is provided here, with additional details and soil maps provided in Appendix E.

# 3.2.2.1 Otay-Sweetwater Unit

The majority of the lands within the Otay-Sweetwater Unit occur within the Peninsular Ranges geomorphic region of San Diego County, which is underlain by granitic rocks formed during the cooling of magmas generated between 140 and 90 million years ago (Deméré no date).

## McGinty Mountain Area

Within the McGinty Mountain area, the majority of the land is underlain by Mesozoic granitic rock of the Southern California Batholith. A number of different soil types have been identified in this area, with the majority of the area overlain with soils of the Cieneba series. This soil series is characterized as excessively drained, very shallow to shallow coarse sandy loam that has been formed in place from granitic rock (Bowman et al. 1973). The erosion hazard for this soil type is high to very high. Soils of the Vista series, which are weathered from granodiorite or quartz diorite, also occur throughout the site (Bowman et al. 1973). The erosion hazard for these soils ranges from moderate for the flatter areas to very high in steep areas.

In the southeast end of the McGinty Mountain area, soils of the Las Posas series are present. These soils, which have a moderate to very high erosion hazard, are formed in place from weathered igneous (gabbro) rocks (Bowman et al. 1973) and usually have a clay subsoil. Because of the chemical and physical composition of this soil series, these soils often support a unique assemblage of native plants.

#### Las Montañas Area

The majority of the Las Montañas area is also underlain by Mesozoic granitic rocks of the Southern California Batholith. The soils in the northern portion of this area generally consist of silty sands of the Cieneba series soils and much of the remaining area overlain with Vista series soils. The erosion hazard associated with these soil types ranges from moderate for 15 percent slopes to very high for slopes exceeding 50 percent.

The two primary soil types on the south side of Highway 94 include Vista course sandy loam with 30 to 65 percent slopes and Cieneba very rocky course sandy loam with 30 to 75 percent slopes. The erosion hazard of both of these soil types is high to very high.

## Sweetwater River Area

The portion of the Sweetwater River area to the north of the Highway 94 is dominated by Mesozoic granite rocks of the Southern California Batholith, while the majority of the area to the south of Highway 94 is underlain with Santiago Peak metavolcanic rocks. The latter geologic formation consists of a collection of mildly metamorphosed (altered by heat and

pressure) volcanic and volcanoclastic rocks (sedimentary units derived from volcanic rocks) with minor amounts of sedimentary material (Ogden 1992). Santiago Peak volcanics are generally hard and extremely resistant to erosion. The Jamacha parcel located to the west of Jamacha Boulevard is underlain by Santiago Peak volcanic rock in the northern end of the parcel and Pleistocene non-marine sediments to the south. Both sides of Highway 94 within and adjacent to the floodplain of the Sweetwater River and its tributaries are underlain by Quaternary alluvium and colluvium.

The Sweetwater River area is overlain with a variety of soil types, including Tujunga sand in the floodway of the Sweetwater River and Riverwash within the streambed near the northern end of the Sweetwater River area. On the north side of Highway 94, Vista, Cieneba, Friant, and Fallbrook series soils overlay the site.

To the south of Highway 94 and west of the Sweetwater River, the area is overlain with Friant rocky fine sandy loam. This soil, which occurs on steep slopes, demonstrates rapid to very rapid runoff velocities with high to very high potential for erosion (Bowman et al. 1973). The majority of the Jamacha parcel is overlain with Diablo clay, which is well drained and consists of moderately deep to deep clays derived from soft, calcareous sandstone and shale (Bowman et al. 1973). The erosion hazard is moderate to high, with the higher hazard occurring on the steeper slopes.

The upland soils on the area to the south of Highway 94 and east of the Sweetwater River are overlain with Vista, Cieneba, San Miguel-Exchequer series soils. About 10 to 20 percent of the surface in these areas is covered with rock outcrops and large granodioritic boulders.

#### San Miguel Mountain Area

The majority of the San Miguel Mountain area is underlain by Jurassic Santiago Peak volcanics, although the lands in the area located closest to SR-125 are underlain by Otay Formation. The predominant soil type is San Miguel-Exchequer rocky silt loams, with a runoff potential that is medium to rapid, and the erosion hazard is moderate to very high. Linne clay loam, a moderately deep clay loam derived from soft calcareous sandstone and shale, occurs in an area along the western edge of the Refuge boundary near Sweetwater Reservoir (Bowman et al. 1973). The majority of the steep slopes on the northeastern edge of the Refuge are overlain with Cieneba very rocky coarse sandy loam, while sandy loams (i.e., Visalia sandy loam, Placentia sandy loam, Escondido sandy loam) are present within the gently rolling valley floor of the Hidden Valley area.

The soil types in the areas at the base of the west and south-facing slopes of San Miguel and Mother Miguel Mountains consist primarily of clays, clay loams, and cobbly loams. The areas closest to the Sweetwater Reservoir from north to south are overlain with Linne clay loam, Diablo clay, and Olivenhain cobbly loam. Because of the gentle slopes in vicinity of the vernal pool parcel in the extreme northwest corner of this management area, it may be more appropriate to classify the soils as Olivenhain cobbly loam, which is described as including microrelief of broad-based mimamounds (Bowman et al. 1973 [Sheet No. 64]). Although some of the original mimamound topography remains in this area, many of the mounds were eliminated due to soil disturbance associated with farming and other human activities. On these soils, runoff is medium, and the erosion hazard is slight to moderate (Bowman et al. 1973). In the extreme southwest corner of this management area, soils consist of the Diablo clay and Linne clay loam series soils.

## **Otay Mesa and Lakes Area**

The majority of the parcels in this area are underlain by Jurassic Santiago Peak volcanic rock. The exception is the northern portion of the parcel lying to the south of Proctor Valley Road, which is underlain by Otay Formation.

The northern parcel in this area is overlain primarily by Friant rocky fine sandy loam, a soil type characterized as shallow to very shallow, well-drained sandy loam (Bowman et al. 1973). Runoff is rapid to very rapid, and the erosion hazard is described as high to very high. The soils present on the southern parcel are considerably more diverse, consisting of soils in the series Friant, San Miguel-Exchequer, Olivenhain, and Visalia.

## 3.2.2.2 Del Mar Mesa Vernal Pool Unit

This unit occurs within the Coastal Plain geomorphic region of San Diego County, which is characterized by layers of marine and non-marine sedimentary rock units (Deméré no date). The uppermost geological formations within the Del Mar Mesa area consists of middle to early Pleistocene marine and marine terrace deposits, sometimes referred to as Linda Vista Terrace. This formation is underlain by Stadium Conglomerate, one of three conglomerate formations that make up the Poway Group, an Eocene geologic formation that formed 35 to 50 million years ago.

The mesas within the Del Mar Mesa Vernal Pool Unit are overlain with Redding gravelly loam soils. The surface topography in these areas typically consists of broad, low mimamounds that are moderately to well drained with intervening poorly drained areas that can be almost impervious. The erosion hazard on these soils is slight to high depending upon the slope gradient, and erosion can best be controlled by maintaining a permanent vegetation cover (Bowman et al. 1973).

The steep canyon slopes that cut through the western three parcels in this area are overlain by Redding cobbly loam. The erosion hazard is moderate to high, and runoff is medium to rapid. The steep and very steep slopes located on the eastern parcel are identified in the Soil Survey (Bowman et al. 1973) as terrace escarpments. These areas typically support 4 to 10 inches of loamy or gravelly soil over soft marine sandstone, shale, or gravelly sediments. Runoff is rapid, and the erosion hazard is high.

# 3.2.3 Geological Hazards

## 3.2.3.1 Faults and Seismicity

The following discussion of the faulting and seismicity affecting the properties within the San Diego County region is taken from the discussion provided by the County of San Diego in the Draft Final Environmental Impact Report prepared for the County of San Diego General Plan Update (County of San Diego 2011):

"The faulting and seismicity of southern California is dominated by the compressionary regime associated with the "Big Bend" of the San Andreas Fault Zone. The San Andreas Fault Zone separates two of the major tectonic plates that comprise the earth's crust. West of the San Andreas Fault Zone lies the Pacific Plate, which is moving in a northwesterly direction relative to the North American Plate, which is located east of the San Andreas Fault Zone. This relative movement between the two plates is the driving force of fault ruptures on the west coast of California. The San Andreas Fault generally trends northwest to southeast and is located to the northeast of San Diego County. A series of sub-parallel faults are located to the west of the San Andreas Fault Zone including the active San Jacinto, Elsinore, and Rose Canyon Fault Zones, which each traverse through San Diego County. North of the Transverse Ranges Province, located generally between Santa Barbara and Joshua Tree, the San Andreas fault trends more in an east to west direction (the Big Bend), causing the fault's right-lateral strike-slip movement to produce north-south compression between the two plates. This compression has produced rapid uplift of many of the mountain ranges in southern California. This crustal shortening is accommodated by faulting (mainly reverse faulting) and causes a large potential for seismicity throughout most of southern California."

The location of the major active fault zones near the San Diego NWR, including the Rose Canyon Fault Zone, Elsinore Fault Zone, and San Jacinto Fault Zone, are illustrated in Figure 3-7. The nearest of these active fault zones is the Rose Canyon Fault Zone which trends northwest to southeast and is located about six miles from the Del Mar Mesa Vernal Pool Unit and about 15 miles to the northwest of the Otay-Sweetwater Unit. It is estimated that the maximum probable earthquake expected to occur on the Rose Canyon Fault would be of a magnitude 6.25 (Dudek & Associates 1996). The other active fault in the region is the Elsinore Fault, which is located about 30 and 35 miles from the Otay-Sweetwater Unit. The maximum probable earthquake expected to occur on this fault would be of a magnitude 6.75. The La Nacion Fault Zone, which lies about six to eight miles to the west of the Otay-Sweetwater Unit, is considered potentially active. Smaller localized faults, most older than 1.6 million years, are also illustrated in Figure 3-7. Within the McGinty Mountain area and an east-west trending localized fault occurs in the general vicinity of the Del Mar Mesa Vernal Pool Unit (California Department of Conservation 2010a).

Although the primary effects of earthquakes can include violent ground motion and, on occasion, permanent displacement of land associated with surface rupture, there is also the potential for secondary effects, including landslides, falling rocks, soil liquefaction, tsunamis, and seiches. It is the ground shaking associated with an earthquake that generally produces the greatest damage. When surface rupture occurs, it can occur at or below the surface, potentially causing large vertical and/or horizontal displacement of the ground along the fault (County of San Diego 2011).

Areas overlain with saturated, loose, fine- to medium-grained soils where the groundwater table is generally 50 feet or less below the surface are the areas most prone to soil liquefaction. During an earthquake, these sediments can experience a sudden increase in pore water pressure causing the soils to lose strength and behave as a liquid. There are three types of lateral ground displacement that can occur as a result of liquefaction: 1) flow failure, which generally occurs on steeper slopes; 2) lateral spread, which generally occurs on gentle slopes; and 3) ground oscillation, which occurs on relatively flat ground (County of San Diego 2011). Historically, seismic shaking in San Diego County has not resulted in liquefaction, but there are areas in the county, including within the Refuge, that are considered susceptible to liquefaction from ground shaking during larger seismic events. The areas include the portions of the Sweetwater River and San Miguel Mountain areas in the vicinity of the Sweetwater River floodplain.



Figure 3-7. Earthquake Faults in the Vicinity of the San Diego NWR

# 3.2.3.2 Landslides

Landslides, the down slope movement of soil and/or rock, may occur as a result of a seismic event, excessive water on a slope, or disturbance at the top or toe of a slope. Landslides can occur rapidly or very gradually (County of San Diego 2011). Although much of the Otay-Sweetwater Unit includes slopes with slope gradients in excess of 25 percent, soil slip susceptibility is considered low within this area. Boulder-strewn steep hillsides, however, are present in portions of the McGinty Mountain and Las Montañas areas. These hillsides can pose a falling rock hazard in association with an earthquake or due to the gradual loosening of their contact with the surface. Actions such as ground disturbance (i.e., excavation, filling), removal of vegetative cover, and changes in drainage patterns that introduce increased water onto a slope may contribute to the instability of a rocky slope, increasing the potential for rockfall.

# 3.2.3.3 Seiches

A seiche, which is a standing wave in a completely or partially enclosed body of water, is not likely to occur because the adjacent Sweetwater Reservoir and Otay Lakes are considered too small to pose a significant threat to public safety. Although unlikely, a seiche generated by an earthquake could result in localized flooding or damage to low lying areas adjacent to these reservoirs. Trails and/or other facilities located along the shoreline would be susceptible to inundation should a seiche be generated (County of San Diego 2011).

# 3.2.4 Paleontological Resources

The Code of Federal Regulations defines paleontological resources as any fossilized remains, traces, or imprints of organisms preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of life on earth(16 U.S.C. 470aaa(4)). Materials associated with an archaeological resource or any cultural items are not considered paleontological resources. Similarly, the County of San Diego (2009) defines paleontological resources as "the remains and/or traces of prehistoric life, exclusive of human remains, and including the localities where fossils were collected and the sedimentary rock formations from which they were obtained or derived. The defining character of fossils is their geologic age. Fossils or fossil deposits are generally regarded as older than 10,000 years, the generally accepted temporal boundary marking the end of the last late Pleistocene glacial event and the beginning of the current period of climatic amelioration of the Holocene. Fossil remains commonly include marine shells, bones and teeth of fish, reptiles, and mammals, leaf assemblages, and petrified wood. Fossil traces include internal and external molds (impressions) and casts. Trace fossils (i.e., ichnofossils) include evidence of past activities of fossil organisms, such as footprints and trackways, burrows and boreholes, coprolites, nests and (packrat) middens."

Paleontological resources, which occur in geologic deposits of sedimentary rock such as sandstone, siltstone, mudstone, claystone, or shale may be exposed at the surface in valley slopes and road cuts, but are typically buried under surficial soil deposits. The geologic deposits contain fossils of extinct organisms; as a result, they are considered limited and non-renewable (County of San Diego 2009). Paleontological resources are managed to preserve their scientific and educational values. When these resources are removed by laypersons, they can be damaged and/or precise information on the original location, rock type, or other conditions of a paleontological resources.

On March 30, 2009, the Paleontological Resources Preservation Act became law as part of the Omnibus Public Land Management Act of 2009, Public Law 111-011. This law requires the Secretaries of the Interior and Agriculture to manage and protect paleontological resources on

Federal land using scientific principles and expertise. This law prohibits the casual collecting of fossils on lands administered by the Service.

There is a direct relationship between fossils and the geologic formations within which they are found; therefore, it is possible to reasonably predict where fossils might or might not be found (County of San Diego 2009). The County of San Diego has prepared a map that indicates the potential for paleontological resources throughout the county. Areas are identified as having a high, low, marginal, moderate, or no potential for paleontological resources. Since fossils form in sedimentary rocks, most of the fossils in the southwestern San Diego County region would likely be expected to occur in the Coastal Plain. In the Peninsular Ranges, fossils may occur in valleys and other environments where material eroded from the mountains was transported downhill and deposited. Jurassic metasedimentary rocks mapped as the Santiago Peak Volcanics have also produced rare but important marine invertebrate fossils (County of San Diego 2009).

Based on the information compiled by the County of San Diego (2009), there is a high potential for the presence of paleontological resources in the northern and western portion of the Sweetwater River area and in the western portions of the San Miguel Mountain and Otay Mesa and Lakes areas of the Otay-Sweetwater Unit. The potential for these resources in the floodway of the Sweetwater River is low; within the remaining portions of the Sweetwater River and San Miguel Mountain areas, as well as the eastern portion of the Otay Mesa and Lakes area, the potential is marginal. There is no potential for paleontological resources within the McGinty Mountain and Las Montañas areas of the Otay-Sweetwater Unit.

A number of well-preserved paleontological resources have been recovered from the Stadium Conglomerate formation in the vicinity of Del Mar Mesa, which occurs within the boundaries of the Del Mar Mesa Vernal Pool Unit. The Del Mar Mesa area is considered of high paleontological resource sensitivity by the City of San Diego. The same is true for the marine and/or non-marine terrace deposits present on the mesas within the Refuge's Del Mar Mesa Vernal Pool Unit (City of San Diego 2011).

# 3.2.5 Mineral Resources

Mineral resources of importance in San Diego County include construction materials, industrial and chemical mineral materials, and historically, precious metals and gemstones. Mineral resources are defined as the concentration or occurrence of natural, solid, inorganic or fossilized organic material in or on the earth's crust in a form and quantity and of a grade or quality that provides reasonable prospects for economic extraction (County of San Diego 2011). In general, construction materials include sand, gravel, and crushed rock. Industrial and chemical mineral materials include limestone, dolomite, and marble (except where used as construction aggregate), as well as specialty sands, clays, phosphate, borates, gypsum, feldspar, talc, building stone, and dimension stone. Precious metals include gold and silver, as well as iron and other ferro-alloy metals, copper, lead, and zinc. Various semi-precious gemstones have been located and, in some instances, mined in San Diego County.

Historical mining activities in and around the Refuge have included a feldspar mine and ceramic grade clay mining in the vicinity of McGinty Mountain, the Peg-Leg Mine to the southeast of McGinty Mountain, a limestone quarry near the current site of Bright Valley Farms, and a granite quarry site near the southwest corner of Jamacha Road and Highway 94. A few occurrences of semi-precious gemstones are also recorded from San Miguel Mountain and nearby Lyons Peak (Weber 1963).

Construction aggregate, including sand, gravel, and crushed rock, are the primary ingredients in concrete and asphalt, products essential to development in San Diego County (SANDAG 2011). Today, aggregate is considered the county's most important mineral resource. Although there are large amounts of these resources in San Diego County, some are no longer accessible because urban development has eliminated access to these resources. Other areas supporting construction aggregate also support sensitive biological resources that would be adversely affected by mineral extraction (County of San Diego 2011). As a result, there is currently a shortage of quality (PCC-grade) sand in the San Diego area. PCC-grade aggregate is aggregate that has been naturally sorted, rounded, and polished in rivers and creeks. It is used primarily in finished concrete work because the rounded material allows for a smoother finish, requires less cement and water than crushed stone, and is easier to mix, pour, and place. According to the California Department of Conservation (1996), aggregate deposits that are acceptable for use as PCC-grade aggregate are the rarest and most valuable of aggregate resources.

The California Department of Conservation (2006), Geological Survey estimates that the 50-year demand for aggregate resources for the western San Diego County production/ consumption (PC) region (essentially the developed western portion of San Diego County) as of January 1, 2006, is 1,164,000,000 tons. The total amount of aggregate resources permitted for extraction as of January 1, 2006, was 198,000,000 tons, representing only 17 percent of the demand over the next 50 years. More importantly, the amount of permitted aggregate resources in the western San Diego County PC region decreased by 28 percent between January 1, 2001, and January 1, 2006, while the projected 50-year demand increased by six percent (California Department of Conservation 2006).

This discrepancy between supply and demand, particularly for PCC-grade sand, has resulted in San Diego having the highest priced aggregate in the State. In 2006, sand was being imported from Mexico in an effort to meet the demand. Another source of aggregate material, particularly class II base used in constructing roadbeds, is recycled construction and demolition waste material (California Department of Conservation 1996).

In 2011, SANDAG, in cooperation with Caltrans District 11, prepared *The San Diego Region Aggregate Supply Study*, which examined the current and future aggregate supply and demand issues in San Diego County. As part of this study, a regional aggregate database and GIS analysis tools were developed to identify potential sources within the county for aggregate. In this study, the sites within the county that were identified as potential aggregate supply sites are at least 20 acres in size, located in areas identified by the California Department of Conservation as not developed, do not meet the definition of a developed land use type, have not been conserved for environmental reasons nor identified for conservation at the 90 percent level, and are not located in areas the California Department of Conservation has identified as having no significant mineral deposits. Using these criteria, 1,159 sites of 20 acres or more were identified in the county as potential aggregate supply sites (SANDAG 2011). Figure 3-8 illustrates the proximity of the potential aggregate supply sites to the San Diego NWR.



Figure 3-8. Potential Aggregate Materials in the Vicinity of the Otay-Sweetwater Unit

One of the resources utilized in SANDAG's aggregate supply study was the California Department of Conservation's mineral land classifications for western San Diego County (California Department of Conservation 1996). These classifications are presented in the form of Mineral Resource Zones (MRZ), and each zone is defined as follows:

- MRZ-1 Areas where adequate information indicates that no significant mineral deposits are present or where it is judged that little likelihood exists for their presence;
- MRZ-2 Areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood exists for their presence;
- MRZ-3 Areas containing mineral deposits the significance of which cannot be evaluated from available data; and
- MRZ-4 Areas where available information is inadequate for assignment of any other MRZ zone.

Because the demand for PCC-grade aggregate will likely exceed the amount available in areas currently classified as MRZ-2, it is likely that areas currently designated as MRZ-3 may be further evaluated as potential resource sites. Sites in these areas have the potential to contain crushed granitic and metavolcanic rocks or alluvial deposits that could be economically minable. Operations involving the crushing of large granitic boulders could also be initiated, as these types of granitic deposits are common in San Diego County. However, large quantities of weathered granitics typically must be mined in order to obtain the larger boulders needed for crushing; therefore, mining these types of areas for PCC-grade aggregate could be costly. If there is a market for the lesser material, then retrieving the larger boulders for crushing could be more feasible (California Department of Conservation 1996).

Within the McGinty Mountain area of the Otay-Sweetwater Unit, only the westernmost portion of this area is located within the western San Diego County PC region, and that area has been classified as MRZ-3. Areas outside this region have not been classified.

The Las Montañas area and a majority of the Sweetwater River area are classified as MRZ-3. There is, however, a portion of the Sweetwater River area that is classified as MRZ-1, as indicated in Figure 3-8. This area is generally located within the floodway of the Sweetwater River extending from about 4,000 feet south of the old steel bridge to about 3,000 feet to the east of Steele Canyon Road. Although the boundaries of this MRZ-1 designation extend north and east beyond the Refuge boundary, the areas outside of the Refuge have been developed and are now occupied by Cuyamaca College and various commercial developments to the north and a golf course to the east. Also within the Sweetwater River area is a site classified as MRZ-2. This site occurs at the northernmost end of the Sweetwater Reservoir with only the northernmost portion of the MRZ-2 site included within the Refuge. The majority of this site is located within lands owned by the Sweetwater Authority.

The western and northeastern portions of the San Miguel Mountain area are located within the western San Diego County PC region and these areas are designated as MRZ-3. Currently (as of 2013), the parcels within the Otay Mesa and Lakes area are located outside the western San Diego County PC region. Within the Del Mar Mesa Vernal Pool Unit, the mesa tops and some of the less incised canyons have been classified as MRZ-2, while the deeper canyons are classified MRZ-3.

# 3.2.6 Agricultural Resources

<u>Historical Prospective</u>. Both the Jamacha Valley, within the Sweetwater River floodplain, and the Proctor Valley area to the east were historically used for agriculture. According to historical records, in the early 1800s, sheep and horses, which belonged to Mission San Diego de Alcalá, grazed on lands within the Jamacha Valley (Van Wormer 1984). The Mission also used Jamacha Valley for grazing cattle. In the early 1830s, the missionaries at San Diego gave a large portion of their grazing lands to Doña Apolinaria, who planted wheat and corn in the valley along the east side of the Sweetwater River. She also set other portions of the land aside for grazing sheep and goats (Van Wormer 1984). Illustrated in Figure 3-9 are the historical boundaries of Rancho Jamacha, which were formalized in 1840. As indicated, portions of the San Diego NWR now occupy some of the area originally included within the 8,881-acre Mexican land grant.

Rancho Jamacha was sold to four partners in 1853, who cultivated wheat, barley, oats, rye, and vegetables on the land. They also raised sheep, horses, cattle, mules, and hogs. This ranch, which is credited as being the first successful large-scale agricultural enterprise in San Diego County (Van Wormer 1984), operated until about 1860, when farming in this area ceased to be economically viable.

Near the end of the 1800s, interest in farming within the valley was renewed and in 1892, the lands to the east of the Sweetwater River in the northern third of what was originally Rancho Jamacha were purchased and later became known as Monte Vista Ranch. Although ownership of Monte Vista Ranch changed several times over the years, the land supported a success corporate farming operation until about 1945. A variety of crops were cultivated, including olives, oranges, grapes, walnuts, alfalfa, hay, melons, and a variety of vegetables (Van Wormer no date). Other portions of the valley were also once again used for grazing.

Cultural resource surveys of the areas to the west of Mother Miguel Mountain, on land now owned by the USFW, have identified evidence of ranching and farming activity dating back to the early 1900s. In addition, a dairy farm complex constructed between the 1930s and the 1940s operated on the ridge to the west of Mother Miguel Mountain prior to the establishment of the Refuge. According to the 1943 USGS map, another ranch identified on as the Williams Ranch was located on what is now Refuge land further down slope from the dairy site near the eastern edge of the current Sweetwater Reservoir. In 1975, when the Williams Ranch site was recorded as a historical site, citrus trees were noted as present on the property (Brian F. Smith and Associates 1992).

Agricultural activity and cattle grazing also occurred in Proctor Valley, which extends through a portion of the Otay Lakes and Mesa area of the Refuge. Historic farming sites have been identified to the north of Proctor Valley Road, where household fragments and structures date back to between the late 1800s and the early 1900s.



Figure 3-9. Boundaries of the Historic Rancho Jamacha Land Grant

Evidence of early ranching activities is also present further to the east within the Las Montañas area of the Otay-Sweetwater Unit. Historic records for the site referred to as the "Barn at the Oaks" indicate that a ranch operated at this site between 1893 and 1928 (Dudek & Associates 1996). Of the structures present on the site at that time, only the barn remains.

Historical agricultural activity on the Del Mar Mesa Vernal Pool Unit appears to have been limited to cattle grazing, although some of the mesas and gentle slopes in the general vicinity have been used over the years to raise tomatoes and other truck crops.

Today, only a few areas surrounding the Otay-Sweetwater Unit are used for agricultural purposes, and these uses are generally limited to grazing of cattle, goats, and horses. At present, there are no agricultural activities occurring on Del Mar Mesa.

<u>California Farmland Mapping and Monitoring Program</u>. The California Department of Conservation's Farmland Mapping and Monitoring Program produces maps and statistical data used for analyzing impacts on California's agricultural resources. Agricultural land is rated according to soil quality and irrigation status; the best quality land is called Prime Farmland. The maps are updated every two years with the use of a computer mapping system, aerial imagery, public review, and field reconnaissance.

According to the San Diego County Important Farmland 2008 map (California Department of Conservation 2010b), the majority of the lands within the Otay-Sweetwater Unit represent lands suitable for the grazing of livestock. As illustrated in Figure 3-10, none of the lands included within the San Diego NWR are identified by the State as Farmland of Statewide Importance or Prime Farmland.

Areas that the State has determined are not suitable for agricultural uses include the steeper slopes around McGinty Mountain, the south side of the Las Montañas area, and the steeper slopes around San Miguel Mountain. Some of the flatter portions within the McGinty Mountain area to the north and west of the McGinty Mountain peak, portions of Hidden Valley in the northeastern corner of the San Miguel Mountain area, and the parcels in the southwest corner of the San Miguel Mountain area, and the parcels in the southwest corner of the San Miguel Mountain area, and the parcels in the southwest corner of the San Miguel Mountain area, and the parcels in the southwest corner of Local Importance is defined as land with a good combination of physical and chemical characteristics for agricultural production but is limited because of the need for irrigation (California Department of Conservation 2010b). The soil types in these areas are suitable for truck crops and orchard crops. No other areas within the Otay-Sweetwater Unit are identified as suitable for farming.

The San Diego County Important Farmland 2008 map (California Department of Conservation 2010b) also indicates that some of the mesas in and around the Del Mar Mesa Vernal Pool Unit are suitable for grazing, with the remaining areas depicted as not suitable for agricultural uses.



Figure 3-10. San Diego County Important Farmland, as mapped by the California Department of Conservation

# 3.2.7 Hydrology and Water Quality

#### 3.2.7.1 Hydrology

#### Watersheds and Surface Water

The lands included within the Otay-Sweetwater Unit occur within two watersheds, the Sweetwater River and Otay River watersheds (Figure 3-11). Both watersheds drain into San Diego Bay.

The McGinty Mountain, Las Montañas, and Sweetwater River areas are located entirely within the Sweetwater River watershed, while only the areas to the west and southwest of the San Miguel Mountain area are included within this watershed. The Sweetwater River watershed encompasses about 230 square miles and extends from the Laguna Mountains to San Diego Bay. The primary tributary within this watershed is the Sweetwater River, which has undergone significant changes over the past 100 years. These changes began in 1888 with the construction of the Sweetwater Reservoir. This was followed in 1945 by the construction of the Loveland Reservoir near the eastern end of the drainage. The construction of this dam resulted in a significant reduction in the intensity and volume of freshwater flows through the portion of the Sweetwater River that extends through the Refuge.

The Loveland Reservoir controls about 98 square miles of the drainage basin, while the Sweetwater Reservoir, located approximately 17 miles downstream, controls approximately 84 square miles the basin. Both reservoirs are owned and operated by the Sweetwater Authority, which provides water service to a population of approximately 177,288 within the western and central portions of the City of Chula Vista, all of the City of National City, and unincorporated areas of the County of San Diego (Bonita) (Sweetwater Authority and RMC Water and Environment 2011).

The water present in the Sweetwater Reservoir comes from two sources: surface runoff from the Sweetwater River watershed, which is fully appropriated to the Sweetwater Authority, and untreated water from the San Diego County Water Authority (Sweetwater Authority 2011). It is estimated that in a normal water year, approximately 7,400 acre-feet of the Sweetwater Authority's water comes from local surface water, representing about 33 percent of the annual water supply (Sweetwater Authority and RMC Water and Environment 2011).

Water movement from the Loveland Reservoir to the Sweetwater Reservoir relies on the Sweetwater River channel for conveyance. Downstream conveyance of water can occur by scheduled release or can occur when water levels in the Loveland Reservoir are sufficient to generate flows over the spillway and into the river channel. Prior to planned releases, which are scheduled during the winter months, the Sweetwater Authority implements protocols (USFWS 1999a) for avoiding impacts to arroyo toad (*Anaxyrus californicus*) and notifies all downstream property owners of the upcoming release. Because the Sweetwater River is an unlined natural floodway, normal transmission losses are about 20 percent of the water released from Loveland Reservoir. Another source of water for the Sweetwater Reservoir, in addition to the water supplied by local surface water, is imported raw water purchased from the San Diego County Water Authority.



Figure 3-11. Watersheds included within the San Diego NWR

As indicated in Figure 3-11, the eastern third of San Miguel Mountain area and the Refuge parcels along Jamul Creek are located within the Otay River watershed. The Otay River drains a watershed of approximately 143 square miles, extending for a distance of 25 miles east from San Diego Bay to the Cleveland National Forest. The Otay River watershed has been artificially increased due to the use of a flume that transfers water from Barrett Lake (on the Tijuana River watershed) to Dulzura Creek (on Otay watershed). The Refuge lands within the Otay watershed feed lower Dulzura Creek and Jamul Creek before water flows reach the lower Otay Lake. The hydrologic conditions in the lower reach of the watershed are influenced by the presence of the Upper and Lower Otay Reservoirs. These reservoirs, which control approximately 69 percent of the watershed, reduce the frequency of flows in the river and capture sediments that historically were carried by the river into San Diego Bay.

The Del Mar Mesa Vernal Pool Unit is part of the Los Peñasquitos Creek watershed (refer to Figure 3-11), which is located in the northern portion of the Los Peñasquitos Hydrologic Unit. This watershed includes an area of approximately 100 square miles and discharges into the 0.6-square-mile Los Peñasquitos Lagoon. The major drainage course within the Del Mar Mesa Preserve is Deer Canyon, which merges with McGonigle Canyon to the northwest of the Refuge lands, forming the Carmel Valley. Surface water in the Carmel Valley drainage passes under Interstate 5, where it empties into Peñasquitos Lagoon. Other smaller drainages within the Refuge parcels also carry water from the site into Carmel Valley. Runoff occurring on this unit is seasonal and attributed almost exclusively to rainfall, while the major downstream drainages tend to carry water throughout the year as result of urban runoff.

There are also several holding ponds within the Otay-Sweetwater Unit, likely remnants of old grazing operations. Some of these ponds hold local surface runoff year round, while others may go dry for extended periods. There are holding ponds present in the low-lying areas near the western base of McGinty Mountain, three ponds located along the western foothills of San Miguel Mountain, and one pond on the northeast side of San Miguel Mountain.

The species supported within the vernal pool habitat present on the Otay-Sweetwater Unit and the Del Mar Mesa Vernal Pool Unit also rely on surface runoff for survival but at a much smaller scale. The microtopography present in these areas results in water ponding following winter storms, and the hard pan present beneath the surface significantly restricts drainage from these ponded areas. The slightest modification of the topography in these areas, particularly modifications that redirect surface runoff, can have significant effects on the overall quality of this habitat.

#### **Groundwater**

The majority of the lands within the Otay-Sweetwater Unit overlay fractured rock aquifers. These aquifers, which generally occur in the foothills and mountainous areas of the county, tend to have low storage capacity, which causes the water table to rise and fall at relatively fast rates. Because less water is typically stored in fractured rock, seasonal variations in precipitation and drought conditions result in greater variations in water levels than in similar conditions in alluvial or sedimentary aquifers (County of San Diego 2011).

Alluvial and sedimentary aquifers are present below those portions of the Otay-Sweetwater Unit that are located along the Sweetwater River or adjacent to the Jamacha Valley. In addition, a large aquifer occurs below the southwestern portion of the San Miguel Mountain area at the south end of the Sweetwater Reservoir. Alluvial and sedimentary aquifers, which are typically found in river and stream valleys, are generally composed of consolidated (i.e., sedimentary rock) or unconsolidated (i.e., alluvium, colluvium) gravel, sand, silt, and clay (County of San Diego 2011). The storage capacity in these aquifers varies depending upon the thickness of the sedimentary or alluvium layer, the proximity of the area to a water body, and other geologic or hydrological factors.

A natural spring has been identified at 1,225 feet above MSL on McGinty Mountain. This spring occurs on the western slope of the mountain along a rock chute area, where some surface moisture is present throughout much of the year. Another spring is known to be present on the southern slopes of San Miguel Mountain, just off the Refuge at about 1,100 feet above MSL. Only one well currently operates on the Refuge. This well is located on the north slope of San Miguel Mountain, near the current site of a Refuge storage building. The well fills a holding tank that can be accessed by Refuge and fire management staff.

#### Flooding and Other Hydrologic Hazards

Hydrologic hazards include flooding, landslides and mudslides, river scour and deposition, and drought. Flooding, which is considered the most significant of the hydrologic hazards, is defined as a temporary condition of partial or complete inundation of normally dry land areas. Flooding is typically associated with the overflow of the floodways of rivers and streams; however, flooding can also occur in streets, stormwater drainage systems, water storage areas (e.g., reservoirs, ponds, lakes), and low-lying upland areas (County of San Diego 2011). The potential for flooding in San Diego County is considered high due to significant variability in the frequency, magnitude, and location of the region's seasonal precipitation (County of San Diego 2011). Most rainfall occurs during the winter months (typically between November and April); however, tropical storms from the south can also bring heavy rainfall during the summer months. Areas prone to flooding within the Refuge are generally limited to the floodway and floodplain of the Sweetwater River and Steele Canyon Creek in the Otay-Sweetwater Unit.

Steep drainages that occur on the slopes of McGinty, San Miguel, and Mother Miguel Mountains in the Otay-Sweetwater Unit, as well as the deeply cut drainages on the Del Mar Mesa Vernal Pool Unit, are susceptible to large water flows during heavy down pours. This situation can result in debris flows that travel rapidly down slopes, carrying rocks, brush, and other debris. Areas containing sandy soils and weathered gabbroic soils are prone to instability and sliding, as are recent burn areas.

Another flooding hazard that could affect portions of the Refuge is related to dam failure, primarily the failure of the Loveland Reservoir. If this dam were to fail, portions of the Refuge along the Sweetwater River floodway would be subject to inundation, and the area between the Loveland and Sweetwater Reservoirs would likely experience the effects of significant scour and deposition as floodwaters flow down the river channel (County of San Diego 2011).

Although a hazard that evolves much more slowly than hazards associated with too much water, drought can result in significant adverse effects to both surface waters and groundwater. This is particularly true for prolonged periods of drought, such as the drought California experienced between 1987 and 1992. Potential effects of drought on Refuge resources include lower groundwater levels in areas supporting riparian and oak woodland habitat, significant reductions in rainfall affecting overall plant growth on the Refuge, and reduced water levels in Loveland Reservoir, which could reduce or temporarily eliminate water releases that provide water flows between this reservoir and the Sweetwater Reservoir. The other effect of drought that could affect significant portions of the Refuge is the increased potential for wildland fires.

## 3.2.7.2 State and Federal Water Quality Regulations

Issues related to water quality in San Diego are regulated by the Federal Clean Water Act (CWA) of 1972, as amended, (33 U.S.C. §1251 et seq.) and Division 7 of the 1969 California Water Code (also known as the Porter-Cologne Water Quality Control Act). Both the Federal and State laws were enacted to protect the beneficial uses of water, although the Porter-Cologne Water Quality Control Act addresses both ground and surface waters, while the Clean Water Act addresses only surface waters.

The CWA establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The USEPA has delegated responsibility for implementing portions of the CWA to the states. In California, the State Water Resources Control Board (State Water Board) and nine Regional Water Quality Control Boards (Regional Water Boards) are the agencies with the primary responsibility for implementing delegated CWA requirements. The Regional Water Boards are also responsible for the preparation, adoption, and implementation of water quality control plans, the issuance of waste discharge requirements, and the performance of other functions concerning water quality control within their respective regions. The Refuge is located within Region 9, which is administered by the staff of the San Diego Regional Water Board.

California's Porter-Cologne Water Quality Control Act authorizes the Regional Water Boards to adopt, review, and revise policies for all waters of the State (including surface and ground waters) and directs them to develop region-specific Basin Plans. The purpose of these Basin Plans is to designate beneficial uses of the region's surface and ground waters, designate water quality objectives for the reasonable protection of those uses, and establish an implementation plan to achieve the objectives. The Basin Plans also include water quality standards for ground and surface waters within the basin. Per the requirements of the CWA, water quality standards are reviewed and, if necessary, updated every three years (California Regional Water Quality Control Board 1994).

The Water Quality Control Plan for the San Diego Basin (Basin Plan), most recently amended in June 2011, sets forth water quality objectives for constituents that could potentially cause an adverse effect on the beneficial uses of water. Periodic review of the Basin Plan is required by both Federal and State law. The components of the San Diego Basin Plan include: 1) the designation of beneficial uses for surface and ground waters; 2) the preparation of narrative and numerical objectives that must be attained or maintained to protect the designated beneficial uses: 3) a description of mitigation measures that can be implemented to protect the beneficial uses of all waters within the region; and 4) a description of surveillance and monitoring activities that enable the Regional Water Board to evaluate the effectiveness of the Basin Plan (California Regional Water Quality Control Board 1994). The Basin Plan designates the beneficial uses for all surface water and groundwater areas in the San Diego Region. Beneficial uses are defined as the uses of water necessary for the survival or wellbeing of man, plants, and wildlife. Statewide, 23 beneficial uses have been defined. Some of the beneficial uses identified in the Basin Plan for the areas in and around the San Diego NWR include municipal and domestic supply; agricultural supply; wildlife habitat; rare, threatened, or endangered species; and preservation of biological habitats of special significance, which includes uses of water that support designated areas or habitats located on established refuges, parks, sanctuaries, or ecological reserves. The specific beneficial use designations for water sources within the Refuge are indicated in Table 3-1.

Table 3-1 Beneficial Uses of Surface and Ground Waters in the Vicinity of the San Diego NWR		
Surface or Ground Water	Existing Beneficial Uses <sup>1</sup>	
Los Peñasquitos Creek Watershed		
Deer Canyon	Agricultural, Industrial Service, Non-water Contact Recreation,Warm Freshwater Habitat,Wildlife Habitat	
Sweetwater River Watershed		
Mexican Canyon	Municipal, Agricultural, Industrial Service, Industrial Process , Water Contact Recreation, Non-water Contact Recreation, Preservation of Warm Freshwater Habitat, Wildlife Habitat	
Steele Canyon	Municipal, Agricultural, Industrial Service, Industrial Process , Water Contact Recreation, Non-water Contact Recreation, Warm Freshwater Habitat, Wildlife Habitat	
Coon Canyon	Municipal, Agricultural, Industrial Service, Industrial Process , Water Contact Recreation, Non-water Contact Recreation, Warm Freshwater Habitat, Wildlife Habitat	
Otay River Watershed		
Jamul Creek (lower)	Municipal, Agricultural, Industrial Service, Industrial Process, Water Contact Recreation, Non-water Contact Recreation, Warm Freshwater Habitat, Wildlife Habitat, Rare, Threatened and Endangered Species	
Little Cedar Canyon	Municipal, Agricultural, Industrial Service, Industrial Process, Water Contact Recreation, Non-water Contact Recreation, Preservation of Biological Habitats, Warm Freshwater Habitat, Cold Freshwater Habitat, Wildlife Habitat	
Loveland Reservoir	Municipal, Agricultural, Industrial Service, Industrial Process , Water Contact Recreation, Non-water Contact Recreation, Preservation of Warm Freshwater Habitat, Cold Freshwater Habitat, Wildlife Habitat	
Sweetwater Reservoir	Municipal, Agricultural, Industrial Service, Industrial Process , Water Contact Recreation, Non-water Contact Recreation, Preservation of Warm Freshwater Habitat, Wildlife Habitat	
Sweetwater Hydrologic Unit		
Groundwater in Middle Sweetwater	Municipal, Agricultural, Industrial Service, Industrial Process	

<sup>1</sup>Codes for Beneficial Uses defined in Table 3-2. Source: (California Regional Water Quality Control Board 1994)

# Table 3-2Descriptions of the Beneficial Uses from the Basin Plan

**Municipal and Domestic Supply -** Uses of water for community, military, or individual water supply systems, including but not limited to drinking water supply.

**Agricultural Supply -** Uses of water for farming, horticulture, or ranching, including but not limited to irrigation (including leaching of salts), stock watering, or support of vegetation for range grazing.

**Industrial Service Supply -** Uses of water for industrial activities that do not depend primarily on water quality, including but not limited to mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.

Industrial Process Supply - Uses of water for industrial activities that depend primarily on water quality.

**Water Contact Recreation -** Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include but are not limited to swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.

**Non-contact Water Recreation -** Uses of water for recreational activities involving proximity to water, but where there is generally no body contact with water nor any likelihood of ingestion of water. These uses include but are not limited to picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, and sightseeing activities.

**Preservation of Biological Habitats of Special Significance** - Uses of water that support designated areas or habitats, such as established refuges, parks, sanctuaries, ecological reserves, or Areas of Special Biological Significance, where the preservation or enhancement of natural resources requires special protection.

**Warm Freshwater Habitat** - Uses of water that support warm water ecosystems, including but not limited to preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

**Cold Freshwater Habitat** - Uses of water that support cold water ecosystems, including but not limited to preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

**Wildlife Habitat -** Uses of water that support terrestrial or wetland ecosystems, including but not limited to preservation and enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

**Rare, Threatened, or Endangered Species -** Uses of water that support aquatic habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened or endangered.

Source: (California Regional Water Quality Control Board 1994)

The CWA has also delegated responsibility for implementation of water quality control programs such as the National Pollutant Discharge Elimination System (NPDES) to the states. The NPDES permit system was established in Section 402 of the CWA to regulate point source discharges to surface waters of the U.S. NPDES permits are issued to ensure that the quality and quantity of discharges does not adversely affect surface water quality or beneficial uses.

Construction and industrial activities are typically regulated under statewide general permits that are issued by the State Water Board. The Regional Water Boards also issue Waste Discharge Requirements that serve as NPDES permits under the authority delegated to the Regional Water Boards under the CWA. In November 1990, under Phase I of the urban runoff management strategy, the EPA published NPDES permit application requirements for municipal, industrial, and construction stormwater discharges.

With regard to municipalities, the permit application requirements were directed at jurisdictions owning or operating municipal separate storm sewer systems serving populations of 100,000 or more or contributing significant pollutants to waters of the U.S. Such municipalities were required to obtain coverage under an NPDES municipal stormwater permit and to develop and implement an urban runoff management program to reduce pollutants in urban runoff and stormwater discharges.

Section 305(b) of the CWA requires states to prepare and submit to the USEPA a report on the status of the state's ambient water quality. This report includes regional water quality assessments for the various water bodies within the state. The report lists the water bodies that are assessed, the pollutants of concern, and the potential pollutant sources. Water bodies identified in the 305(b) report as not supporting one or more beneficial uses are considered "impaired" and are then placed on the Clean Water Act Section 303(d) List of impaired water bodies. In accordance with CWA Section 303(d), each state must develop, update, and submit to the USEPA a list of those surface water body segments that are "impaired or threatened"— meaning not meeting, or not expected to meet, water quality standards. Impaired water bodies or segments on the Section 303(d) List must be addressed through the development of Total Maximum Daily Loads (TMDLs), through alternative regulatory programs, or through revisions in standards.

The requirement to develop TMDLs applies to "pollutants" as defined in the CWA. Pollutants include chemicals, sediment, and temperature. TMDLs are not required for impairment due to "pollution." Pollution includes factors such as flow alteration, hydromodification, and alterations in aquatic habitat that are not related to specific pollutants.

Section 303(d) of the CWA not only requires States to identify "water quality limited segments" but also to rank each segment, taking into account the severity of the pollution and the uses to be made of the waters. A water quality limited segment is defined by regulation as "any segment [of a water body] where it is known that water quality does not meet applicable water quality standards, and/or is not expected to meet applicable water quality standards, even after application of technology-based effluent limitations required by CWA Sections 301(b) or 306." The Section 303(d) List must include a description of the pollutants causing the violation of water quality standards. The Section 303(d) List must be reviewed and updated every two years.

In California, the Section 303(d) List is prepared in accordance with the 2004 Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (Listing Policy). The Listing Policy requires the nine Regional Water Boards to assess information and data, conduct public participation processes, and adopt recommendations to the State Water Board regarding the segments to be included in the statewide Section 303(d) List. Following additional participation, the State Water Board submits a statewide list to the USEPA. The USEPA may approve or disapprove specific listings and may add other segments to the list.

In coordination with the Section 303(d) assessment, the State Water Board has historically prepared a statewide Section 305(b) report with information on the total miles of streams, acres of lakes, and areas of other surface water bodies that support or do not support beneficial uses. For the 2008 cycle, the Water Boards prepared their first Integrated Reports addressing both Section 303(d) and 305(b) of the CWA. The final 2008 Integrated Report was incorporated into the statewide 2010 Integrated Report that was approved by the State Water Board on August 4, 2010. On November 12, 2010, USEPA approved the 2008-2010 CWA Section 303(d) List that includes listings for the San Diego Region.

The California State Water Board recently approved an NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities that went into effect in July 2010. This General Permit authorizes discharges of stormwater associated with construction activity so long as the dischargers comply with all requirements, provisions, limitations, and prohibitions in the permit. Covered under this General Permit are all discharges of pollutants in stormwater associated with construction activity (storm water discharges) to waters of the US from construction sites that disturb one or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface. Coverage under this General Permit is obtained by filing a Notice of Intent, Storm Water Pollution Prevention Plan, and other appropriate documents with the State Water Board. In some cases, a General Permit may be determined by the Regional Water Board to be inappropriate for a specific construction project, requiring the discharger to obtain an individual permit or apply for coverage under a more specific General Permit. To make this finding, the Regional Water Board must determine that the General Permit does not provide adequate assurance that water quality would be protected, or that there is a site-specific reason for obtaining an individual permit.

## 3.2.7.3 Ground and Surface Water Quality

Surface water quality within a watershed is directly affected by the types of land uses present within the watershed. As development in the watershed increases, the level of pollutants in surface runoff also increases. This situation is made worse because a high proportion of developed areas consist of impervious surfaces, greatly reducing the potential for native plants and soil to filter pollutants out of runoff water before it enters nearby rivers and streams. Pollutants such as petroleum products, antifreeze, heavy metals, and sulfates accumulate on impervious surfaces and are easily carried downstream by natural and human-generated runoff. In addition, irrigation and natural runoff transport fertilizers, pesticides, bacteria, viruses, and erosion-generated sediments into storm drains or natural drainages. These types of discharges are the primary sources of surface water and groundwater contamination in San Diego County (County of San Diego 2011).

Because a large portion of the drinking water supplied to the Sweetwater Authority's customers comes from the Sweetwater Reservoir, concerns related to the land use changes and associated decrease in surface water quality within the Sweetwater watershed upstream of the reservoir have been addressed by diverting runoff around the reservoir. To accomplish this, the Sweetwater Authority has constructed an Urban Runoff Diversion System (URDS). The URDS, which was constructed in two phases in 1991 and 1999, includes a series of ponds and conveyances designed to capture dry weather flows, the first flush from early seasonal storms, or hazardous spills in the watershed and divert the flows around the reservoir (Sweetwater Authority and RMC Water and Environment 2011). The facilities associated with the URDS are located on the Refuge within the Sweetwater River.

All of the drainages located within the Otay-Sweetwater Unit, which ultimately empty into San Diego Bay, are part of the San Diego Bay Watershed Management Area (WMA). The pollutants of concern for this WMA include trace metals, other toxic substances, coliform bacteria, pesticides, and nutrients. Urban development within this WMA contributes to the current water quality issues in San Diego Bay.

There are no water bodies located within the Refuge boundary that have been included on the currently approved Section 303(d) List; however, Loveland Reservoir, located upstream of the Refuge, and Sweetwater Reservoir, located immediately to the west of the Refuge, are identified as impaired (California Regional Water Quality Control Board San Diego 2009). The Loveland Reservoir is included on the Section 303(d) List because sampling indicates that the water quality objectives for aluminum, manganese, dissolved oxygen, and pH are not being met. In the case of the Sweetwater Reservoir, the water quality objectives for dissolved oxygen are not being met.

The Final Program Environmental Impact Report for the County of San Diego's General Plan Update (County of San Diego 2011) identifies various areas in the unincorporated county with known groundwater quality issues. Of the areas identified, four occur within or in close proximity to properties located within the Otay-Sweetwater Unit. Three of these sites are identified as leaking underground fuel tank sites. These sites are generally located as follows: near the Sweetwater River where it crosses under Highway 94 within the Sweetwater River area; along Highway 94 near the western boundary of the Las Montañas area; and near the extreme southeastern portion of the McGinty Mountain area. The latter area also occurs in the general vicinity of a site identified as having nitrate-related groundwater quality problems. These problem areas have been identified based on a subset of wells in which nitrate levels have exceeded the maximum contaminant levels (MCLs) in groundwater samples analyzed (County of San Diego 2011). In this area, nitrate contamination can largely be attributed to septic system failures and/or agricultural uses.

# 3.2.8 Climate and Climate Change

# **Current Climatic Conditions**

The Mediterranean climate in southwestern San Diego County is generally mild with warm, dry summers and mild, wet winters. The high and low average temperatures on the coast in the winter are 66°F and 52°F, respectively. In the summer, the average high and low is 76°F and 66°F, respectively. The temperature range is slightly greater along the foothills. In Jamul, the high and low average temperatures in the winter are 60 °F and 44°F, respectively. In the summer, the average high and low is 87°F and 65°F, respectively.

Most of the precipitation falls during October through April, occurring principally as rain. On average, the wettest month at the coast is January; farther inland, the wettest month is March. Precipitation across San Diego County is highly variable in terms of yearly averages, location, and intensity. The coastal and western foothills regions of the county receive an average of 6 to 18 inches of rainfall per year.

During winter and spring, polar storm systems pass through the region as the eastern Pacific high weakens and shifts south. Most regional precipitation occurs during this period. Excessive rainfall can occur when the jet stream maintains a position over southern California and carries multiple storms across the region. Moderate to major flooding events have typically occurred from December through March, with the worst recorded flooding event occurring in January 1916, when catastrophic flooding caused the failure of the Otay Reservoir Dam, destroying structures, property, and lives in the Otay and Tijuana River valleys.

Winds are characterized by a moderately strong land and sea breeze cycle. Sea breeze conditions generally occur between late morning and late afternoon with an average direction from the west-southwest. Between late afternoon and early morning, a land breeze dominates the local wind pattern. Land breezes generally flow in from the east-northeast. The wind patterns, which are influenced by the topography, flow through the canyons and Sweetwater River Valley. Strong east to northeastern winds, referred to as Santa Anas, generally begin throughout southern California in fall, but can occur at any time throughout the year. These Santa Ana winds, which can include steady strong winds ranging from 20 to 40 miles per hour (mph) with occasional gusts of 60 to 70 mph or greater, carry warm to hot, very dry air from the deserts to the coast, dramatically increasing temperatures and decreasing relative humidity levels.

#### **Climate Change**

Climate change is defined as any change in climate over time, whether due to natural variability or the result of human activity (CCSP 2008). Changes in climate can interact with other environmental changes to affect biodiversity and the future condition of ecosystems. Scientific evidence acknowledges that world climate is changing as indicated by increases in global surface temperature, altered precipitation patterns, warming of the oceans, sea level rise, increases in storm intensity, changes in wind patterns, and changes in ocean pH (Bierbaum et al. 2007, Coastal Resources Center and International Resources Group 2009). This is significant because "climate is a dominant factor influencing the distributions, structures, functions and services of ecosystems" (CCSP 2008).

Shifts in precipitation patterns and hydrological cycles, sea level rise, and more frequent and severe weather events (e.g., storms and storm surge) are the result of the warming of air and sea. The conservative climate change forecast for western North America (based on the results of 21 global climate models that address a scenario [referred to as A1B] in which multiple energy sources, including fossil fuels, continue to be consumed) is a linear change in mean temperatures ranging from +3.8 °F to +10.4 °F (+2.1 °C to +5.7 °C) and a linear change in mean precipitation ranging -3 percent to +14 percent through the end of the century (Friggens et al. 2012).

In California, maximum, average, and minimum air temperatures have shown an increase over the past century, with the greatest increase seen in minimum temperatures (Anderson et al. 2008). Between 1950 and 2000, the mean annual temperatures in California have increased by 1.8°F (LaDochy et al. 2007). According to recent climate modeling, California is projected to warm by approximately 2.7°F above 2000 averages by 2050, a threefold increase in the rate of warming over the last century. In addition, summer temperatures are expected to rise more than winter temperatures, with increases greater in inland California than on the coast. Heat waves, with higher temperatures and longer durations, are also expected to occur more frequently throughout California (Moser et al. 2012).

California's Mediterranean climate zone is typically described as having hot, dry summers and cool, wet winters. The habitats and species present in this climate zone have adapted to these variations in conditions. Past climate model projections have indicated that this wet/dry pattern would continue with seasonal, year-to-year, and decade-to-decade variability (Moser et al. 2012). However, more recent model projections of precipitation shifts have provided varying results, indicating less certainty in predicting changes in precipitation, particularly in the southwestern United States (Mastrandrea and Luers 2012, Barrows and Murphy-Mariscal 2012). Nevertheless, there is broad model support for the prediction that rainfall will become

more variable and periods of heavy rain and drought will become more extreme (Barrows and Murphy-Mariscal 2012, IPCC 2007).

The issue of how and why climate model simulations disagree on whether future precipitation will increase or decrease in California was explored by Pierce et al. (2013). After examining a variety of global models and downscaling techniques, they determined that the differences related to the way each model combines changes in precipitation frequency and daily precipitation intensity, with changes in the occurrence of the heaviest precipitation days accounting for the majority of the disagreement in the projected change in annual precipitation. They also note that in the southern part of the state, although many simulations exhibit moderate increases in winter precipitation intensity, the simulations also indicate that these increases are offset and in several cases overwhelmed by decreases in the number of precipitating days (Pierce et al. 2013).

Some climate models for the San Diego region indicated that by mid-century the 30-year average precipitation in the San Diego region will decrease by more than 8 percent compared to historical totals, even under a lower greenhouse gas emissions scenario (Moser et al. 2012). With respect to temperature, several of the recent climate simulations for southern California suggest that increases in average temperature are more likely to occur during the summer than in the winter, with the effects felt most significantly in the interior areas of southern California (Cayan 2009). Pratt and Mooney (2013) hypothesize that Mediterranean plant communities (like those supported on the San Diego NWR) may be particularly sensitive to changes in precipitation, requiring the integration of biological processes, including local adaptation and adaptive plasticity, into forecasts of ecosystem response to changing climatic conditions.

Climate change research and monitoring is ongoing, and information about local and global climate conditions and trends continues to be expanded and updated. Also being explored are other possible climate-related changes and impacts, termed emerging issues by the State of California, Office of Environmental Health Hazard Assessment (OEHHA) (2013). A few of these emerging issues—that are believed to be, but have not yet been proven to be—influenced by climate change include: the increased survival and spread of forest disease-causing pathogens and insects; the increased susceptibility of trees to these pathogens, insects, and fire; and changes in the frequency and intensity of extreme events such as droughts and floods (California, OEHHA 2013).

Researchers are also continuing to refine their approach to modeling the changes in distribution of vegetation types and species in response to climate change. Recent research has provided empirical evidence of shifting species ranges (Hannah et al. 2012), but predicting how species distributions and vegetation communities will change is difficult. Until recently, modeling of shifting species distribution was conducted at larger landscape scales. Although modeling species response at this level is still important, to address the uncertainties of how populations of species, potentially adapted to local conditions, will respond to a changing climate, it is necessary to implement fine-scale (local-scale) modeling techniques that take into consideration the topographic and ecological complexities of a specific management area or species range (Barrows and Murphy-Mariscal 2012, Hannah et al. 2012). The results of these types of modeling efforts will assist in identifying those areas that should be conserved to accommodate predicted shifts in species ranges.

# 3.2.9 Air Quality

The San Diego NWR is located within the southwestern region of the San Diego Air Basin. Air quality within the basin is influenced to some extent by climatic conditions, particularly a common atmospheric condition known as a temperature inversion. During a temperature inversion, air temperatures get warmer with increasing height rather than cooler. Inversions occur during the warmer months (May through October) when descending air associated with the Pacific high-pressure cell comes into contact with cool marine air. The boundary between the layers of air represents a temperature inversion that traps pollutants below it. The inversion layer is approximately 2,000 feet above MSL during the months of May through October, and approximately 3,000 feet above MSL during the winter months (November through April). Inversion layers affect local air quality by inhibiting the dispersion of pollutants, which results in the temporary degradation of air quality.

The Federal Clean Air Act (42 U.S.C. §§ 7401-7671q) requires the EPA to set outdoor air quality standards for the nation, referred to as National Ambient Air Quality Standards (NAAQS). To date, standards have been established for sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), ozone eight-hour standard, particulate matter equal to or less than 10 microns in size (PM<sub>10</sub>), fine particulate matter equal to or less than 2.5 microns in size (PM<sub>2.5</sub>), and lead (Pb). The Clean Air Act also permits states to adopt additional or more protective air quality standards if needed. Within California, the California Ambient Air Quality Standards (CAAQS) set parameters for pollutants, such as particulate matter and ozone, that provide greater protection of public health than the respective Federal standards. California has also set standards for some pollutants that are not addressed by Federal standards, including a one-hour classification for ozone, sulfates (SO<sub>4</sub>), hydrogen sulfide (H<sub>2</sub>S), and visibility reducing particles. The current national and State ambient air quality standards are provided in Appendix F.

In March 2008, the USEPA revised the NAAQS for ground-level ozone, lowering the primary eight-hour ozone standard from 0.08 ppm to 0.075 ppm and revised the secondary eight-hour ozone standard, making it identical to the primary standard. These new standards were reconsidered in 2009; however, in September 2011, the USEPA restarted efforts to implement the 2008 standards. On May 21, 2012, the USEPA issued a Final Rule in the *Federal Register* (77 FR 30160) in which air quality thresholds were established that define the classifications assigned to all nonattainment areas for the 2008 ozone NAAQS. According to the USEPA, the new primary standard is needed to protect the public from adverse health effects (e.g., respiratory illness, premature death from heart or lung disease) associated with ozone exposure, and the revised secondary eight-hour ozone standard is needed to protect against welfare effects, including impacts on sensitive vegetation and forested ecosystems (USEPA 2011a). Although San Diego County is currently designated by the USEPA as a 2008 8-hour ozone standard nonattainment area, in May 2013, the USEPA approved California's request to redesignate the county as an attainment area for the 1997 8-hour ozone NAAQS.

Specific geographic areas are classified as either "attainment" or "nonattainment" areas for each pollutant based upon the comparison of measured data with NAAQS and CAAQS. When an air basin is in compliance with these standards, it is designated as an attainment area. Conversely, when an air basin is not in compliance with a national and/or California air quality standard, it is designated as a nonattainment area for that pollutant. As of April 1, 2013, the San Diego Air Basin was designated by the State of California as a "serious" nonattainment area for ozone and a nonattainment area for PM<sub>10</sub> and PM<sub>2.5</sub>. No changes to these State designations are currently included in the proposed 2013 State area designations.

The most significant regional sources of ozone,  $NO_2$ , and CO are automobiles and other on-road vehicles. Ozone is formed by the reaction of volatile organic compounds (VOC) and oxides of nitrogen (NOx), which are combustion products from gas and diesel engines. Other important sources of VOC are paints, coatings and process solvents. The major sources of  $PM_{10}$  are construction, demolition, and dust from paved and unpaved roads.

The San Diego Air Basin is managed by the San Diego Air Pollution Control District (APCD). In accordance with its monitoring responsibilities, the APCD maintains an ambient air monitoring network and records air quality readings to determine compliance with national and California standards. Compliance with air quality standards is measured based on these records. In addition to monitoring regional ambient air quality, the San Diego APCD also evaluates and issues air quality permits to ensure that proposed new and changed operations and industrial equipment meet emission standards. Construction and operation permits are required for any operation or equipment capable of emitting air contaminants. Persons building, altering, or replacing equipment that may emit air pollutants are required to obtain an Authority to Construct Permit. In addition, persons operating equipment that may emit air pollutants are required to obtain a Permit to Operate.

The Rules and Regulations established for the APCD do not specifically address grading projects, and no permit is required for construction. However, the APCD does have the authority to regulate construction activities that meet the definition of a "nuisance" as provided in Rule 51 of the APCD Rules and Regulations. Rule 51 states: "A person shall not discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health or safety of any such persons or the public or which cause or have a natural tendency to cause injury or damage to business or property." In the case of large-scale grading operations, the APCD may require specific measures to minimize the generation of dust during excavation.

Rule 1501 (Conformity of General Federal Actions) of the APCD Rules and Regulations requires that a Federal agency must, when applicable, make a determination that a Federal action conforms to the State implementation plan for achieving the NAAQS before the action is taken. A conformity determination is required for each pollutant, where the total direct and indirect emissions in a nonattainment or maintenance area caused by a Federal action would equal or exceed any of the following rates:

 $\begin{array}{l} PM_{10}-100\ tons/year,\\ Ozone\ (NO_x),\ SO_2\ or\ NO_2-100\ tons/year,\\ Ozone\ (VOCs)-100\ tons/year,\\ Carbon\ monoxides\ -100\ tons/year,\ or\\ Lead\ (Pb)\ -25\ tons/year. \end{array}$ 

The requirements of Rule 1501 do not apply to Federal actions where the total of direct and indirect emissions is below these emission levels. However, when the total of direct and indirect emissions of a pollutant from a Federal action represents 10 percent or more of an area's total emissions of that pollutant, the action is defined as a regionally significant action. Such actions would require a conformity determination and must comply with all reporting requirements described in section 1551.855 of Rule 1501.

## 3.2.10 Greenhouse Gas Emissions

There is general scientific consensus that increases in greenhouse gases (GHG) in the atmosphere are a contributing factor to increases in average global temperatures. GHG trap heat in the atmosphere, which in turn heats the surface of the Earth. Some GHG occur naturally and are emitted to the atmosphere through natural processes, while others are created and emitted solely through human activities. The emission of GHG through the combustion of fossil fuels (i.e., fuels containing carbon) in conjunction with other human activities, appears to be closely associated with global warming (California Office of Planning and Research 2008). The USEPA and the State of California identify the principal GHG that enter the atmosphere because of human activities as: carbon dioxide ( $CO_2$ ), methane ( $CH_4$ ), nitrous oxide ( $N_2O$ ), and fluorinated gases (i.e., hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride). The most common GHG that results from human activity is carbon dioxide, followed by methane and nitrous oxide.

Carbon dioxide enters the atmosphere through the burning of fossil fuels. Methane is emitted during the production and transport of coal, natural gas, and oil; it is also emitted by livestock and other agricultural practices and the decay of organic waste in municipal solid waste landfills. Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste. Fluorinated gases are powerful synthetic greenhouse gases that are emitted from a variety of industrial processes and are sometimes used as substitutes for ozonedepleting substances.

In California, emissions from transportation, electrical power generation and the industrial sector account for over 80 percent of GHG emissions. The transportation sector alone is responsible for more than one third of all such emissions in the state (California OEHHA 2013). California is a substantial contributor of GHG, emitting over 400 million tons of carbon dioxide a year in 2006 (California Energy Commission 2006). However, since 2008, GHG emissions in California have decreased by more than seven percent (California OEHHA 2013).

The impact of anthropogenic activities on global climate change is apparent in the observational record. Air trapped by ice has been extracted from core samples taken from polar ice sheets to determine the global atmospheric variation of carbon dioxide, methane, and nitrous oxide from before the start of the industrialization (approximately 1750) to over 650,000 years ago. For that period, it was found that carbon dioxide concentrations ranged from 180 ppm to 300 ppm. For the period from approximately 1750 to the present, global carbon dioxide concentrations increased from a pre-industrialization period concentration of 280 ppm to 379 ppm in 2005, with the 2005 value far exceeding the upper end of the pre-industrial period range (IPCC 2007). The IPCC constructed several emission trajectories of GHG needed to stabilize global temperatures and climate change impacts and concluded that a stabilization of GHG at 400 to 450 ppm carbon dioxide-equivalent concentration is required to keep mean global climate change below  $2^{\circ}C$  (3.6°F).

To address GHG emissions at the Federal level, President Obama on October 5, 2009, signed Executive Order 13514, *Leadership in Environmental, Energy, and Economic Performance,* which addresses the need to set measureable environmental performance goals for Federal agencies. Each Federal agency was required to submit a 2020 GHG pollution reduction target from its estimated 2008 baseline to the White House Council on Environmental Quality and to the Director of the Office of Management and Budget by January 4, 2010. On January 29, 2010, President Obama announced that the Federal government would reduce its GHG emissions by 28 percent by 2020. To achieve this goal, each Federal agency must develop a Sustainability Plan that defines how sustainability goals will be met, energy use will be reduced, long-term savings will be achieved, taxpayer dollars will be saved, and local clean energy jobs will be created.

In response to Executive Order 13524, the Service made a commitment to become carbon neutral as an agency by the year 2020, and to reduce our carbon footprint by using less energy, reducing consumption, and appropriately altering land management practices. By incorporating sustainability into refuge day-to-day operations, we are making progress towards meeting our goal of achieving carbon neutrality.

In California, to avert the consequences of climate change the California legislature passed California Assembly Bill 32 (AB 32), the Global Warming Solutions Act of 2006. AB 32 establishes a State goal of reducing GHG emissions to 1990 levels by the year 2020. It also directed the California Air Resources Board (CARB) to begin developing discrete early actions to reduce greenhouse gases while also preparing a scoping plan to identify how best to reach the 2020 limit. The CARB recently adopted a statewide 2020 GHG emissions limit and an emissions inventory, along with requirements to measure, track, and report GHG emissions by the industries it determined to be significant sources of GHG emissions. In addition, the CARB has developed a Scoping Plan that outlines California's strategies for reducing GHG emissions. In addition to the passage of AB 32, the Governor of California also set a long-range reduction goal of reducing GHGs to 80 percent below 1990 levels by 2050.

# 3.2.11 Contaminants

Contaminants can enter the Refuge via a variety of transport pathways involving surface water, groundwater, wind, and living organisms. Surface water enters the Refuge from adjacent lands via the Sweetwater River and several small drainage channels. Urban runoff and storm water from upstream urban areas flows into the Sweetwater River, Steele Canyon Creek, and other tributaries that flow into the Sweetwater River. Some common pollutants that can be carried in these waters include fertilizers, pesticides, oil and grease, detergents, coolant, and paint. Groundwater transport can transport contaminants from adjacent developed or cultivated areas into natural drainages and wetlands. In addition, wind can transport airborne contaminants such as fine particulate matter into wetland areas.

Prior to the acquisition of land for incorporation in the Refuge, a Level 1 Pre-acquisition Environmental Site Assessment is conducted in accordance with U.S. Fish and Wildlife Service Policy 341 FW 3. This assessment process involves the completion of an Environmental Site Assessment Level I Survey Checklist, which is used to determine whether there is any potential hazardous substance or other environmental problem on the site. Based on this initial assessment, it may be necessary to conduct a Level II or Level III Survey. A Level II Survey may be necessary when a potential issue is identified during the Level I Survey (i.e., the answer to a question on the Level I checklist is "Yes") or when no response is given and there is insufficient information documented to conclude that no additional investigation is necessary. The other reason for conducting a Level II Survey is when a bioassessment or sampling is needed to determine the presence or absence of a hazardous substance. Estimates of remediation or other cleanup costs, if any, must be included in the Level II Survey, unless a Level III Survey is recommended.

A Level III survey is required when the Service determines that a hazardous substance is probably present on the site and significant sampling and original research is necessary to determine the extent of any hazardous substance and the actual or potential costs for remediation. The Level III Survey may also be used to determine the extent of other environmental problems.

The Level I Surveys conducted for the various acquisitions on the Refuge have not identified the presence of any hazardous compounds on the acquisition lands. However, the Level I Survey

conducted in 1995 for the Rancho San Diego acquisition area, the portion of the Otay-Sweetwater Unit identified as the Sweetwater River area in this document, did identify hazardous material contamination at two sites near the western side of the Sweetwater River, outside the boundaries of the Refuge (USFWS 1995b). These included a record of leaking underground storage tanks at the Otay Water District Water Plant located near Singer Lane, to the south of Highway 94; however, the record also indicated that the tanks had been removed and site cleanup up was completed in 1993. The other contamination site was the Jamacha Sanitary Landfill, located to the southwest of the intersection of Highway 54 and Highway 94. This landfill, which is unlined, was active from 1960 through 1978 and is currently managed and monitored by the County of San Diego.

In 2007, a debris site containing metal pipes, concrete, plastic, and other materials of unknown sources was exposed when the Harris Fire destroyed the existing vegetation that had been concealing the site. This debris site is located in a tributary canyon that flows into the Sweetwater River near the existing Sweetwater River trail bridge. Because of concerns that contaminants may be associated with the improper disposal of the waste at this site and that the exposed debris could be a health and safety hazard for the public, an environmental assessment of the site was conducted by the Environmental Contaminants Division in the Carlsbad Fish and Wildlife Office. It was determined that some of the debris piles were observed during the initial Level 1 Preacquisition Contaminants Survey in 1995 but were not considered to contain hazardous materials at that time. In the subsequent 2007 assessment, it was also concluded that the solid waste piles represented nonhazardous material, and remediation under the guidance of the applicable regulatory agencies, the County of San Diego, Solid Waste Management, Local Enforcement Agency, and the State of California Waste Management Board was recommended (USFWS 2008a).

As part of the 2007 assessment, information was also gathered regarding current and historic activities in the general area to evaluate whether known or suspected environmental concerns were present in this portion of the Refuge and/or on the adjoining properties. As a result, information regarding the Jamacha Landfill was updated. Monitoring wells are now located around the perimeter and downgradient of the landfill (outside of the Refuge boundary) to delineate and monitor contaminant levels in the groundwater. Although semi-annual groundwater monitoring reports obtained from the San Diego County's Geotracker database for the Jamacha Landfill show that some results exceed the maximum contaminant levels (MCLs) for drinking water, the sample results from the monitoring well located downgradient of the landfill and closest to the Refuge boundary show that the level of analytes are at less than detection limits (USFWS 2008a). Therefore, the groundwater down slope of the landfill in the vicinity of the Refuge does not pose an apparent risk to Refuge resources.

Another potential contaminants site is known to occur in the Sweetwater River floodplain to the north of Highway 94. This site contains an abandoned tanker trailer enclosed by a chain link fence. There is no evidence that the tank is leaking, and it appears to be hooked up to a well. Aerial photos from the early 1990s show a dirt road leading from the north at Jamacha Road to the site. That road has since grown over, and access from Jamacha Road is now constrained by road infrastructure. This may be the tanker that was identified in the 1996 Level I Survey as a portable water tanker. In March 2013, the tanker and surrounding area was once again inspected by the Environmental Contaminants Division and no evidence of contamination was identified.

Another potential contaminants issue that warrants further investigation is the presence of dark oily areas along portions of Millar Ranch Road and the access road to the top of San Miguel Mountain. These oily spots imply that prior to topping the roadway with asphalt, road oil may have been used along the present day alignment to improve access to the top of the mountain (pers. comm. Jill Terp, San Diego NWR).

Pet and livestock feces constitute another potential source of contamination. An undetermined number of dogs are brought onto the Refuge daily by their owners or enter the Refuge unescorted. In areas where dog walking is prevalent, such as the trail at Par Four Drive, the density of dog feces is excessive. The Refuge has installed dog waste stations in an effort to have owners pick up dog waste and reduce this pollutant source. An undetermined number of horses are ridden daily on Refuge trails, and their droppings are regularly encountered. Runoff from the droppings and from Bright Valley Farms may contribute pollutants (including nitrogen) into Steele Canyon Creek and Sweetwater River.

# 3.3 Biological Resources

This section addresses the biological resources present on the Refuge both from a regional context and at the site-specific level. Descriptions are provided of the Refuge's vegetation communities, plants, wildlife (e.g., birds, mammals, reptiles, amphibians, invertebrates), wildlife corridors, sensitive species, and invasive species. In addition to information obtained during site visits, a number of documents have been used in the preparation of this section, including the San Diego County General Plan Update Draft Final Environmental Impact Report (County of San Diego 2011), draft Carmel Mountain and Del Mar Mesa Preserves Resource Management Plan (City of San Diego 2011), and Final Program Environmental Impact Report for the Draft General Plan (City of San Diego 2008).

# 3.3.1 Regional Species and Habitat Conservation Planning

Southwestern San Diego County includes a unique combination of physical features, climate, and hydrology that have resulted in a diversity of plants and wildlife unlike any other region in North America. These characteristics also drive the desire to work and live in this region, resulting in the loss of native habitats to support development. As such, the San Diego region has been identified as a major "hot spot" for biodiversity and species endangerments (City of San Diego 2008). Habitats within Southern California's Mediterranean climate support the highest concentration of locally endemic species, along with the highest number of species listed as threatened or endangered, in the continental United States (USFWS 1997a).

The development of the management actions addressed in this CCP to conserve the Refuge's listed and sensitive species, as well as the habitats that support them, was guided by a range of landscape-level, regional, and species and habitat specific planning efforts. The relevant national, state, and landscape-level programs are described in Chapter 1, while the regional and habitat specific planning efforts are described here.

# 3.3.1.1 San Diego Multiple Species Conservation Program

The San Diego MSCP preserve system (City of San Diego 1998a) has been designed to conserve large contiguous blocks of native habitat in an effort to sustain southwestern San Diego County's native biological diversity, as well as the extensive number of listed and sensitive species that occur within these protected native habitats. The lands within the San Diego NWR are identified as core biological resource areas in the San Diego MSCP Plan, and the acquisition of the lands within the Refuge represents the Federal government's contribution to the implementation of the MSCP. As per the agreements made in association with the approval of the MSCP, the Service will manage the lands within the San Diego NWR in accordance with the MSCP guidelines (City of San Diego 1998a). These management activities include:

- Identification of area-specific management actions (e.g., species monitoring, invasive species control, habitat restoration, use of herbicides, biological surveys, fire management, and appropriate public access), which are addressed through the preparation of the San Diego NWR CCP;
- Participation in a coordinated biological monitoring program to ensure uniformity in data gathering and analysis; and
- Participation in focused research studies addressing topics such as basic inventories of biodiversity, habitat value, and covered species populations; taxonomic studies; wildlife corridor and dispersal investigations; habitat restoration; population enhancement and reintroduction; and experimental fire management techniques (City of San Diego 1998a).

Refuge staff, along with representatives from the Carlsbad Fish and Wildlife Office, continue to participate in interagency coordination activities associated with the implementation of the San Diego MSCP, while also actively participating with other agencies and academia in the development and implementation of species and habitat monitoring protocols, habitat restoration and enhancement actions, and research.

# 3.3.1.2 Applicable Species Recovery Plans

Recovery plans are prepared to delineate the actions required to recover and protect federally listed plant and animal species. Management of the Refuge includes addressing the recovery actions outlined in recovery plans for the listed species known to occur on the Refuge or that have the potential to be reestablished on the Refuge in the future. Relevant recovery plans include:

- Vernal Pools of Southern California Recovery Plan (USFWS 1998a);
- Draft Recovery Plan for Least Bell's Vireo (USFWS 1998b);
- Arroyo Toad Recovery Plan (USFWS 1999b);
- Southwestern Willow Flycatcher Recovery Plan (USFWS 2002a);
- Recovery Plan for the California Red-Legged Frog (USFWS 2002c);
- Quino Checkerspot Butterfly Recovery Plan (USFWS 2003b); and
- Recovery Plan for Otay Tarplant (USFWS 2004b).

Each recovery plan includes specific recommendations for actions considered necessary to satisfy the biological needs and assure the recovery of the listed species. Recommended actions generally include habitat protection, enhancement, and restoration to support listed species, minimizing the effects of known stressors (e.g., invasive species, disturbance, frequent fire) when possible, monitoring, research, and public outreach. Recovery plan recommendations have been considered during the development of the San Diego NWR CCP and are reflected in the CCP goals, objectives, and strategies. Additional information is provided in the section "Federally and State Listed Endangered and Threatened Species."

## 3.3.1.3 Bird Conservation Plans

## Sonoran Joint Venture Bird Conservation Plan

The SJV Bird Conservation Plan (SJV Technical Committee 2006) summarizes the status of avian species, prioritizes these species, provides habitat discussions and conservation recommendations, and lists focus areas for conservation action (i.e., specific locations or sites where conservation work can have a significant positive effect). As noted in Chapter 1, the USFWS-owned lands that comprise the San Diego NWR are located within the SJV's Californian Coast and Mountains Region. Of the priority bird species identified for the Californian Coasts and Mountains Region, the San Diego NWR supports 17 species of continental concern, 19 species of regional concern, and all 12 of the stewardship species (Table

3-3). The species of continental concern are recognized as vulnerable in either the breeding or the nonbreeding season by at least one of the national or international bird conservation initiatives, while the species of regional concern are species that have a combination of moderately high vulnerability, high regional threats, and declining regional population trends. The concern level for the species identified as stewardship species is not high at present; however, the SJV is responsible for ensuring that these species do not slip into a category of concern (SJV Technical Committee 2006).

Table 3-3 Priority Bird Species within the Californian Coasts and Mountains Region of the Sonoran Joint Venture Present on the San Diego NWR			
Species of Continental Concern	Species of Regional Concern	Stewardship Species	
California gnatcatcher <sup>1</sup>	Least "Bell's" vireo <sup>1</sup>	California quail	
Wrentit <sup>1</sup>	San Diego cactus wren <sup>1</sup>	Green heron	
California thrasher <sup>1</sup>	Southwestern willow flycatcher <sup>2</sup>	Black-crowned night heron	
White-throated swift <sup>2</sup>	Loggerhead shrike <sup>2</sup>	White-tailed kite	
Costa's hummingbird <sup>2</sup>	Sage sparrow <sup>2</sup>	Acorn woodpecker	
Nuttall's woodpecker <sup>2</sup>	Western meadowlark <sup>2</sup>	Black phoebe	
Oak titmouse <sup>2</sup>	Bufflehead <sup>3</sup>	Cassin's vireo	
Black-chinned sparrow <sup>2</sup>	Snowy egret <sup>3</sup>	Western scrub jay	
Tricolored blackbird <sup>2</sup>	Northern harrier <sup>3</sup>	Rock wren	
Lawrence's goldfinch <sup>3</sup>	Sora <sup>3</sup>	Bewick's wren	
Mallard <sup>4</sup>	Common-ground dove <sup>3</sup>	Ruby-crowned kinglet	
Northern pintail⁴	Burrowing owl <sup>3</sup>	California towhee	
Black swift⁴	American wigeon⁴		
Rufous hummingbird <sup>4</sup>	Golden eagle <sup>4</sup>		
Allen's hummingbird⁴	Long-eared owl <sup>4</sup>		
Olive-sided flycatcher <sup>4</sup>	Bushtit <sup>4</sup>		
Willow flycatcher <sup>4</sup>	Marsh wren <sup>4</sup>		
	Rufous-crowned sparrow <sup>4</sup>		
	Grasshopper sparrow <sup>4</sup>		

"1"-"4" Signifies vulnerability groupings, with those species indicated as "1" the most vulnerable (Note that all of the species listed under the first two columns meet the criteria for vulnerability either continentally or regional and are worthy of conservation (SJV Technical Committee 2006).

Conservation actions recommended in the SJV Bird Conservation Plan generally involve preserving large blocks of undisturbed native habitat that will meet the specific needs of bird species of concern. Such habitats include:

- Open terrain and adjacent foothill chaparral and mountain areas for golden eagles (*Aquila chrysaetos*);
- Native grasslands to support northern harrier (*Circus cyaneus*), grasshopper sparrow (*Ammodramus savannarum*), and western meadowlark (*Sturnella neglecta*);
- Secluded cliffs and steep canyons for black swifts (*Cypseloides niger borealis*), white-throated swifts (*Aeronautes saxatalis*), and rufous-crowned sparrows (*Aimophila ruficeps*);
- Oak woodland to support acorn woodpecker (*Melanerpes formicivorus*), oak titmouse (*Baeolophus inornatus*), and Lawrence's goldfinch (*Spinus lawrencei*);
- Riparian areas and adjacent open terrain to support long-eared owl (*Asio otus*), Nuttall's woodpecker (*Picoides nuttallii*), and least Bell's vireo;
- Dense chaparral for California thrasher (*Toxostoma redivivum*) and wrentit (*Chamaea fasciata*); and
- Large expanses of coastal sage scrub, some with extensive cactus patches, to support California gnatcatcher and cactus wren (*Campylorhynchus brunneicapillus*).

### Partners in Flight – Conservation of the Land Birds of the United States

Partners in Flight, which began in 1990, addresses the challenges of bird conservation in North America through a cooperative partnership involving a variety of agencies, conservation groups, foundations, academia, and commercial enterprises. The mission of Partners in Flight is to stop the decline of, maintain, or increase healthy populations of landbirds in North America. To that end, Partners in Flight has completed a number of bird conservation plans that provide a comprehensive treatment of bird conservation issues in the continental United States (Pashley et al. 2000), including the conservation of landbirds. For planning purposes, Partners in Flight has divided its study area into physiographic areas that are largely based upon physiographic areas set by the North American Breeding Bird Survey. The San Diego NWR Refuge is located within the Central and Southern California Coast and Valleys physiographic area (and is identified as part of Bird Conservation Region 32 [Coastal California], a Partners in Flight North American Conservation Plan Planning Region).

Four of the habitats identified by Partners in Flight as habitats for which careful management is important for the conservation of land birds (i.e., coastal scrub/chaparral, oak woodland, riparian, grasslands) are supported within the San Diego NWR. The protection, restoration, and/or enhancement of these habitats are recommended to reverse declining bird populations within the Central and Southern California Coast and Valleys physiographic area. Presented here are goals and recommendations of the four applicable bird conservation plans. The relevant recommendations of each plan are included, as applicable, in the goals, objectives, and strategies prepared for inclusion in the San Diego NWR CCP.

<u>Oak Woodland Bird Conservation Plan</u>. The Oak Woodland Bird Conservation Plan was developed to promote conservation and restoration of oak woodland habitat to support long-term viability and recovery of both native bird populations and other native species in California (CalPIF 2002). Plan goals include:

- Defining the conservation implications of key problems facing California's oak woodlands (e.g., the long-term lack of recruitment, disease and vectors that result in the loss of significant numbers of oaks, destruction of oak woodland habitats for development and other purposes);
- Informing land managers and others about the complex and interrelated issues affecting California's oak woodlands and their management;
- Providing technical support necessary to select, design, and implement the highest priority conservation and land management actions identified in the plan; and
- Supporting and informing efforts to increase the quantity (acreage) and quality (ecosystem function) of California's oak woodland habitat by providing funding information and promoting on-the-ground conservation projects.

Plan recommendations relevant to the San Diego NWR include:

- Prioritizing oak woodland sites for restoration according to their proximity to existing high-quality sites and according to the likely success of regeneration and transplanted oak viability;
- Restoring protected oak woodland systems to benefit healthy bird populations and promote oak regeneration;
- Restoring understory components of oak woodland systems, as the presence of shrubs and brush piles in the understory of oak woodlands may also help promote the survival of oak seedlings;
- Replacing non-native annual grasses with native perennial grasses in oak woodland systems;
- Restoring upland oak woodland habitats in conjunction with adjacent riparian restoration;
- Restoring natural fire regimes in oak woodlands, whenever possible;
- Restoring a mosaic configuration of a diversity of oak woodland types; and
- Controlling and, where possible, eradicating non-native animal species such as European starlings (*Sturnus vulgaris*), feral cats, and pigs that may be harmful to native birds (CalPIF 2002).

<u>Coastal Scrub/Chaparral Bird Conservation Plan</u>. The Coastal Scrub/Chaparral Bird Conservation Plan was developed to guide conservation policy and action on behalf of coastal scrub/chaparral habitats and wildlife. The primary goals of this plan include:

- Emphasizing the conservation of populations of species and species assemblages;
- Synthesizing and summarizing current scientific knowledge of the requirements of birds in shrubland habitats;
- Providing recommendations for habitat protection, restoration, management, and monitoring to ensure the long-term persistence of birds and other wildlife dependent on shrubland ecosystems; and
- Supporting efforts to increase the overall acreage and effectiveness of shrubland habitat conservation efforts in California (CalPIF 2004).

Plan recommendations relevant to the San Diego NWR include:

- Prioritizing coastal scrub sites for protection and restoration according to their proximity to existing high-quality sites;
- Promoting coastal scrub and chaparral ecosystem health by ensuring that the patch size, configuration, and connectivity of restored scrub habitats adequately support the desired populations of scrub-dependent species;
- Designing and implementing restoration projects that mimic the diversity and structure of natural shrubland plant communities;
- Restoring both shrub canopy and herbaceous understory in coastal scrub habitats;
- Locating restoration sites close to existing shrub habitat patches to allow rare, native, understory herb species to invade restored sites and to increase the structural and floristic diversity of the habitat;
- Planting coastal scrub species in a mosaic pattern modeled after the spatial design of an existing healthy site with similar abiotic characteristics; and
- Controlling and, if possible, eradicating non-native plant species in existing coastal scrub and chaparral sites (CalPIF 2004).

**<u>Riparian Bird Conservation Plan</u>**. The Riparian Bird Conservation Plan summarizes the current state of scientific knowledge concerning the requirements of birds in riparian habitats and provides recommendations for habitat protection, restoration, management, research, monitoring, and policy (Riparian Habitat Joint Venture 2004).

Those recommendations relevant to the San Diego NWR include:

- Prioritizing the restoration of riparian sites by the ability to restore the natural hydrology of the area, proximity to existing high-quality riparian sites and "source" populations of species that can disperse into the restored habitat, and the ability to provide adequate undisturbed buffer areas;
- Ensuring that the patch size, configuration, and connectivity of restored riparian habitats adequately supports the desired populations of riparian dependent species;
- Increasing the value of ongoing restoration projects for bird species by restoring and managing the structural diversity and volume of the understory, planting native forbs and sedge species, restoring the width of the riparian corridor, and planting vegetation in a mosaic design with dense shrub patches interspersed with trees to achieve a semi-open canopy;
- Providing undisturbed native upland habitat adjacent to riparian areas to provide migratory stopover grounds, foraging habitat, and dispersal corridors for non-breeding adults and juveniles;
- Coordinating with management and restoration projects that are focusing on nonavian taxa to ensure that the benefits of conserving riparian habitats are maximized; and
- Controlling and, where possible, eradicating non-native plant species on a watershed scale (Riparian Habitat Joint Venture 2004).

**Draft Grassland Bird Conservation Plan**. The draft Grassland Bird Conservation Plan (CalPIF 2000) was developed to guide conservation policy and action on behalf of grassland habitats and birds; to synthesize and summarize current knowledge concerning the requirements of birds in grassland habitats; and to provide recommendations for habitat protection, restoration, management, and monitoring in an effort to ensure long-term persistence of birds and other wildlife dependent on grassland ecosystems.

Those conservation action recommendations presented in the plan that are relevant to the San Diego NWR include:

- Contributing to a statewide monitoring and research effort that will improve our understanding of the distribution of grassland birds in California, identify those habitat qualities that best support grassland bird species, and provide insight into how grassland habitats should be managed to benefit these birds;
- Considering the habitat requirements of grassland bird species when developing and implementing native grassland habitat management and restoration plans; and
- Protecting native grassland areas from disturbance (CalPIF 2000).

# 3.3.2 Vegetation Communities

# 3.3.2.1 Overview

San Diego County supports a wide range of native vegetation communities, many of which occur within the boundaries of the San Diego NWR. The type of vegetation present in a particular area is influenced by many factors, including geographic location, soil type and sometimes the associated underlying geologic formation, moisture availability and precipitation rates, slope aspect (i.e., the direction a slope is facing), degree of site inclination or steepness, site elevation, and level of disturbance. These factors also affect the distribution and abundance of specific plant species within the various vegetation communities.

Vegetation mapping for the Del Mar Mesa Vernal Pool Unit was prepared by SANDAG (1995), with classifications based on Holland (1986). Vegetation mapping for the Otay-Sweetwater Unit was conducted in 2007 by Recon Environmental, Inc. (RECON). This vegetation mapping effort involved evaluating existing vegetation mapping prepared for the San Diego MSCP Plan (SANDAG 1995) and updating that data as necessary based on current aerial photography and some field investigations to "ground truth" the results of the aerial photography analysis. The delineation of vegetation communities was based on *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986), as revised by Thomas Oberbauer in 1996.

Following completion of the Refuge's updated vegetation mapping project, the Holland classification system was further modified for San Diego County in *Draft Vegetation Communities of San Diego County* (Oberbauer et al. 2008) and again in February 2011 in the *Vegetation Classification Manual for Western San Diego County* (Sproul et al. 2011). The most recent classification, which delineates the vegetation communities more narrowly than either Holland or Oberbauer, describes the native and naturalized vegetation types known to occur within western San Diego County and provides users with a means to determine each vegetation type through direct observations of species composition (Sproul et al. 2011). This latest classification manual was prepared consistent with the recommendations for standardized data collection and analysis provided in CDFW VegCAMP (http://www.dfg.ca.gov/biogeodata/vegcamp/), as well as the methods used to prepare *A Manual of California Vegetation*, 2nd ed. (Sawyer et al. 2008).

These methods are modeled after the National Vegetation Classification Standards (NVCS), "a central organizing framework for how all vegetation in the United States is inventoried and studied, from broad scale formations (biomes) to fine-scale plant communities" (http://usnvc.org/). The latest classification standard was published in 2008 by the Federal Geographic Data Committee and provides the basis for ongoing refinement of the National Vegetation Classification. The hierarchy of the NVCS is represented by eight primary levels, with the highest levels emphasizing physiognomic (structural and ecological) similarities with floristic composition. The lowest levels, referred to as alliances and associations, focus on floristic variations within an area (Sproul et al. 2011). Alliances are typically defined by the presence of diagnostic species within a range of cover values within a single plant stratum, whereas associations represent a subset of types within an alliance, which are further defined by additional diagnostic species that may be present in any stratum.

A listing of the vegetation types present on the Refuge, using the Holland classifications as modified by Oberbauer et al. (2008), is presented in Table 3-4, as is the estimated acreage of each vegetation type within the Otay-Sweetwater Unit and Del Mar Mesa Vernal Pool Unit.

Table 3-4Summary of Vegetation Types Present on the San Diego NWR1		
Vegetation Type	Approximate Acreage on the Otay-Sweetwater Unit	Approximate Acreage on the Del Mar Mesa Vernal Pool Unit
Coastal Sage Scrub	7,700 acres	0
Chaparral	3,100 acres	60 acres
Native Grassland	154 acres	0
Non-native Grassland	78 acres	0
Oak Woodland	114 acres	0
Coast Live Oak Riparian Forest	86 acres	0
Cottonwood-willow Riparian Forest	170 acres	0
Riparian Willow Scrub	4 acres	0
Other Wetlands	15 acres	0
Southern Interior Cypress Forest	3 acres	0
Non-Native Woodland	36 acres	0
Unvegetated	10 acres	0

<sup>1</sup> This table does not include vernal pool vegetation, a specialized vegetation type that occurs in depressions (vernal pools) surrounded by grassland vegetation on the Otay-Sweetwater Unit and chaparral vegetation on the Del Mar Mesa Vernal Pool Unit.

(For a crosswalk to correlate the modified Holland nomenclature with the vegetation classifications used in the *Vegetation Classifications Manual for Western San Diego County*, refer to Appendix C of *Vegetation Classification Manual for Western San Diego County* [Sproul et al. 2011]). More detailed mapping of the vegetation on the Otay-Sweetwater Unit is available for review upon request at the Refuge Complex headquarters.

A general description of the mapped vegetation types, consistent with the Holland classifications (1986), is presented in the following text. Additional information about these vegetation types is taken from Oberbauer et al. (2008) and Sproul et al. (2011). This general discussion of vegetation types is followed by a more detailed description of the vegetation present within each of the six management areas within the Refuge boundary.

## 3.3.2.2 Forest and Woodland Vegetation

## **Upland Forests and Woodlands**

<u>Southern Interior Cypress Forest</u>. Southern interior cypress forest is a relatively dense, low, fire-maintained coniferous forest dominated by Tecate cypress (*Hesperocyparis forbesii*). Stands are often even-aged due to high mortality rates during fires and the requirement of high temperature to stimulate seed germination. Tree density varies in relation to site factors and fire history. Tecate cypress is locally common on portions of Otay Mountain, occurring within chaparral on slopes and ridges and in steep drainages.

<u>Coast Live Oak Woodland</u>. This woodland is dominated by evergreen coast live oaks (*Quercus agrifolia*) reaching 32 to 82 feet (10 to 25 meters) in height. This vegetation typically occurs on north-facing slopes or in shaded ravines and intergrades with coastal sage scrub or mixed chaparral on drier sites (Holland 1986). The shrub layer is typically poorly developed but may include tree (*Heteromeles arbutifolia*), currant (*Ribes* spp.), laurel sumac (*Malosma laurina*), and desert elderberry (*Sambucus mexicana*). The herbaceous component is continuous and often dominated by weedy species.

**Eucalyptus Woodland.** Eucalyptus woodland is typically characterized by dense stands of gum trees (*Eucalyptus* spp.). Plants in this genus, imported primarily from Australia, were originally planted in groves throughout many regions of coastal California as a potential source of lumber and building materials, for their use as windbreaks, and for their horticultural novelty. They have increased their cover through natural regeneration, particularly in moist areas sheltered from strong coastal winds. Gum trees naturalize readily in the region and, where they form dense stands, they tend to completely supplant native vegetation, greatly altering community structure and dynamics. Very few native plants are compatible with eucalyptus (City of San Diego 1995).

## **Riparian Forests and Woodlands**

<u>Southern Riparian Woodland</u>. This vegetation is characterized by moderate-density riparian woodlands dominated by small winter-deciduous trees or shrubs (e.g., willows [*Salix* sp.], mulefat [*Baccharis salicifolia*]) with scattered taller riparian trees. This vegetation, which contains more western sycamores (*Platanus racemosa*) than cottonwoods (*Populus fremontii*), typically occurs in those areas of major river systems and smaller major tributaries that are routinely or periodically affected by flood scour (Oberbauer et al. 2008).

**Southern Cottonwood-Willow Riparian Forest.** This vegetation community occurs along streams and rivers, occupying relatively broad drainages and floodplains. It can consist of an open or closed canopy forest, with trees that are generally greater than 20 feet (six meters) high. Dominated by mature winter deciduous trees, including Fremont's cottonwood and several species of tree willows (i.e., *Salix gooddingii, S. lasiandra, S. lasiolepis*), this community often has a dense understory of shrubby willows, mulefat, and mugwort (*Artemisia douglasiana*). The dominant species require moist, bare mineral soil for germination and establishment (Holland 1986), an environment that is provided after flood waters recede. Riparian forest differs from riparian woodland in that western sycamore is generally lacking, or at least is not dominant. Coast live oaks are also mostly absent from this community.

**Southern Coast Live Oak Riparian Forest**. Holland (1986), as modified by Oberbauer et al. (2008), identifies open to locally dense riparian forests of coast live oak located in bottomlands and outer floodplains along larger streams as southern coast live oak riparian forest. This vegetation tends to be richer in herbs and poorer in understory shrubs than those of other riparian communities. In addition to coast live oak, these areas are characterized by mugwort, spotted eucrypta (*Eucrypta chrysanthemifolia*), toyon, wild cucumber (*Marah macrocarpus*), California wild rose (*Rosa californica*), desert elderberry, and poison oak (*Toxicodendron diversilobum*) (Oberbauer et al. 2008).

Southern Arroyo Willow Riparian Forest. This vegetation type consists of winter-deciduous riparian forests with closed or nearly closed canopies that are dominated by moderately tall broad-leaved trees, primarily arroyo willow (*Salix lasiolepis*) (Oberbauer et al. 2008). Typically occurring on frequently flooded areas along rivers and streams, southern arroyo willow riparian forest and the understory usually consists of mulefat and shrubby willows, including sandbar willow (*Salix exigua*) and occasional Goodding's (black) willow (*Salix gooddingii*) and/or red willow (*Salix laevigata*). Understory plants can include western ragweed (*Ambrosia psilostachya*), mugwort, and spiny rush (*Juncus acutus* ssp. *leopoldii*) (Sproul et al. 2011).

## 3.3.2.3 Shrubland Vegetation

## **Chaparral**

This shrubland vegetation is widely distributed throughout California on dry slopes and ridges at low and medium elevations where it occupies thin, rocky, or heavy soils. It is typically composed of hard-stemmed, leathery leaved shrubs, with a species composition that varies considerably with location. The plants of this community have adapted to wildfire by either resprouting from underground roots following a burn and/or producing seeds that require a fire-related cue to stimulate germination. If fires occur too frequently, the chaparral vegetation may be replaced with weedy, non-native vegetation (City of San Diego 1995).

Four distinct chaparral associations were recognized by Holland (1986), and numerous associations and alliances are described by Sproul et al. (2011). The four associations recognized by Holland are present within the San Diego NWR: southern maritime chaparral, southern mixed chaparral, chamise chaparral, and scrub oak chaparral.

Southern maritime chaparral, which is further divided into species-specific associations by Sproul et al. (2011), is generally comprised of low, relatively open vegetation characterized by such species as wart-stemmed ceanothus (*Ceanothus verrucosus*), Del Mar manzanita (*Arctostaphylos glandulosa* ssp. crassifolia), summer-holly (*Comarostaphylis diversifolia* ssp. diversifolia), Del Mar sand aster (*Corethrogyne filaginifoila var. linifolia*), and sea dahlia (*Coreopsis maritima*). Other species that commonly occur in this habitat are chamise (*Adenostoma fasciculatum*), mission manzanita (*Xylococcus bicolor*), and toyon. Geographically, southern maritime chaparral is restricted primarily to the coastal fog belt (Oberbauer et al. 2008). As with other chaparral associations, fire appears to be necessary for continued reproduction of many of the characteristic species within southern maritime chaparral (Holland 1986).

Distinguishing southern maritime chaparral from southern mixed chaparral, as described by Oberbauer et al. (2008), can be difficult. The larger differences between these two associations include the number and dominance of characteristic southern maritime chaparral species, the structural characteristics of the vegetation, and the range of soil types and geographical areas over which these habitats occur. Species such as Del Mar manzanita, wart-stemmed ceanothus, summer-holly, and others tend to be more frequent and have increased dominance in southern maritime chaparral, while species such as chamise, toyon, and mission manzanita typically dominate southern mixed chaparral. Species richness (i.e., the number of species per unit area) also seems to be higher in southern maritime chaparral than in southern mixed chaparral, and southern maritime chaparral is often more open and lower growing than southern mixed chaparral (Oberbauer et al. 2008).

Chamise chaparral is characterized by nearly monotypic stands of chamise, with these shrubs measuring from three to 10 feet (one to three meters) in height. Additional shrub species, such as mission manzanita and our Lord's candle (*Yucca whipplei*), may be present, but contribute little to the overall cover. The herbaceous component of this association is largely lacking. Chamise chaparral occurs on xeric slopes and ridges and is found on shallower, drier soils or at somewhat lower elevations than southern mixed chaparral (City of San Diego 1995).

Southern mixed chaparral is typically dominated by broad-leaved sclerophyllous (i.e., hard-leaved) shrubs or small trees that characteristically occupy protected north-facing slopes, as well as canyon slopes or ravines, where more mesic conditions are present. Dominant shrubs in this community are generally about five feet (1.5 meters) in height on ridges and 6.5 to 8.0 feet (2.0 to 2.5 meters) high in ravines. This association is typically a mixture of chamise, mission manzanita, Ramona lilac (*Ceanothus tomentosus* spp. *olivaceus*), and laurel sumac. Subdominant shrub species include holly-leafed redberry (*Rhamnus ilicifolia*), yellow-bush penstemon (*Keckiella antirrhinoides*), flat-top buckwheat (*Eriogonum fasciculatum*), our Lord's candle, Mohave yucca (*Yucca schidigera*), scrub oak (*Quercus berberidifolia*), and toyon. The understory of dense stands of mixed chaparral is fairly sparse. Many species in this community are adapted to fire. Although the vegetation is usually dense, it can include patches of bare soil where the vegetation is more open. A variety of species may be present in these open areas including, mariposa lily (*Calochortus* spp.), soap plant (*Chlorogalum* spp.), and bedstraw (*Galium* spp.) (Oberbauer et al. 2008).

Scrub oak chaparral is a dense, evergreen chaparral association that approaches 20 feet (six meters) in height and is dominated by scrub oak. This habitat occurs on more mesic sites than other chaparral associations and often at slightly higher elevations. These more favorable sites often allow scrub oak chaparral to recover from fire more quickly than other chaparral types (City of San Diego 1995). Other shrub species that occur in scrub oak chaparral include toyon, mountain mahogany (*Cercocarpus montanus* var. *glaber*), and holly-leaf redberry. Understory species that may be present include poison oak and bedstraw.

Rock outcrops are common within areas supporting chaparral vegetation. Where present, these rocky outcrops often provide distinct microhabitats that support plant species generally absent or uncommon throughout most of the surrounding mixed chaparral community. Such species include melic grass (*Melica frutescens*), California bee-plant (*Scrophularia californica var. floribunda*), cotton fern (*Cheilanthes newberryi*), California brickelbush (*Brickellia californica*), and caterpillar phacelia (*Phacelia cicutaria*).

The vegetation mapping as of August 2013 indicated that approximately 27 percent of the lands included within the Otay-Sweetwater Unit support chaparral vegetation. Within the Del Mar Mesa Vernal Pool Unit, virtually all of the lands support chaparral vegetation (SANDAG 1995).

#### Coastal Sage Scrub

Coastal sage scrub is comprised of low, soft-woody subshrubs, generally no higher than three feet (one meter). This vegetation community is typically located on dry sites, such as steep, south-facing slopes or clay-rich soils that are slow to release stored water. The dominant shrub species vary depending on local site factors and levels of disturbance. Sproul et al. (2011) separates these into distinct associations and alliances. Dominants may include California sagebrush (*Artemisia californica*), flat-top buckwheat, laurel sumac, white sage, broom baccharis (*Baccharis sarothroides*), and San Diego sunflower (*Bahiopsis laciniata* [*Viguiera laciniata*]). Other, less frequent, constituents include spiny redberry (*Rhamnus crocea*), deerweed (*Lotus scoparius*), and yellow bush-penstemon (City of San Diego 1995).

The shrub layer in this community ranges from a continuous canopy and little understory to a more open canopy with widely spaced shrubs and a well-developed understory. Native understory species include foothill stipa (*Stipa lepida*), ashy spike-moss (*Selaginella cinerascens*), chalk live-forever (*Dudleya pulverulenta*), wishbone bush, and coast barrel cactus (*Ferocactus viridescens*).

Vegetation mapping of the Refuge indicates that as of August 2013, coastal sage scrub vegetation covered approximately 67 percent (about 7,700 acres) of the lands included within the Otay-Sweetwater Unit. No coastal sage scrub vegetation is present on the four parcels included within the Del Mar Mesa Vernal Pool Unit (SANDAG 1995).

## **Riparian Scrublands**

This scrubby vegetation, which occurs in riparian zones, is described by Holland (1986) as modified by Oberbauer et al. (2008) as southern riparian scrub, consisting of mulefat scrub and southern willow scrub, while Sproul et al. (2011) divides riparian scrublands into various associations (e.g., *Salix lasiolepis* Association, *Salix laevigata* Association) based on the dominant species present in a particular location.

The mix of species in riparian scrub vegetation can vary from a dense, broad-leaved, winterdeciduous association dominated by several species of willow (southern willow scrub) to an herbaceous scrub association dominated by mulefat (mulefat scrub). The former association is found on loose, sandy, or fine gravelly alluvium deposited near stream channels during floods, and most stands are too dense to allow much understory to develop (Holland 1986). Typical willow species include arroyo willow, sandbar willow, red willow, and Goodding's willow. Other species typically present in these areas include mulefat and western sycamore. Frequent flooding maintains this early seral community, preventing succession to a riparian woodland or forest (Holland 1986). Most stands are too dense to allow any substantive understory development (Oberbauer et al. 2008).

Areas dominated by mulefat scrub occur along intermittent streams with a fairly coarse substrate and moderately deep water table. The vegetation is depauperate, tall, herbaceous riparian scrub strongly dominated by mulefat (Oberbauer et al. 2008). Other characteristic species include sandbar willow, arroyo willow, poison oak, and stinging nettle (*Urtica holosericea*). This early seral community is maintained by frequent flooding; without flooding, most stands would be expected to succeed to cottonwood- or sycamore-dominated riparian forests or woodlands (City of San Diego 1995, Sproul et al. 2011).

Less than five acres of riparian scrub vegetation has been mapped within the Otay-Sweetwater Unit. This vegetation type is not present on the parcels included within the Del Mar Mesa Vernal Pool Unit.

# 3.3.2.4 Herbaceous Vegetation

# **Upland Herbaceous Vegetation**

<u>Native Perennial Grassland</u>. Perennial grassland is grassland dominated by native bunchgrass (City of San Diego 1995). Within the Refuge, it is typically dominated by dense, irregular tussocks of native purple needlegrass (*Stipa pulchra*) interspersed with several other herbs and grasses, including shooting-star (*Dodecatheon clevelandii*), blue-eyed grass (*Sisyrinchium bellum*), common golden star (*Bloomeria crocea*), morning glory (*Calystegia macrostegia*), splendid mariposa lily (*Calochortus splendens*), and several non-native grasses such as fescue (*Vulpia* sp.) and soft chess (*Bromus hordeaceus*). This plant association, which typically alternates with coastal sage scrub on some clay soils, often occurs on more mesic exposures and at the base of slopes.

Approximately 15 acres within the McGinty Mountain area have been mapped as native grassland vegetation. Native grassland vegetation also occurs in various other locations throughout the Otay-Sweetwater Unit.

**Non-native Grasslands**. Non-native grassland is a dense to sparse cover of annual grasses, often associated with numerous species of showy-flowered native annual forbs (City of San Diego 1995). Characteristic species include wild oats (*Avena* spp.), foxtail chess (*Bromus madritensis* ssp. *rubens*), ripgut grass (*Bromus diandrus*), ryegrass (*Lolium* sp.), and mustard (*Brassica* spp.). Most of the annual introduced species in this vegetation community originated from the Mediterranean region, an area with a climate similar to California. Plant germination in these grasslands occurs with the onset of the late fall rains, well before many native forbs have sprouted; growth, flowering, and seed-set occur from winter through spring. With a few exceptions, the plants are dead through the summer-fall dry season, persisting as seeds. Approximately 78 acres on the Otay-Sweetwater Unit were mapped as non-native grasslands within the San Miguel Mountain and Sweetwater River areas burned in the 2007 Harris Fire. Although dominated by non-native grasses and annuals at the time of mapping, these areas may ultimately recover from the effects of the fire and eventually support coastal sage scrub or native grassland habitat.

## Hydrophytic Herbaceous Vegetation

**Freshwater Marsh**. Freshwater marsh is dominated by perennial, emergent monocots ranging from four to seven feet (1.3 to 2 meters) in height. Uniform stands of bulrushes (*Schoenoplectus* spp.) or cattails (*Typha* spp.) often characterize this habitat. Freshwater marsh occurs in wetlands that are permanently flooded by standing fresh water (Holland 1986).

**Emergent Wetland.** These wetlands, which are dominated by low growing perennial wetland species such as sedges (*Carex* spp.), spike rushes (*Eleocharis* spp.), rushes (*Juncus* spp.), docks (*Rumex* spp.), and bur reed (*Sparganium eurycarpum*) occur in channels, seeps and springs, floodplains, margins of lakes and rivers, and various basins such as pools and ponds (Oberbauer et al. 2008).

<u>Vernal Pools</u>. Vernal pools are a unique, specialized form of seasonal wetlands that occur in a geographical area extending from southern Oregon through California into northern Baja California, Mexico (USFWS 1998a). Vernal pool habitats are not homogeneous throughout this

large area because of regional differences in climate, topography, and soils (USFWS 1998a). Although the vernal pools of southern California share some wide-ranging temporary wetlands species with pools in other parts of the State, the pools in southern California support species unique to the area, which helps to set them apart (Stone 1990). In fact, the vernal pools in southern California support at least 12 endemic plants (USFWS 1998a), including seven plant species protected under the ESA.

Vernal pools require a unique combination of climatic, topographic, geologic, and evolutionary factors for their formation and persistence. In southern California, these pools form in areas where downward percolation of water is prevented by an impervious subsurface layer consisting of claypan, hardpan, or volcanic stratum (Holland 1976, Holland 1986). Under these conditions, the pools appear as shallow depressions filled with rainwater during fall and winter months and as dry depressions in the summer after the water in the pools has evaporated (Holland 1976, Thorne 1984). Seasonal inundation makes vernal pools too wet for adjacent upland plant species adapted to drier soil conditions, while rapid drying during late spring makes pool basins unsuitable for typical marsh or aquatic species that require a more persistent source of water. As a result, vernal pools support a distinctive living community adapted to extreme variability in hydrologic conditions (Oberbauer et al. 2008).

According to Bauder and McMillan (1998), the vernal pool landscapes in San Diego County are fragmented by "mountains and the discontinuity of suitable soils and/or microtopography." This fragmentation, along with differences in the underlying geological formations, surface soil properties, hydrology, micro- and landscape-level topography and sub-regional climate, results in a species distribution that varies greatly within the pools located between north coastal San Diego County and the Mexican border. The plant species confined to these pools constitute what Thorne (1976) calls the vernal pool ephemeral plant community and Holland (1986) refers to as San Diego mesa vernal pools (City of San Diego 1995).

For convenience of reference, groups of vernal pools are sometimes referred to as vernal pool complexes that may include two to several hundred individual vernal pools (Keeler-Wolf et al. 1998). Vernal pool complexes are defined as a series of vernal pool groups that are hydrologically connected with similar soil types and species compositions. Within San Diego County, they were first described and surveyed by Beauchamp and Cass (1979) and subsequently updated in 1986 (Bauder) and by the City of San Diego in 2004. Local upland vegetation communities associated with vernal pools include needlegrass grassland, annual grassland, coastal sage scrub, maritime succulent scrub, and chaparral (USFWS 1998a).

Holland recognizes two types of vernal pools in San Diego County: San Diego mesa hardpan vernal pools, like those found on Del Mar Mesa, and San Diego mesa claypan vernal pools, such as those found on Otay Mesa, in Proctor Valley, around Lower Otay Reservoir, and to the southeast of the Sweetwater Reservoir. Vernal pools are often surrounded by low hummocks called mimamounds, but this feature is not always present.

San Diego mesa hardpan vernal pools, which are present in the Del Mar Mesa Vernal Pool Unit of the Refuge, are a low, mesic, herbaceous community dominated by annual herbs and grasses. Sensitive plant species expected to occur in these types of pools include San Diego button-celery (*Eryngium aristulatum var. parishii*), federally listed as endangered; little mousetail (*Myosurus minimus* ssp. *apus*); spreading navarretia (*Navarretia fossalis*), federally listed as threatened; Orcutt's brodiaea (*Brodiaea orcuttii*); California adder's tonguefern (*Ophioglossum lusitanicum* ssp. *californicum*); and San Diego mesa mint (*Pogogyne abramsii*), federally listed as endangered. The mimamounds associated with these pools are generally well developed, and the surrounding vegetation is often chamise chaparral (City of San Diego 1995). Iron-silica cemented soils, often of the Redding soils series, form the hardpan layer (Holland 1986).

San Diego mesa claypan vernal pools, which are present in the Otay-Sweetwater Unit of the Refuge, are generally characterized by lower, overall vegetative cover than hardpan pools. Typical sensitive plant species in these pools include San Diego button-celery; little mousetail; spreading navarretia; California Orcutt's grass (*Orcuttia californica*), federally listed as endangered; and Otay mesa mint (*Pogogyne nudiuscula*), federally listed as endangered (City of San Diego 1995). The microrelief of these pools is often lower than hardpan pools, and they are generally surrounded by grassland or sparse coastal sage scrub rather than chaparral. Claypan pools are restricted to marine terraces in the southwestern portion of the county.

Historically, vernal pool habitat, which was scattered throughout San Diego County in locations with appropriate soil and hydrological conditions, covered approximately 200 square miles (520 square kilometers), or about six percent of the county (USFWS 1998a). Only a fraction of this habitat remains intact today. Current estimates indicate that 95 to 97 percent of the vernal pool habitat in the San Diego County has been lost to urbanization and agriculture (Bauder and McMillan 1998). In recent years, efforts have been made to restore and/or recreate vernal pool habitat on preserved lands, including within the Otay-Sweetwater Unit of the San Diego NWR, where vernal pools were historically present.

### 3.3.2.5 Overview of the Vegetation Types Present within Each Refuge Area

This discussion provides an overview of the vegetation types present within the five distinct areas of the Otay-Sweetwater Unit, as well as the Del Mar Mesa Vernal Pool Unit.

#### **Otay-Sweetwater Unit - McGinty Mountain Area**

Much of this portion of the Refuge has been largely unchanged by development and human activity. The primary exception is a network of trails that cross the area. As illustrated in Figure 3-12, six general vegetation communities occur within this portion of the Refuge: coastal sage scrub, which is the most wide spread plant community on McGinty Mountain; southern mixed chaparral, which in some areas forms dense, impenetrable stands, is the dominant plant community at the higher elevations; perennial native grassland; oak woodland; a small area of riparian scrub; and eucalyptus woodland. The mesa to the north of McGinty Mountain peak supports a small area of riparian scrub, as well as a mosaic of coastal sage scrub and intervening patches (less than 0.1 acre) of native grassland (Dudek & Associates 1995).

Coast live oak occurs in low densities on some of the area's north-facing slopes and is the dominant species in the southern coast live oak woodland present within the area's major drainages and more mesic mountain slopes. Engelmann oak (*Quercus engelmannii*) and scrub oak also occur within areas identified as southern coast live oak, including portions of the parcel located along Jamul Drive, the southernmost parcel within this area.

The composition and structure of the vegetation in this management area is also influenced to some extent by the chemical and structural properties of the soil types present on McGinty Mountain, primarily the gabbro soils of the Las Posas soil series. A number of sensitive plant species are either wholly restricted to or generally associated with these soil types, which are present on portions of McGinty Mountain's west and south-facing slopes.

The upper elevations of the mountain are characterized by outcrops of gabbro-derived soils. Gabbro outcrops weather into soils that content a greater iron and magnesium contact than other more common soils in the area. The unique mineral content of these gabbro-derived soils restricts the growth of many common plant species, while allowing species that are gabbro-tolerant to thrive (Dudek & Associates 1995). The threatened San Diego thornmint (*Acanthomintha ilicifolia*) is a gabbro-tolerant plant species present within the McGinty Mountain area. Also found on McGinty Mountain's gabbro-derived soils are the MSCP-covered species Parry's tetracoccus (*Tetracoccus dioicus*), Dehesa beargrass (*Nolina interrata*), and Gander's butterweed (*Packera ganderi*), classified by the State as a rare plant.

Unlike the McGinty Mountain area, portions of the Las Montañas area have been subject to significant human disturbance. In the early 1990s, approximately 190 acres of this area were graded and/or cleared in conformance with approved development plans (Dudek & Associates 1994). Over the years, natural recruitment of pioneer coastal sage scrub species has occurred within these disturbed sites, particularly within previously graded areas on the south side of Highway 94, and much of this area now supports successional coastal sage scrub vegetation. The rest of this management area is mostly undisturbed, supporting a rich diversity of plant and wildlife species.



Figure 3-12. Vegetation Types Present on the McGinty Mountain Area

### **Otay-Sweetwater Unit - Las Montañas Area**

As illustrated in Figure 3-13, five native plant communities (southern mixed chaparral, coastal sage scrub, southern coast live oak riparian forest, coast live oak woodland, and mulefat scrub) are present in this area. North of Highway 94, the dominant vegetation type is coastal sage scrub; to the south, the majority of the site supports dense southern mixed chaparral, with oak woodland present in the major drainages and coastal sage scrub present on the drier slopes.

Located within the drainage that parallels the south side of Highway 94 is a well-developed southern coast live oak riparian forest dominated by coast live oak; it also includes individual western sycamores and Mexican elderberry, as well as patches of willow and mulefat. Also occurring in this vegetation are non-native trees including eucalyptus and Brazilian peppertree (*Schinus terebinthifolius*). Coast live oaks can also be found in shaded canyon bottoms and on mesic north-facing slopes within this area.

This portion of the Otay-Sweetwater Unit includes a 3.0-mile (4.8-kilometer) section of the Sweetwater River located between the Sweetwater Reservoir in the south and an existing golf course located near the intersection of Willow Glen Drive and Jamacha Road in the north. Within the Sweetwater River floodplain, the riparian vegetation ranges from riparian scrub, characterized by willows and mulefat, to well-developed riparian woodland. This riparian woodland is dominated by arroyo willow and black willow, with scattered individuals of western sycamore, coast live oak, velvet ash (*Fraxinus velutina*), and California black walnut (*Juglans californica*). This vegetation, as well as areas of coast live oak woodland, is present along Steele Canyon Creek. Areas of freshwater marsh located within this portion of the Sweetwater River floodway.

Coastal sage scrub is the predominant vegetation type within the upland portions of this area, occupying most of the south- and east-facing slopes that extend down into the Sweetwater River floodplain. Other native plant communities include southern mixed chaparral, coast live oak woodland, and native grassland (Figure 3-14). Coast live oak woodland tends to occur in deeper drainages and on steep north-facing slopes (Ogden 1994).

Small patches of native grassland (too small to depict in Figure 3-14) can be found scattered throughout the area south of Steele Canyon Creek upstream of its confluence with the Sweetwater River. Exotic and native grasslands are present on the parcel north of Jamacha Road. An isolated 25-acre refuge parcel, Lot 707 located northwest of the Sweetwater River, consists of an abandoned olive grove with an understory of native and non-native plants, including patches of native coastal sage scrub vegetation.

#### **Otay-Sweetwater Unit - San Miguel Mountain Area**

The vegetation types present within the San Miguel Mountain area, as illustrated in Figure 3-15, include coastal sage scrub, southern mixed chaparral, riparian scrub, and non-native grasslands. Small areas of disturbed native grassland also occur in this area. The majority of the vegetation within the San Miguel Mountain Area has been adversely affected by wildland fires. The fire history of this area is illustrated in Figure 3-16. This history includes a number of small fires and several notable large fires including the 1970 Laguna Fire (Pacific Southwest Biological Services, Inc. 1991), the 1985 Miller Fire, and the Harris Fire, which burned most of the San Miguel Mountain area in 2007.



Figure 3-13. Vegetation Types Present on the Las Montañas Area



Figure 3-14. Vegetation Types Present on the Sweetwater River Area



Figure 3-15. Vegetation Types Present on the San Miguel Mountain Area



Figure 3-16. Fire History for the Otay-Sweetwater Unit

## **Otay-Sweetwater Unit - Sweetwater River Area**

Historically, Mother Miguel Mountain and the western slopes of San Miguel Mountain were dominated by very high quality coastal sage scrub vegetation, interspersed with pockets of native grassland, chamise chaparral, and southern mixed chaparral vegetation (Pacific Southwest Biological Services, Inc. 1991). This area also includes several old stock ponds and ephemeral drainages that support freshwater marsh and riparian scrub vegetation. Vernal pool habitat has been restored in the extreme southwestern portion of this area.

The eastern portion of this area, particularly the upper southern, eastern, and northern slopes of San Miguel Mountain, is dominated by southern mixed chaparral, while the southeast-facing slopes located along the western edge of Proctor Valley support coastal sage scrub. A small canyon in the northeastern portion of this area supports coast live oak woodland.

## **Otay-Sweetwater Unit - Otay Lakes and Mesa Area**

As illustrated in Figure 3-17, the northern parcel in this area supports coastal sage scrub vegetation with scattered barren, rocky outcrops and small pockets of chamise and ceanothus chaparral. Some of the species included within this site's coastal sage scrub habitat include Munz's sage (*Salvia munzii*) and San Diego sunflower.

Historically, the southern parcel within this area supported native grassland and coastal sage scrub, with coast live oak woodland occurring within Little Cedar Canyon. Southern mixed chaparral is present in the other major drainage on this parcel. These parcels burned in 2003 and again in 2007, and currently non-native grasses dominate nearly all habitats. Although damaged by fire, Tecate cypress saplings are likely present on the Refuge in Woodwardia Canyon and upstream in Little Cedar Canyon.

## Del Mar Mesa Vernal Pool Unit

The vegetation communities present on the Refuge parcels in the Del Mar Mesa Vernal Pool Unit, as illustrated in Figure 3-18, include chamise chaparral on the flatter mesa areas and southern mixed chaparral on protected north-facing and canyon slopes or ravines. A deep canyon located near the western Refuge boundary also supports a small area of scrub oak chaparral (SANDAG 1995). Open patches in the flatter portions of this unit, where appropriate soil conditions and microtopography are present, support areas of vernal pool habitat (City of San Diego 2011).

## 3.3.3 Plants

A comprehensive plant inventory has not been completed for the San Diego NWR; however, various biological surveys have been conducted over the years for different portions of the Refuge. The results of these surveys provide general information about the range of plant species observed on the Refuge at various times. In addition to general plant surveys, directed searches for rare plants are periodically conducted throughout the Refuge. The results of these directed searches are documented, and plant locations are mapped for use during future searches. More information regarding those plant species identified as endangered, threatened, rare, or species of concern that have been documented on the Refuge is provided in subsequent sections.



Figure 3-17. Vegetation Types Present on the Otay Mesa and Lakes Area



Figure 3-18. Vegetation Types on the Del Mar Mesa Vernal Pool Unit

# 3.3.4 Wildlife

A comprehensive wildlife inventory has not been completed for the San Diego NWR; however, various surveys have been conducted over the years for different portions of the Refuge. More information about the types and extent of wildlife present on the Refuge is provided in the following sections, and partial species lists are provided in Appendix G.

## 3.3.4.1 Birds

The Refuge includes woodland, shrubland, riparian, and grassland habitats that support a wide range of bird species. More than 180 species of birds have been observed on the Refuge, including a number of listed and sensitive species. A list of species observed on the Refuge is provided in Appendix G.

The birds present within the Refuge's oak woodlands are connected to this habitat in part through acorns, which dozens of species, such as acorn woodpecker, western scrub-jay, and oak titmouse, eat and store (CalPIF 2002). In addition to providing an important food source, oaks can provide nesting habitat for cavity-dependent nesting birds and other wildlife, as well as nesting sites for cup-nesting species. They also can serve as cache sites for acorn woodpeckers and other species.

The mistletoe that is often found growing in coast live oaks is an important food source for species such as western bluebird (*Sialia mexicana*) and phainopepla (*Phainopepla nitens*) (CalPIF 2002), and the insects found in these areas provide forage for species such as Nuttall's woodpecker. Bewick's wren and California quail can be found foraging within the understory of oak woodland habitat.

Shrublands are generally characterized by woody perennials with multiple stems growing from the base; however, despite similarities in general growth form within shrublands, there are notable structural and physiological differences among shrubland types (CalPIF 2004). These differences in structure and cover are important to a variety of bird species. The two predominant shrubland types on the Refuge include coastal sage scrub and chaparral, each providing slightly different nesting and foraging opportunities for birds. California gnatcatchers and rufous-crowned sparrows are associated almost exclusively with coastal sage scrub, while other species such as Costa's hummingbird, greater roadrunner (*Geococcyx californianus*), western scrub-jay, wrentit, California thrasher (*Toxostoma redivium*), and California towhee (*Pipilo crissalis*) can be found in both vegetation types.

Within the Refuge's shrubland habitats, there are local, small-scale non-shrub features such as cryptobiotic crusts, which create open gaps of low, sparse herbaceous vegetation, or rock outcrops that support low, sparse herbaceous vegetation that add to the structural diversity of the vegetation as bird habitat (CalPIF 2004). The chaparral habitat on the Refuge also includes areas of restricted floristic mixes that may provide additional elements or diversity for bird assemblages.

Important features within some areas of the Refuge's coastal sage scrub habitat are large cactus patches composed primarily of coastal cholla (*Cylindropuntia prolifera*), but they may also include coastal prickly pear (*Opuntia littoralis*) and foothill prickly pear (*O. oricola*). These areas provide nesting habitat for the coastal cactus wren, which is an obligate inhabitant of coastal sage scrub. Fire has destroyed or seriously damaged a number of the cactus patches found within the Sweetwater River and San Miguel Mountain areas. Efforts to reestablish healthy cactus patches in these areas are ongoing.

Riparian areas, which have been identified as habitat essential to the conservation of Neotropical migrant birds in California (RHJV 2004), harbor the highest number of bird species found in the arid and semiarid portions of the western United States. Not only do riparian areas provide important breeding grounds for birds, but they also represent vital overwintering and migration stopover areas and corridors for dispersal (RHJV 2004) for a variety of birds. The diversity and abundance of birds present within a particular riparian and other wetland area varies with the extent of tree cover, understory cover and composition, and proximity of the habitat to adjacent high-quality upland habitats. Portions of the riparian habitat along the Sweetwater River provide critical habitat for the endangered least Bell's vireo, while these and other riparian areas also support a range of migrant and resident birds including yellow-breasted chat, yellow warbler, blue grosbeak, belted kingfisher (*Ceryle alcyon*), and warbling vireo.

Although grasslands are limited on the Refuge, they do provide foraging habitat for a variety of avian species, from raptors to seed eating birds. Greater roadrunners, which occur at low densities, are year-round residents that nest in relatively open chaparral and coastal scrub habitats and forage in open areas of low grasses. Other species that utilize the grassland areas of the Refuge include grasshopper sparrow, northern harrier, white-tailed kite, and burrowing owl (*Athene cunicularia*).

Occasionally golden eagles are sighted foraging around San Miguel Mountain, and as recently as 2005, a golden eagle nest was documented near the peak of San Miguel Mountain. A variety of other raptor species have also been observed foraging throughout the Refuge, including northern harrier,

-shinned hawk (*Accipiter striatus*), Cooper's hawk (*Accipiter cooperii*), and red-tailed hawk (*Buteo jamaicensis*). The oak woodland and riparian habitats on the Refuge provide potential nesting habitat for several of these species, and over the past few years, an occupied northern harrier nest has been documented within the grassland area north of Mother Miguel Mountain.

As part of the CCP process, the potential for opening a portion of the Refuge for hunting is being evaluated. Although the hunting proposals and specific areas to be hunted on the Refuge vary by alternative, both quail and dove would be hunted on some portion of the Refuge under either alternative. For that reason, additional information about those species that could be hunted on the Refuge is provided in the following sections.

## California Quail

The California quail (*Callipepla californica*) is a medium-sized quail, with the male measuring about 10.2 to 10.6 inches (260 to 270 millimeters) in length and the female measuring 9.5 to 10.5 inches (241 to 266 millimeters) in length. The males and females have similar markings; however, males are brighter and more boldly patterned. The male has a black-and-white patterned face with a buffy forehead. There is a brown patch on the rear crown and nape, and a set of six forward-facing, comma-shaped black plumes arise from the top of the bird's head. The breast is gray and the sides and flanks are streaked with white. The remaining underparts are buffy with black "scaling" and a chestnut patch at center of the belly. The adult female is similar but duller and browner, with the head entirely brownish gray and the belly lacking a chestnut patch (Calkins et al. 1999).

California quail occur in scrub habitat primarily in California, Oregon, and Washington. This bird prefers habitats such as chaparral and coastal sage scrub characterized by a dense cover of shrubby perennials that are interspersed with patches of open areas supporting annuals and other low forms of vegetation. The quail's primary diet consists of seeds, leaves, and flowers from grasses, shrubs, and trees but can also include berries, catkins, plant galls, and insects (Calkins et al. 1999).

Typically monogamous, the California quail spends most of the year in large groups called coveys (Mastrup 2002). Coveys, which can typically range from 30 to 70 individuals, are usually formed in August and September and consist of several family groups, including parents and their offspring. The quail in these coveys perform all of their daily activities as a group, including roosting together at night and feeding together during the day.

The California quail can now be found within and well beyond the boundaries of its historical range. Breeding surveys conducted in California from 1968 to 2003 indicate a generally stable population trend (Zornes and Bishop 2009). Unfortunately, there is currently no reliable population estimate for California quail within Bird Conservation Region (BCR) 32, in which the Refuge is included; therefore, the Western Quail Management Plan (Zornes and Bishop 2009) uses harvest by hunters as an index to quail abundance. A rough estimate of average annual harvest in BCR 32 for 2002–2004 was 200,000 birds.

The California quail is recognized as an upland game bird and, where permitted, is hunted over much of its range. It is not a species covered by the Migratory Bird Treaty Act (MBTA) of 1918, as amended. According to the information available, the present levels of hunting do not appear to have negative effects on this species' population levels. The largest harvest of this species occurs in California. In 1992, approximately 0.8 million birds were taken by California hunters (Calkins et al. 1999). Based on the results of California's 2000 Game Take Hunter Survey, quail hunting is the third most popular form of hunting in terms of time spent in pursuit (Mastrup 2002). In 2000, the average seasonal bag of California quail per hunter was 10.6, the average number of California quail bagged per day hunted was 1.9, and the average number of days in the field hunting California quail was 5.7 per hunter (Mastrup 2002). These numbers are subject to fluctuation, just as the size of the quail population fluctuates in any given year due to climatic conditions.

For the 2010/2011 archery and firearm hunting season, where permitted in San Diego County, California quail were hunted from the third Saturday in October extending through the last Sunday in January. The bag limit was 10 quail in any combination of species per day, and the possession limit was double the daily bag limit. Hunting quail using falcons was permitted from the third Saturday in August extending through the last day in February. The bag limit and possession limit were the same as for archery and firearm, with hawking hours designated as sunrise to sunset.

In 2007, surveys were conducted to assess habitat usage and relative abundance of various game species, including California quail, on portions of the McGinty Mountain, Las Montañas, and San Miguel Mountain areas of the Otay-Sweetwater Unit (Dudek & Associates 2008). To determine relative abundance of California quail, bird call count surveys were conducted at 50 point sample locations in April 2007 and again in June 2007 (Dudek & Associates 2008). Relative abundance estimates were made by averaging the number of calls recorded for all of the sample locations within a sampled vegetation type. Quail calls were heard in all three survey areas. On McGinty Mountain, quail were present in both chaparral and coastal sage scrub habitat but were more abundant in chaparral than coastal sage scrub. In the Las Montañas and San Miguel Mountain areas, quail were also found to be more abundant in chaparral areas than in coastal sage scrub. Surveys were not conducted on the area south of Otay Lakes Road, but the chaparral vegetation found in this area is expected to support

California quail at abundance levels similar to those encountered in chaparral vegetation within the Las Montañas and San Miguel Mountain areas.

Based on the survey results, the expected highest use areas for quail on McGinty Mountain would occur at the upper elevations of the mountain (ranging from an elevation of about 1,200 feet [366 meters] to 2,100 feet [640 meters] at the top of the mountain). In the Las Montañas area, the expected highest use area would be on the south side of Highway 94, covering much of the area from 1,000 feet (305 meters) south of Highway 94 to the southern boundary of the Refuge in this area. The expected highest use areas in the San Miguel Mountain area include the upper west-facing slopes of San Miguel Mountain and an area of north-facing slopes just below Mother Miguel Mountain.

## Mountain Quail

The mountain quail (*Oreortyx pictus*) is the largest of the native quail in California. Measuring about 10 to 12 inches (25 to 30.5 centimeters) in length, this quail has a long, slender black plume atop its head, a chestnut throat broader with white, and bluish gray breast, upper back, and head. The sides are chestnut with broad black and white stripes (Mastrup 2002). Although this species of quail occurs in various locations throughout California, it is only found in certain habitat types, typically shrub-dominated communities such as chaparral. The populations in the Sierra Nevada and in California's coastal ranges appear to be stable (Winter 2002). Mountain quail forage in shrub and forest communities under the canopy and at the edge of shrub or tree cover. Primary foods are plant materials, with less than five percent of the diet composed of invertebrates (Gutierrez and Delehanty 1999).

Although not recently documented on the Refuge, isolated populations of mountain quail were located on the eastern slope of McGinty Mountain, as well as over most of Otay Mountain, which abuts the Otay Mesa and Lakes area of the Refuge, in 2000 during surveys conducted for the San Diego County Bird Atlas project (Unitt 2004).

## Dove

Four species of dove have been documented on the Refuge: mourning dove (*Zenaida* macroura), white-winged dove (*Zenaida asiatica mearnsi*), Eurasian collared-dove (*Streptopelia decaocto*), and common ground-dove (*Columbina passerina*). Of these, mourning dove, white-winged dove, and Eurasian collared-dove can be hunted in California in accordance with CDFW hunting regulations. The hunting season for dove is generally September 1 through 15 and from the second Saturday in November extending for 45 days, although the season may vary from year to year. There is currently no open hunting season on common ground-doves in California.

<u>Mourning Dove</u>. The mourning dove is a mid-sized bird with a small head and long graduated tail. The total length of this species ranges from 10.4 to 13.4 inches (26.5 to 34 centimeters) for a male and 8.9 to 12 inches (22.5 to 31 centimeters) for a female. It is grayish blue or grayish brown above and buffy below, with black spots on the wing coverts and behind the eye. The wing and tail feathers are gray with black-bordered white tips on the tail. This dove has a delicate, black bill and dull red legs and feet. The eyes are dark brown bordered by bluish skin (Otis et al. 2008a).

Mourning doves are habitat generalists that can be found in both urban- and rurally-developed landscapes, as well as native habitats such as grasslands, coastal sage scrub, and chaparral. They are almost always seen feeding on the ground, with approximately 99 percent of their diet consisting of seeds from cultivated and wild plants (Otis et al. 2008a).

The mourning dove is classified as a migratory bird under the MBTA. The MBTA permits hunting of migratory birds and gives individual states the ability to impose more restrictive regulations for such things as hunting seasons and daily bag limits, but it does not permit states to enact regulations more liberal than the Federal frameworks. The mourning dove is the most harvested migratory game bird in North America, with some 20 million mourning doves, representing 5 to 10 percent of the mourning dove population, harvested annually by approximately one million hunters (Otis et al. 2008b; Seamans et al. 2011).

In 2001, a National Mourning Dove Planning Committee was formed to develop guidelines that could be used to prepare harvest management plans for mourning doves. As a result, the Mourning Dove National Strategic Harvest Management Plan was completed in July 2003 and approved by all four flyway councils by August 2003. The purposes of this plan were to promote the concept of coordinated management of mourning doves to: 1) insure uniformity of regulatory action and equitable conservation across the species range; 2) acknowledge the need to recognize demographic differences among management units within the United States; and 3) acknowledge that the knowledge base supporting the harvest management system in place at the time of the plan's approval needed improvement. The plan also acknowledged the need for future recommendations regarding management unit-specific harvest strategies and the initiation of new, long-term monitoring efforts (USFWS 2003a). The compilation of data needed to provide useful assistance in the harvest regulation process was expected to take several years to complete; therefore, the USFWS Regulations Committee requested that interim mourning dove harvest management strategies be developed for each management unit based on currently available information.

An initial mourning dove harvest strategy was approved in 2004 for the western management unit, and a revised strategy was issued in 2008. In 2008, the Service accepted and endorsed the interim harvest strategies for the western management unit, determining that the interim mourning dove harvest strategy was an important step towards implementing the previously approved Mourning Dove National Strategic Harvest Plan. In 2009, the interim harvest strategy was successfully implemented (76 FR 44730, July 26, 2011).

The 2008 Mourning Dove Harvest Management Strategy for the Western Management Unit uses hierarchical modeling techniques to produce composite estimates of dove trends at the management unit scale. Composite estimates of trends are derived from four data sources, including call count surveys of doves heard (1966–2006), call count surveys of doves seen (1966-2006), North American Breeding Bird Surveys (1996–2006), and indirect population growth rate estimates (2003–2006) calculated from harvest and banding data (Otis et al. 2008b). The management goal for this strategy is to optimize harvest of mourning dove in a sustainable fashion, which is to be accomplished by learning how changes in hunting regulations affect changes in harvest rates, vital population rates, and abundance.

The Final Rule for Migratory Bird Hunting; Final Frameworks for Early-Season Migratory Bird Hunting Regulations for the 2011/2012 migratory bird hunting season (76 FR 54052, August 30, 2011) identified the mourning dove hunting season as not more than 60 days, which was split between two periods, September 1to 15 and November 1through January 15. In addition to mourning doves, take of white-winged doves and Eurasian collared-doves was also permitted. The daily bag limit in California during the 2011/2012 season was 10 mourning and white-winged doves in the aggregate. There was no limit for Eurasian collared-doves.

The mourning dove is one of the most widely distributed and abundant bird species in North America (Seamans et al. 2011). A recent estimate of the fall population of mourning doves in

the United States was 350 million (Otis el al. 2008b). The Service annually collects information on the abundance and harvest of mourning doves in the United States. The most recent report was provided in 2011 (Seamans et al. 2011). Abundance is reported primarily as trends in the numbers of doves heard per route during the annual Mourning Dove Call-count Survey.

Additional input is provided by the number of doves seen during the call count survey, as well as birds seen during the annual Breeding Bird Survey. The 2011 report states that based on the call count heard data, as well as the Breeding Bird Survey, it appears that the abundance of mourning doves decreased in Western Management Unit, which includes California, during both the long term (1966–2011) and during the past 10 years. There was no evidence of a change in abundance in the Western Management Unit over the past two years. About 15 percent of the total mourning dove in the United States occurs within the Western Management Unit (Seamans et al. 2011).

As described for California quail, surveys were conducted in 2007 on the Refuge to assess the habitat usage and relative abundance of several game species, including the mourning dove. As with the quail, these surveys took place within the McGinty Mountain, Las Montañas, and San Miguel Mountain areas of the Otay-Sweetwater Unit (Dudek & Associates 2008). For mourning doves, bird call count surveys were used to determine relative abundance in various habitat types. Estimates were made by averaging the number of calls recorded for all of the sample locations within a sampled vegetation type. Mourning dove calls were heard in all three survey areas. On McGinty Mountain, mourning doves were present in both chaparral and coastal sage scrub habitat, with mourning dove more abundant in coastal sage scrub than chaparral. In addition, there were more doves than quail in coastal sage scrub areas and more quail than doves in chaparral areas. In the Las Montañas area, mourning doves were equally abundant in coastal sage scrub and chaparral. As on McGinty Mountain, there were more doves than quail in coastal sage scrub areas and more quail than doves in chaparral areas. In the San Miguel Mountain area, both mourning dove and California quail were most abundant in chaparral; however, doves were more abundant than quail in these areas, as well as in coastal sage scrub areas. Mourning doves were least abundant in grassland areas.

<u>White-winged Dove</u>. One of 12 subspecies of white-winged dove, the western white-winged dove has been observed on the Refuge. The western white-winged dove is similar in overall appearance to a mourning dove, but is somewhat larger and grayer, with a white band across the middle of the wing that forms a white border along the front of the folded wing. The white-winged dove head and beak are relatively larger than that of the mourning dove, and its beak is slightly downcurved near the tip. Compared to the mourning dove, the white-winged dove tail is shorter and more rounded. The iris of the eye is bright red surrounded by a patch of bare blue skin (Pacific Flyway Council 2003). White-winged doves nest at relatively low densities throughout the Sonoran, Mohave, and Chihuahua deserts of southern and western Arizona, southern California, and southern New Mexico.

The breeding range of the western white-winged dove extends from southeastern Nevada and southeastern California through most of southern Arizona into southwestern New Mexico, and Baja California and Sonora in Mexico. Virtually the entire western breeding population migrates south to spend the fall and winter in western Mexico.

White-winged doves are managed cooperatively by the Service and State wildlife agencies, with management direction provided in the Pacific Flyway Management Plan for Western White-winged Doves (Pacific Flyway Council 2003). The purpose of the management plan is to provide guidelines for cooperative management of the western race of white-winged doves in

the U.S. and Mexico, where practical. The plan goal is to maintain the western white-winged dove populations in a healthy, productive state. Management activities include population and harvest assessment, harvest regulation, and habitat management. Each year to monitor the population status of this subspecies, breeding population and harvest surveys are conducted by biologists and others in Arizona, and harvest data is collected in California and New Mexico; California began collecting harvest data for western white-winged doves in 1992. The information provided by this survey and harvest data is used by wildlife administrators to set annual hunting regulations (Rabe and Sanders 2010).

The Management Plan indicates that in recent times, white-winged dove densities have been greatest in areas near agriculture where food is abundant. The response of white-winged doves to agricultural activities is likely partially responsible for recent large changes in abundance in the southwestern U.S. Hunting seasons for white-winged doves have been permitted in Arizona and California since the turn of the century. In California, Nevada, and New Mexico, seasons and bag limits have remained relatively constant; bag limits in these states are taken together with mourning doves.

In 1992, the Harvest Information Program (HIP) was implemented to coordinate migratory bird harvest information among states and the Service. As part of this program, all dove hunters must register for HIP and surveys are sent to a random sample of registrants before the start of the season in each state. Consistent, timely harvest estimates among states are critical for effective dove management (Pacific Flyway Council 2003).

Research indicates that white-winged doves may be more vulnerable to over harvest than mourning doves (George 1993). A combination of high dove harvest in Arizona during the 1960s, destruction of river-bottom nesting habitat, and a shift in agricultural crops were considered major factors in declining harvests in Arizona in the 1960s. As a result, in 1970 bag limits were reduced. Continued harvest declines prompted further reduction in bag limits (six per day) in 1980. In 1988, season length was reduced from 3 weeks to 2 weeks and half day shooting was implemented in 1989 (Pacific Flyway Council 2003). This downward trend has not been documented in California. From 1992 to 2003, the mean California harvest was 64,644. There were peak harvests of over 100,000 in 1994 and 1997. Based on these figures, there appears to be no clear upward or downward trend in the California data (Pacific Flyway Council 2003). The number of western white-winged doves present on the Refuge is not known and no breeding surveys have been conducted on the Refuge for this species.

<u>Eurasian Collared-dove</u>. This nonnative dove is larger than a mourning dove, gray-brown in color with vinous pink flush, especially on chest. It has a distinctive black collar marking on nape, has dark eyes, and red legs. The tail is not as sharply pointed as the mourning dove.

A native of the Middle East, the Eurasian collared-dove was inadvertently released in the Bahamas in the 1970s. By the late 1970s or early 1980s, Eurasian dove populations were established in southern Florida. Today, this dove is a year-round resident in most of the mid-west, and all of the southwest and northwest states, including California. The number of Eurasian collared-doves present on the Refuge is not known. In California, there is no limit to the number of Eurasian collared-doves that a licensed hunter can take or possess during the hunting season.

<u>Common Ground-dove</u>. The common ground-dove, one of the smallest doves in North America, is about the size of a song sparrow (approximately 6.5 inches long). It is common across the southernmost parts of the U.S. from California to Florida and can be found in

southern California within open habitats and along the edges of more dense habitats. There is no open hunting season on common ground-doves.

## 3.3.4.2 Mammals

A comprehensive survey of the mammals present within the Refuge has not been conducted, but a number of species have been observed directly or detected by tracks, scat, burrows, pellets, or other indirect signs. Mammals present on the Refuge range from small rodents to large species such as southern mule deer (*Odocoileus hemionus fuliginatus*) and mountain lion.

A fairly diverse range of rodent species is expected to be present on the Refuge; however, trapping to thoroughly sample for the presence of these species has not been conducted. Information from various surveys conducted on specific portions of the Refuge over the years does, however, provide some information about the types of species observed or expected to occur on the Refuge. During these surveys, evidence of burrows and dusting areas for Pacific kangaroo rats (*Dipodomys agilis*) was observed in open areas of coastal sage scrub habitat; Botta's pocket gopher (*Thomomys bottae*) diggings were observed throughout the Refuge; desert woodrat (*Neotoma lepida*) nests were identified in rock outcrop areas and cactus patches; and dusky-footed woodrat (*Neotoma fuscipes*) nests were observed in more mesic locations such as drainages and dense scrub and chaparral vegetation (ERCE 1991). Other species such as San Diego pocket mouse (*Perognathus fallax*), California pocket mouse (*Perognathus californicus*), deermouse (*Peromyscus maniculatus*), and California mouse (*Peromyscus californicus*) have also been observed on the site.

California ground squirrel (*Spermophilus beecheyi*), brush rabbit (*Sylvilagus bachmani*), and desert cottontail (*Sylvilagus audubonii*) are the most commonly observed mammals on the Refuge. These species are important prey items for the Refuge's carnivores, raptors, and large snakes (ERCE 1991). Southern mule deer is an MSCP-covered species that inhabits a variety of vegetative communities within the Refuge, including coastal sage scrub, chaparral, oak woodland, grasslands, and riparian habitats. The San Diego black-tailed jackrabbit (*Lepus californicus bennettii*), a CDFW species of special concern, is also known to be present in various locations throughout the Refuge, including the Del Mar Mesa Vernal Pool Unit. This strict herbivore, which ranges throughout southern California with the exception of high-altitude mountain areas, prefers shrubland habitat with intermediate density canopy for cover and open shrub/herbaceous and tree/herbaceous edges for foraging (Zeiner et al. 1988-1990).

In 2002 and 2003, the U.S. Geological Survey conducted bat surveys within the preserved lands of the San Diego County MSCP, including some bat roosting and bat foraging sites located within or immediately adjacent to the Refuge (Stokes et al. 2005). A bat foraging area located along the Sweetwater River was identified as the third richest site within the survey area in terms of species observed, with 11 bat species documented. An additional species, Townsend's big-eared bat (*Corynorhinus townsendii*), was one of six bat species observed at a granite boulder-covered hill on the Refuge near McGinty Mountain (Stokes et al. 2005). Of the 12 species identified on the Refuge, three of these species (Townsend's big-eared bat, western mastiff bat [*Eumops perotis*], and western red bat [*Lasiurus blossevillii*]) have been identified as California Species of Special Concern. A list of the bats observed on the Refuge during the USGS surveys is provided in Appendix G.

A number of carnivores are known to be present on the Refuge, and several others may be present or historically occurred in the area. Some of the species known to be present include striped skunk (Mephitis mephitis), gray fox (Urocyon cinereoargenteus), raccoon (Procyon lotor), coyote (Canis latrans), bobcat (Lynx rufus), and mountain lion (Felis concolor). In 1990, the voters of California approved Proposition 117, making mountain lions a specially protected species in California. It is also an MSCP-covered species. Carnivores potentially and/or historically present on the Refuge include American badger (*Taxidea taxus*), an MSCP-covered species, and ringtail (*Bassariscus astutus*). The presence of a badger den near Sweetwater Reservoir was reported in the 1970s (Pacific Southwest Biological Services 1991); however, subsequent surveys to locate this species on the Refuge have been negative. Although the presence of the secretive ringtail, a nocturnal carnivore, has not been documented on the Refuge, it may be present in some of the large rocky canyon areas within the San Miguel Mountain area and similar habitat elsewhere on the Refuge.

As part of the CCP process, the potential for opening one or more portions of the Refuge for hunting is being evaluated. The location and type of species to be taken varies with the alternatives. Species that have the potential to be hunted on the Refuge depending upon the alternative selected (either Alternative C or D) include big game mammals (i.e., southern mule deer, wild pig [an introduced, nonnative species]) and small game mammals (i.e., brush rabbit, desert cottontail rabbit, jackrabbit). To address the potential effects of hunting, additional information about the native species listed here are provided below.

## Southern Mule Deer

Southern mule deer (mule deer) are present in various locations throughout the Otay-Sweetwater Unit, as well as on the Del Mar Mesa Vernal Pool Unit. The southern mule deer, which is an MSCP-covered species, is the principal food source of the mountain lion, another MSCP-covered species. In addressing the mule deer, the MSCP Plan states "Although not considered sensitive, this broadly distributed species has aesthetic and intrinsic values, and is the only large native herbivore in the plan area, thereby making it an important species to protect" (City of San Diego 1998a).

Mule deer is the only native species of deer in California. It gets its name from its mule-like ears. Mule deer have reddish coats in the summer and grayer coats in the winter (Nelson and Hooper 1975). The most abundant and popular big game animals in California, mule deer have a keen sense of hearing and can easily detect motion. Their vision of stationary objects is, however, poor.

Only male mule deer (bucks) develop antlers, which they shed every winter. It is the physical condition of the buck that dictates antler size and number of points—not age. Bucks will mate with multiple female mule deer (does); therefore, it is not necessary to maintain equal numbers of bucks and does to maintain adequate population levels in a given area (Nelson and Hooper 1975). The breeding season varies throughout the State, occurring from September through January depending upon elevation and latitude. First time breeders are usually 1.5 years old. Fawns are born about seven months after mating, with the peak of fawning occurring from April through July.

The home range of bucks appears to be highly variable, with mean home ranges estimated at 705 acres (285.3 hectares). Smaller home ranges averaging 247 to 741 acres (100 to 300 hectares) have been estimated for doe and fawn groups (Penrod et al. 2006). Actual home range sizes vary depending upon the availability of food, cover, and water. In coastal San Diego County, mule deer are considered resident species, as they are not known to migrate long distances.

Mule deer are herbivores, eating twigs and leaves of shrubs and trees, as well as grasses, weeds, and acorns when available (Nelson and Hooper 1975). Because of their need for visual and escape cover, mule deer are generally found in woodland and shrubland vegetation. These

animals, which require a mosaic of habitat types of different age classes, reach their highest densities in oak woodlands, riparian areas, and along edges of meadows and grasslands (Penrod et al. 2006). In addition, mule deer occur in areas with varying slopes and topography where there is variability in shade and sun exposure.

Little historical information is available regarding the mule deer population on the Refuge. In 2007, surveys were conducted on portions of the Otay-Sweetwater Unit (i.e., McGinty Mountain, Las Montañas, San Miguel Mountain areas) to assess the habitat usage and relative abundance of mule deer in these areas (Dudek & Associates 2008). To determine relative abundance, pellet count surveys were conducted along eight transects measuring one mile (1,609 meters) in length located randomly within the three sampling areas and crossing multiple vegetation types. The surveys were conducted on six days in April 2007 (Dudek & Associates 2008). Surveyors walked the transect line as closely as possible, utilizing GPS, and visually surveyed a corridor about three feet (one meter) wide for mule deer scat.

Mule deer scat observations were very low during this survey. No scat was observed on the two transects in the Las Montañas area, and scat was observed on only two of the three transects in both the McGinty Mountain and San Miguel Mountain areas. A total of eight scat piles were found on four of the eight transects. Within the McGinty Mountain area, one scat pile was found within the oak riparian forest habitat; however, the total area sampled for this vegetation type was relatively small. The three remaining scat piles on the roads, game trails, and foot trails in the Las Montañas area, but none were observed adjacent to the transects within this area. Unfortunately, the number of observations made during this survey was too low to make a meaningful estimate of relative abundance of mule deer in any of the areas beyond the actual raw count of scat pile observed (Dudek & Associates 2008). No surveys were conducted in the Otay Mesa and Lakes area of the Refuge.

CDFW, which has trustee responsibility for the conservation and management of deer and other wildlife in California, has been tasked with providing information regarding mule deer population trends regionally and statewide. In implementing its responsibilities, CDFW is guided by State policies and laws relating to deer and other wildlife. The Fish and Game Code (Section 450) states: "It is hereby declared to be the policy of the Legislature to encourage the conservation, restoration, maintenance, and utilization of California's wild deer populations. Such conservation shall be in accordance with the principles of conservation of wildlife resources set forth in Section 1801 and in accordance with the objectives and elements stated in *A Plan for California Deer*, 1976."

CDFW gathers deer population data throughout the State and has monitored deer habitat conditions on public lands at varying levels of intensity over the years. This data indicates that deer populations in California peaked in the late 1950s to 1960s and are now at a lower level of statewide population (CDFG et al. 1998). This decline it attributed to long-term declines in habitat quality throughout the State brought about by various factors, including development, past fire management practices, increased frequency of wildland fires in some parts of the State, and drought. Today, the deer population in coastal southern California, described by CDFW as the South Coast Deer Assessment Unit, is considered fairly stable; however, it has decreased considerably since 1952, when the population was estimated at about 79,000 deer (CDFG et al. 1998). In 1998, the deer population for this area was estimated at 16,000 to 24,000.

CDFW is also responsible for establishing deer management units and plans and for setting annual deer hunting regulations and limits. California Deer Kill Reports are issued annually to summarize the information gathered from deer tag report cards returned by successful hunters. Data received is analyzed by season or hunt category; zone and hunt (Deer Management Subunit); zone of kill (Deer Management Unit); Deer Assessment Unit; county; Department region; Private Lands Management Area; archery method kill; method of kill; sex; antler class; and land ownership. Also included within these reports are analyses of duplicate kill (hunters killing two deer); county of residence information; deer hunting regulation summary for the year of the report, and deer tag draw summary. All of this data is available online at http://www.dfg.ca.gov/wildlife/hunting/deer/deerhunt.html.

Much of the information included in the Deer Kill Reports is derived directly from returned deer tags (reported kill), but the report also includes estimated kill information, which is the reported kill number times a correction factor which is specific for each zone. This zone correction factor is an estimator of the non-reporting rates specific to each zone and takes into account those successful hunters that failed to submit the report card section of the deer tag. The estimated deer kill is considered a more realistic approximation of the actual deer harvest and is used primarily for population modeling and analysis.

In general, where hunting is permitted in the San Diego region (with some exceptions), the 2011 deer hunting season was split between an archery season (September 3, 2011, through September 25, 2011) and a general method season (October 22, 2011, through November 29, 2011). The portion of the county that includes the Refuge is identified by CDFW in the hunting regulations as Zone D-16. In Zone D-16, some areas were only open to hunting on certain days during these periods. Within Zone D-16, 3,000 tags were available, and the take of one buck with a forked horn or better was permitted per tag. For the 2010 season, hunter success was approximately 12 percent, with an estimated total take for the area of 225 bucks. For the 2011 season within Zone D-16, hunter success was approximately 14 percent with an estimated take for the zone of 421 bucks; and in 2012, estimated hunter success was about 15 percent with an estimated take for the zone of 451 bucks. There were also several special hunts in 2011, including the San Diego antlerless deer hunt, a general method hunt, in which 300 tags are available; a San Diego muzzle loading rifle hunt, allowing the take of a buck or doe, in which 80 tags are available; and a San Diego archery either sex hunt with a split season, in which 1,000 tags are available. In 2010, hunters involved in the San Diego antlerless deer hunt had a success rate of 20 percent. The success rate for the San Diego muzzle loading rifle hunt and San Diego archery either sex hunt was eight percent and six percent, respectively. CDFW also issues archery only tags and there is no quota. Hunters with archery only tags may not possess a firearm or crossbow while hunting with this tag. In 2009, only five deer were taken in Zone D-16 by hunters with archery only tags: statewide, an estimated 286 were taken with these tags. Additional harvest data is available at http://www.dfg.ca.gov/wildlife/hunting/deer/deerhunt.html.

In an effort to address the many issues affecting mule deer populations, the Western Association of Fish and Wildlife Agencies through the Mule Deer Working Group developed the North American Mule Deer Conservation Plan (Mule Deer Working Group 2004). The overall goal of this plan is to achieve ecologically sustainable levels of mule and black-tailed deer throughout their range through habitat protection and management, improved communication, increased knowledge, and ecoregional-based decision making. The plan addresses the need for standardized survey methodologies, population models, and harvest data collection processes that are based on scientifically sound standards and assumptions. From 2006 through 2009, the Mule Deer Working Group published habitat management guidelines for all seven North American ecoregions, including the California woodland chaparral ecoregion in which the lands within the San Diego NWR are located. These guidelines provide comprehensive recommendations to private, tribal, State, provincial, and Federal land managers for maintaining and improving mule deer habitat. In 2011, the Mule Deer Working Group also issued Methods for Monitoring Mule Deer Populations (Keegan et al. 2011), which provides a comprehensive collection of population monitoring methods for mule deer. The intent of this document is to facilitate "collecting and disseminating scientifically defensible and comparable mule deer population information to increase interagency coordination, collaboration, and management capabilities" (Keegan et al. 2011).

## Brush Rabbit and Desert Cottontail

There are four types of rabbits and three species of hares in California, of which two species of rabbits (brush rabbit and desert cottontail) and one species of hare (San Diego black-tailed jackrabbit) are present on the San Diego NWR. Brush rabbits, desert cottontails, and jackrabbits are classified as resident small game by CDFW.

The brush rabbit is a small gray rabbit, measuring about 13 inches (33 centimeters) long and weighing one to two pounds (0.45 to 0.9 kilograms). The desert cottontail, which has brown fur, black-tipped ears, and a large white tail, is slightly larger, averaging about 15 inches (38.1 centimeters) long and weighing from 1.5 to 2.5 pounds (0.68 to 1.13 kilograms).

Brush rabbits and desert cottontail are both abundant, yearlong residents on the Refuge. Brush rabbits tend to occur in dense, brushy areas, particularly the chaparral vegetation on the Refuge (Polite in Zeiner et al. 1988–1990), while desert cottontails occur in more open habitat areas. Both rabbit species are herbivorous, grazing on a wide variety of grasses and forbs in the spring and summer and on tender leaves, twigs, buds, and bark of various species during the fall and winter months. Desert cottontail will also eat fallen fruit and acorns (Polite and Ahlborn in Zeiner et al. 1988-1990). These two rabbit species tend to be most active around dusk and dawn, although they may occasionally also be active at night or during the day.

Brush rabbits and desert cottontails usually nest beneath dense brushy cover on the ground or in cavities that range from three to six inches (7.6 to 15.2 centimeters) in depth. Nests may be lined with dry vegetation and/or fur, and nests are often plugged with dry vegetation if located in a cavity or burrow.

The breeding season for these rabbits is December through June, with peak activity occurring between March and May. Females produce two to four litters per year and have one to six young per litter. Young rabbits remain in the nest for approximately two weeks (Polite and Ahlborn in Zeiner et al. 1988-1990).

In those areas in which hunting is permitted in California (except as described in Section 308(d) of the Fish and Game Code), the general rabbit hunting season is July 1 extending through the last Sunday in January. Rabbits may be taken using falconry during the general rabbit season and from the first Monday following the close of the general season extending through the third Sunday in March. The daily bag limit is five rabbits total, and the possession limit is 10 rabbits.

As of 2013, detailed rabbit population data was not available for the Refuge; however, rabbit scat studies were conducted in April 2007 to establish the relative abundance of rabbits in

various locations and habitats within the Otay-Sweetwater Unit of the Refuge (Dudek & Associates 2008). Survey methods involved conducting surveys along sixteen 328-foot (100meter) long transects that crosses coastal sage scrub, chaparral, oak riparian forest, and riparian scrub habitat within the McGinty Mountain, Las Montañas, and San Miguel Mountain areas of the Refuge. In addition to these linear transects, circular 3.3-foot (one meter) plots were sampled at 65.6-foot (20-meter) intervals along each transect. For each plot, the number of individual rabbit scat piles was counted. In cases where the number of pellets was very high, an estimate was made of the total number of pellets and the number of clusters was recorded. Relative abundance was calculated as the average number of scat piles in each sample plot within the sampled vegetation type.

Survey data indicates that rabbit scat was nearly ubiquitous across the sampling areas. No rabbit scat was found in the plots located within riparian scrub vegetation, and oak riparian forest habitat had the highest observed abundance of scat piles, followed by chaparral and coastal sage scrub. In terms of relative abundance within the areas sampled, the average scat piles per plot ranged from a low of 0.58 piles per plot in the San Miguel Mountain area to 1.79 piles per plot in the Las Montañas area (Dudek & Associates 2008).

### San Diego Black-tailed Jackrabbit

The San Diego black-tailed jackrabbit has long ears with black tips and very long front and rear legs. Generally found in open habitats, including grasslands, sage scrub, and oak woodlands, this jackrabbit is primarily nocturnal. It typically does not inhabit a burrow; rather it stays under shrubs in depressions referred to as forms.

The jackrabbit is considered a small game animal by CDFW. In areas where hunting is permitted in California (except as described in Section 308(d) of the Fish and Game Code), hunting season for jackrabbits is year round, there are no daily bag or possession limits; shooting hours are from one-half hour before sunrise to one-half hour after sunset.

Although this species exhibits natural fluctuations in population size and distribution, habitat loss associated with urban development has affected the total population size and distribution of this species throughout portions of its range. As a result, the San Diego black-tailed jackrabbit is included on CDFW's list of species of special concern (CDFG 2011). The extent of the Refuge's jackrabbit population was not known in 2013.

## 3.3.4.3 Reptiles and Amphibians

The habitats in coastal southern California provide support for a substantial number reptile and amphibian species, one of the richest herpetofaunas in the United States. Among these species are several with federally listed and/or State protected status (Fisher and Case 2000). Because of the range of habitats present within the San Diego NWR, many of the species known to occur in coastal southern California are expected to occur at one or more locations within the Refuge. A list of the species known to occur on the Refuge, including several species of conservation concern (e.g., San Diego horned lizard [*Phrynosoma coronatum blainvillei*], orange-throated whiptail [*Cnemidophorus hyperythrusbeldingi*], silvery legless lizard [*Anniella pulchra pulchra*], red diamond rattlesnake [*Crotalus ruber*], southwestern pond turtle [*Actinemys marmorata pallida*]) is provided in Appendix G.

Although not listed as Federal or State threatened or endangered species, the southwestern pond turtle is included on the list of Amphibian and Reptile Species of Special Concern in California (Jennings and Hayes 1994). It is also a covered species under the San Diego MSCP. Suitable habitat for the southwestern pond turtle occurs on the Otay-Sweetwater Unit within portions of

the Sweetwater River corridor, as well as in portions of Steele Canyon Creek that extend east to west through the Las Montañas area. A single southwestern pond turtle was identified on the Refuge in Steele Canyon Creek in 2010. No turtles were detected within the Sweetwater River during surveys conducted in 2002 by USGS, nor were they detected in artificial ponds in Coon Canyon and Wild Man's Canyon in the San Miguel Mountain area of the Otay-Sweetwater Unit during surveys conducted in 2003 (Madden-Smith et al. 2005).

Based on survey results, the two areas surveyed by USGS were identified as possessing high habitat quality that could have the potential to support pond turtles. This ranking takes into consideration the presence of deep pools and slow moving water, basking sites, aquatic refugia, streamside refugia, and upland nesting habitat, but it does not take into consideration threats, such as the presence of non-native species that may prey on pond turtles or disturbance related to human activities (Madden-Smith et al. 2005). Both of these factors have the potential to render the sites on the Refuge as less suitable for pond turtles than the habitat quality may suggest.

Several reptiles and amphibians found on the Refuge, including bullfrog (*Lithobates* [*Rana*] catesbeianus), African clawed frog (*Xenopus laevis*), and red-eared slider (*Trachemys scripta elegans*), are non-native, invasive species that can severely limit the presence of native herpetofauna such as southwestern pond turtle, California red-legged frog, and arroyo toad. Although the latter two species are not currently present on the Refuge, reestablishment of viable populations of these species, which historically occurred in the area, would be difficult if these invasive species are present within suitable habitat areas.

# 3.3.4.4 Fish

No native fish occur on the Refuge, but at least four species of non-native fish are present within the Sweetwater River, including mosquito fish (*Gambusia* sp.), carp (*Cyprinus carpio*), green sunfish (*Lepomis cyanellus*), and largemouth bass (*Micropterus salmoides*). There is also the potential for black bullhead (*Ameiurus melas*) to be present in some portions of the floodway. All of these species are known to prey on frog eggs and larvae, representing a threat to red-legged frogs and arroyo toads. Largemouth bass are also a threat to southwestern pond turtle hatchlings.

# 3.3.4.5 Terrestrial and Aquatic Invertebrates

Although the Refuge is believed to support a diverse array of terrestrial invertebrates, little is known about the diversity, abundance, or distribution of the species present. The surveys that have been conducted within various areas of the Refuge in the past have identified numerous species of butterflies, various species in the order Diptera (true flies) and the order Coleoptera (beetles and weevils), as well as a variety of beetles in the genus Eleodes. During surveys conducted in the McGinty Mountain area in 1995, 33 species of butterflies were observed. In spring 2011, Keng-Lou 'James' Hung, a graduate student from UCSD, collected more than 125 species in the family Apidae (bees) on the Refuge during a study of bee species found in various coastal sage scrub locations in San Diego County. Of the species identified during the study, 35 species found on the Refuge were not collected elsewhere in the county.

A large number of aquatic and semi-aquatic insects are also present in the various riparian and other wetland areas on the Refuge, and ticks are very abundant in shrubland areas (Dudek & Associates 1994). The vernal pools on the Refuge also support a unique array of aquatic invertebrates, including two species of endangered fairy shrimp.

The endangered, threatened, and rare terrestrial and aquatic invertebrates present on the Refuge are described under the section "Federally and State Listed Endangered and Threatened Species."
# 3.3.4.6 Wildlife Corridors

A wildlife corridor, as defined by San Diego County's Biological Mitigation Ordinance (Section 86.508), is "a specific route that is used for movement and migration of species," while a linkage is defined as "an area of land which supports or contributes to the long-term movement of wildlife and genetic material." These two terms are often used interchangeably to describe the need to connect core areas within the San Diego MSCP planning area for purposes of facilitating animal movement between areas of habitat or between habitat and geographically discrete resources (e.g., water) and maintaining demographic and genetic exchange between wildlife populations residing within geographically disjunct areas (Hierl et al. 2005). For large animals (e.g., mule deer, mountain lion), corridors provide a link between habitat patches, increasing the area available for dispersal, foraging, and breeding. For smaller animals, the corridor itself may provide habitat adequate to sustain viable populations.

The San Diego MSCP (City of San Diego 1998a) established 16 core biological resource areas within the MSCP study area boundary, as well as numerous associated habitat linkages, for a total of about 202,757 acres. Portions of three of these 16 core areas are preserved within the Otay-Sweetwater Unit. Specifically, the refuge lands within the McGinty Mountain area are located within Core Area 8 (McGinty Mountain/Sycuan Peak-Dehesa), refuge lands within the Sweetwater River and San Miguel Mountain areas are included within Core Area 7 (Sweetwater Reservoir/San Miguel Mountain/Sweetwater River); and the refuge lands within the Otay Lakes and Mesa area are included within Core Area 6 (Jamul Mountains). Habitat linkages are identified that connect these core areas to each other, as well as to other regional core areas. The Sweetwater River corridor located between San Miguel Mountain and McGinty Mountain (Biological Linkage L) is an important linkage that is located within and adjacent to the Refuge. The Otay Mountain/Jamul Mountains to Sycuan Peak linkage (Biological Linkage N) is located outside the Refuge boundary but provides a link for wildlife movement between the McGinty Mountain area and the Sweetwater River, San Miguel Mountain, and Otay Lakes and Mesa areas of the Refuge. The Del Mar Mesa Vernal Pool Unit is included within Core Area 14 (Los Peñasquitos Lagoon/Del Mar Mesa/Peñasquitos Canvon).

# 3.3.5 Invasive and Exotic Species

## 3.3.5.1 Invasive Plant Species

Invasive species are organisms that have been introduced into a non-native ecosystem and are causing or are likely to cause harm to the environment, economy, or human health. Invasive species can be plants, animals, or other organisms (e.g., microbes), and human actions are the primary means of invasive species introduction. Under favorable conditions, introduced exotic or alien (invasive) species can become established and outcompete a site's native species. In the case of plants, altered hydrologic, soil, and fire regimes are the primary factors contributing to invasive plant germination and establishment.

Invasive species are one of the most significant threats to the NWRS (Haskett 2007). This threat is clearly visible on the San Diego NWR where over 100 species of non-native plants occur. Invasive plant species often displace the native species and/or change species composition, community structure, or ecosystem function (Bossard et. al. 2000). Invasive plants represent a serious threat to biological diversity, directly affecting both native plants and wildlife. The distribution, abundance, and diversity of non-native plants currently on the Refuge are not thoroughly known; however, there are sufficient numbers and diversity of these non-native plants on the Refuge to warrant concern. A list of the known invasive plants on the Refuge, which includes a wide range of non-native invasive annual grasses and forbs, is provided in Appendix G.

As part of the implementation of a national strategy for management of invasive species developed by the National Invasive Species Strategy Team in 2003, the San Diego NWR was selected as one of four refuges to participate in a NWRS pilot project to evaluate the similarities and differences in invasive plant inventory objectives and methods across a variety of refuge environments. Results of the pilot project are being used to inform development of a standardized guide or process for conducting invasive plant inventories on refuge lands. As part of the pilot project, Utah State University (USU) was asked to conduct an inventory for targeted invasive non-native plants within selected portions of the refuge. A one-day webinar and a two-day workshop were conducted with refuge staff and partners in September 2011 to develop inventory objectives and identify priority species and areas for inventory.

A total of 1,961.6 acres, which represents 21 percent of the 9,235 acres included within the Refuge at that time, were inventoried by USU crewmembers in 2012. This work included the complete inventory of trails and roads within the McGinty Mountain (536.8 acres) and Las Montañas (284.6 acres) management areas, as well as additional trails and roads in the Sweetwater (506.6 acres), San Miguel (576.4 acres), and Otay Lakes and Mesa (57.2 acres) management areas. About 58 percent of the total inventoried area (1,139.98 acres) supported 4,805 individual infestations or patches of both targeted and non-targeted species. Of the initial 24 targeted invasive plant species, 20 species were located within the inventoried management areas (Table 3-5).

Table 3-5Targeted Invasive Plant Species Identified on the Refuge in 2011			
False brome	Brachypodium distachyon		
Sahara mustard	Brassica tournefortii		
Ripgut brome	Bromus diandrus		
Red brome	Bromus madritensis spp. rubens		
Italian thistle	Carduus pycnocephalus		
Starthistle (tocolote)	Centaurea melitensis		
Crown daisy	Chrysanthemum coronarium		
Andean pampasgrass	Cortaderia jubata		
Pampasgrass	Cortaderia selloana		
Саре іvy	Delairea odorata		
Stinkwort	Dittrichia graveolens		
Perennial veldtgrass	Ehrharta calycina		
Fennel	Foeniculum vulgare		
French broom	Genista monspessulana		
Shortpod mustard	Hirschfeldia incana		
Tree tobacco	Nicotiana glauca		
Scotch thistle	Onopordum acanthium		
Crimson fountaingrass	Penniseum setaceum		
Big periwinkle	Vinca major		
Rattail fescue	Vulpia myuros		

Source: Evardchuk et al. 2012

The four targeted invasive species that were not identified during the surveys for the pilot project include Scotch broom (*Cytisus scoparius*), Spanish broom (*Spartium junceum*), Portuguese broom (*Cytisus striatus*), and crystalline iceplant (*Mesembryanthemum crystallinum*). To date, these species have not been identified elsewhere on the Refuge, although crystalline iceplant is likely to occur in some disturbed portion of the Refuge.

Data on diversity, abundance, and distribution of invasive exotic plant species generated by this pilot project will be used to:

- Inform future eradication efforts (early detection and rapid response, EDRR);
- Inform development of resource management plans;
- Increase the efficiency and effectiveness of invasive plant management;
- Protect and maintain existing restoration projects;
- Increase funding support for invasive plant eradication or control; and
- Facilitate partnerships for invasive plant management at the refuge and larger landscape scale.

Various upland areas within the Refuge—particularly recently burned areas and areas disturbed in the past by ranching and other agricultural activities, utility installations, and other human activities—typically experience some level of invasion by non-native plants. Invasive plant species in these areas consist primarily of non-native grasses and annual weeds (e.g., wild oats, bromes [*Bromus* spp.], ryegrasses, mustard species, filarees [*Erodium* spp.], fennel, thistles [*Cirsium* spp.], wild radish [*Raphanus raphanistrum*]). Periodic surveys are conducted of vulnerable areas on the Refuge to ensure early detection of invasive species known to be present elsewhere in coastal southern California. If new invasive species are detected, actions are taken to control new invaders and avoid further invasion into native habitat areas. Species of particular concern include but are not limited to perennial pepperweed (*Lepidium latifolium*), carnation spurge (*Euphorbia terracina*), Canary Island starthistle (*Volutaria canariensis*), globe chamomile (*Oncosiphon piluliferum*), barbed goatgrass (*Aegilops triuncialis*), and bladderflower (*Araujia sericifera*).

Invasive plants present in the Refuge's freshwater habitats that can adversely affected habitat quality include giant reed (*Arundo donax*), castor bean (*Ricinus communis*), tamarisk (Tamarix sp.), pampas grass, cape ivy, Peruvian pepper (*Schinus molle*), Brazilian peppertree, and common periwinkle (*Vinca minor*).

Non-native plants on the Refuge also include exotic plant species that represent remnants of past human disturbance. Examples include olive and other orchard tree specimens, various species of eucalyptus trees and shrubs, palms, and Brazilian peppertree. Some of these exotic trees and shrubs do not appear to be spreading, while others, such as some eucalyptus species, have naturalized and continue to reproduce.

On the Refuge, invasive plants are controlled using a combination of mechanical (i.e., physical removal either by hand, hand tool, or heavier equipment) and chemical (i.e., conventional herbicides applied in accordance with label requirements) methods. Other methods that are available but are not currently being used include biological control (i.e., introduction of a known natural predator or parasite) and controlled burns. A more detailed discussion of invasive plant control on the Refuge is provided in the Integrated Pest Management Plan that accompanies this CCP (Appendix D).

## 3.3.5.2 Invasive and Exotic Wildlife

Just as non-native plants can adversely affect native species composition and habitat quality, animal invaders also threaten native species by competing with and displacing or preying on indigenous wildlife, acting as vectors or reservoirs of disease, and physically altering habitats (Pimentel et al. 2005). Examples of how noninvasive wildlife can adversely affect native species are presented in the following text.

## **Invasive or Exotic and Parasitic Birds**

Several non-native bird species present in San Diego County including European starlings and wild turkeys (*Meleagris gallopavo*), have the potential to impact Refuge resources. Starlings are already present on the Refuge, while the range of the introduced wild turkey has not yet expanded to include Refuge lands. There are also several other non-native bird species present on the Refuge that do not appear to be adversely affected the Refuge native bird species, possibility because they do not occur in large numbers on the Refuge. These include the rock dove (*Columba livia*), Eurasian collared-dove, and house sparrow (*Passer domesticus*).

European starlings have the potential to affect native birds through competition for nest sites with secondary cavity-nesting species such as acorn woodpecker, Nuttall's woodpecker, downy woodpecker (*Picoides pubescens*), western bluebird, ash-throated flycatcher (*Myiarchus cineraeus*), and oak titmouse.

Although a native species, the brown-headed cowbird (*Molothrus ater*) is a brood parasite that lays its eggs in the nests of open cup-nesting passerine birds. Nestling cowbirds are larger, grow faster, beg more effectively, and compete with the host nestlings to the extent that most nests parasitized by cowbirds fledge no host young. Impacts of cowbirds on threatened and endangered birds such as California gnatcatcher, least Bell's vireo, and southwestern willow flycatcher (*Empidonax traillii extimus*) are well documented. Data on brood parasitism by brown-headed cowbirds on the Refuge have not been collected within the last 15 years. However, of 591 nests examined on Sweetwater Authority lands adjacent to the Refuge, only 0.85 percent were parasitized by a cowbird (Famolaro 2009). This low rate of parasitism may be a result of the Sweetwater Authority's active cowbird trapping program, which involves active trapping from mid-March through mid-July at three locations: the Sweetwater Dam, the upper end of the Sweetwater Reservoir, and the Bright Valley Farms horse stables.

Wild turkeys, successfully introduced to San Diego County in 1993, are now widespread in higher-elevation areas from the Riverside County line to within 10 miles of the Mexican border (Unitt 2004). They have yet to be recorded on the San Diego NWR, but since the Refuge includes some good-quality turkey habitat (i.e., oak woodlands with a patchy shrub understory) that is connected by riparian corridors of similar habitat to areas inhabited by turkeys, it is reasonable to assume that they may occur on the Refuge within the time period for which the CCP is in effect. Turkeys have the potential to reduce recruitment of oaks and other native plants, alter soil ecological processes through litter disturbance, and eat sensitive native plants and animals, though it is not clear at this time that they have any of these impacts. Exclosure experiments have demonstrated that where turkeys have access to oak woodland habitat, litter cover, abundance of acorns and other hard mast (i.e., bay nuts), and arthropod abundance and diversity are reduced (D. Gluesenkamp, CalFlora, pers. comm. to John Martin, San Diego NWR).

#### Invasive and Exotic Mammals

<u>Cats (*Felis catus*)</u>. Feral and domestic cats are known to prey on native birds, mammals, reptiles, and amphibians. Given that the Refuge shares a boundary with hundreds of homes, it is likely that domestic, abandoned, and feral cats make incursions into the Refuge and kill native animals. Crooks and Soulé (1999) studied domestic cat depredation on small vertebrates at the urban/wildland interface in San Diego. This study found that 32 percent of residents bordering native wildlife habitat in San Diego owned cats, and 77 percent of these cat owners let their cats outdoors. Of the cats that went outdoors, 84 percent brought prey back to the house, with each of these cats bringing back an average of 24 rodents, 15 birds, and 17 lizards each year. Using these data, Crooks and Soulé estimated that at an urban interface with about 100 homes, cats brought back about 840 rodents, 525 birds, and 595 lizards annually. These are likely underestimates of predation, as they only address animals that the cats bring back to the house.

Barratt (1997) found that radio-collared suburban cats routinely made incursions of several hundred meters into adjacent native wildlife habitat. Given the results of these studies and the high probability that abandoned and feral cats are also present in this urban interface, it is likely that wildlife in those areas of the Refuge located near urban interfaces experience some level of cat depredation. However, at present, there is little evidence that feral and domestic cats pose a significant problem to wildlife on the Refuge. This is likely because cat numbers, movements, and depredations on wildlife are currently reduced by the coyotes, which prey on cats and other small mammals present within the Refuge.

Crooks and Soulé (1999) found cat carcasses in most habitat fragments occupied by coyotes, found cat remains in 21 percent of coyote scat examined, and observed that 25 percent of their radio-collared cats were killed by coyotes. Coyotes are frequently seen on the Refuge, but feral or domestic cats are rarely, if ever, detected. In 2,400 hours of operation of nocturnal trail cameras on the Refuge, no cats were detected, and coyotes were detected over 80 times (Dana Morin, Virginia Tech University, pers. comm. to John Martin, San Diego NWR). Cat depredations on wildlife can be managed by supporting the continued presence of coyotes on the Refuge, through maintenance of extensive high-quality habitat, through prohibition of coyote hunting, through land acquisition to maintain habitat connectivity between currently disjunct Refuge parcels, and by taking steps to minimize impacts to the Refuge's coyote population due to road mortality.

<u>Feral pigs (Sus scrofa)</u>. Feral pigs are a non-native species known to occur in California and throughout the United States. These wild populations can consist of escaped domestic stock, introduced European wild boar, or a hybrid of both types. They are considered an invasive species in California and the rest of the Americas (California Department of Parks and Recreation [CDPR] 2013).

The environmental and agricultural damage caused by feral pigs has been widely documented in scientific literature and media reports (USDA Forest Service 2013). Feral pigs cause substantial damage across the United States; conservative estimates of the financial cost of this damage nationwide are in the range of \$1.5 billion annually (West et al. 2009). As a result, several feral pig eradication and control efforts have been accomplished or are underway across the country.

Until recently, feral pig populations in San Diego County have been very low (a few individuals) or non-existent. Over the past several years, however, feral pigs have been introduced by people, either intentionally or inadvertently, and populations have become

established in several areas within the region. As of 2013, an estimated 300 to 500 feral pigs were present in San Diego County (CDPR 2013). As of January 2014, feral pigs were not known to be present on any lands within the San Diego NWR; however, models for geographic expansion of San Diego County pig distribution predict that pigs inhabiting oak woodland and chaparral in and around the Capitan Grande Indian Reservation have the potential to reach the Refuge within one to two dispersal events (CBI 2009). It is not clear how frequently pigs cross suboptimal habitat to colonize new areas of high-quality habitat; thus, it is difficult to accurately predict when pigs might be likely to colonize the Refuge.

Feral pig populations can grow rapidly and dispersal can result in pigs quickly colonizing and populating new areas (Waithman et al. 1999) resulting in damage to habitat, competition with native species, negative impacts to drinking water quality, damage to agriculture and rangelands, destruction of archeological sites, and transmission of diseases to livestock and humans (CDPR 2013). As habitat generalists, these opportunistic omnivores can be found in a variety of habitats, although they appear to prefer riparian and oak grassland habitats. They are known to eat almost anything from grass, worms, and insects to young fawns, small mammals, eggs and chicks of ground-nesting birds, and reptiles (CBI 2009, CDPR 2013), but their diet generally consists of plants (e.g., roots, tubers, fruit, acorns). Feral pigs cause extensive and severe soil disturbance due to rooting, wallowing, and trampling. Their foraging techniques can result in serious disturbance to soils and associated plants and animals (Sweitzer and Van Vuren 2002, 2008).

If feral pig populations become established on the Refuge, they will have high potential to adversely affect the federally listed species and MSCP-covered species present on the Refuge, as well as to reduce habitat quality for other wildlife. In addition, pigs may potentially affect human health and safety, cause economic losses both on and off the Refuge, and potentially damage cultural resources through severe soil disturbance. Because pigs have high reproductive potential and begin breeding at a young age, there is a potential for rapid population growth should a population become established on the Refuge.

The feral pig population in San Diego County is not isolated on any particular jurisdiction; they have spread onto Federal lands managed by the Forest Service and BLM, State lands (e.g., parks, wildlife areas, ecological reserves), lands managed by local jurisdictions, tribal lands, and private lands. Many of the lands that could be affected are lands set aside to preserve the region's biodiversity as part of the San Diego MSCP.

To help coordinate feral pig control efforts across the County, an Inter-Governmental Group on Feral Pig Impacts was formed. A Principles of Understanding (POU) was signed by tribal governments and jurisdictions ranging from city governments, State agencies, water districts, Forest Service, and BLM (USDA Forest Service 2013). All these entities agreed to work together, potentially pooling financial and human resources towards a countywide effort to eradicate or control feral pigs recognizing that any course of action necessitates cooperation and willingness of adjacent landowners to work together since pigs move freely across jurisdictional boundaries.

The purpose of the group is to coordinate feral pig management actions, foster collaboration and share information to address the negative impacts of feral pigs to natural and cultural resources, as well as the economic and physical health of the region (USDA Forest Service 2013). To that end, the Forest Service, as the lead agency, prepared an EA, in accordance with NEPA, for the Feral Pig Damage Control Project on Cleveland National Forest and Bureau of Land Management Lands in 2013. The BLM was a cooperating agency in this effort. Concurrent with the EA, CDPR issued a Mitigated Negative Declaration (MND), per the California Environmental Quality Act (CEQA), which also addressed the multiple jurisdictional Feral Pig Eradication and Control Project for San Diego County (CDPR 2013). CEQA responsible agencies included CDFW, City of San Diego, County of San Diego, Vista Irrigation District, and Helix Water District.

### Invasive and Exotic Aquatic Wildlife

Exotic aquatic species known to occur on the San Diego NWR include red swamp crayfish (*Procambarus clarkii*), bullfrog, African clawed frog, red-eared slider, spiny soft-shelled turtle (*Trionyx spiniferus*), mosquito fish, carp, largemouth bass, and green sunfish. It is likely that all of these species were intentionally introduced by humans: as discarded pets, for mosquito control, for food, for sport fishing, or as bait.

Exotic crayfish are thought to threaten amphibian species. Diamond (1996) showed that crayfish, which are abundant on the Refuge, preyed on eggs, larvae, and adults of the California newt (*Taricha torosa*). Crayfish predation was seen as one factor leading to the disappearance of the species, which does not have mechanisms of defense against the new predator. Crayfish are resistant to tetrodotoxin poison in newt adults and eggs, are able to open the egg mass' protective gelatin, and are not recognized as predators by the larval newts, which fail to identify chemical cues from the crayfish (Diamond 1996). An example of the indirect impact on amphibian populations by alien crayfish was provided by Axelsson et al. (1997), who demonstrated that an increase of the predation rate upon the tadpoles of the European green tree frog (*Hyla arborea*) was a consequence of the reduction in the habitat complexity due to the consumption of macrophytes by the alien North American crayfish (*Pacifastacus leniusculus*).

Bullfrogs are a serious impediment to management of aquatic habitat on the Refuge for three species of concern: the California red-legged frog, arroyo toad, and the southwestern pond turtle. Several researchers in central California have noted the decline and eventual disappearance of California red-legged frogs once bullfrogs become established at the same site (Moyle 1976, Fisher and Schaffer 1996). Bullfrogs prey on California red-legged frogs (Twedt 1993) and may have a competitive advantage over them because of their larger size, generalized food habits (Bury and Whelan 1984), extended breeding season (Storer 1933) that allows for production of two clutches of up to 20,000 eggs during a breeding season (Emlen 1977), and the unpalatability of their larvae to predatory fish (Kruse and Francis 1977). Lawler et al. (1999) found that fewer than five percent of California red-legged frogs survived in ponds with bullfrog tadpoles, and the presence of bullfrogs delayed frog metamorphosis. Red-legged frogs have long been extirpated from the Sweetwater River in San Diego County, and bullfrogs likely contributed to their disappearance.

Bullfrogs are also known to eat larval and adult arroyo toads (Sweet 1993) and hatch-year southwestern pond turtles (Chris Brown, US Geological Survey, pers. comm. to John Martin, San Diego NWR). In addition to these sensitive species, they may attempt to eat any animal that they can fit into their mouth, and thus may impact a wide array of wildlife on the Refuge.

African clawed frogs introduced to San Diego County consume native invertebrates, and the eggs, tadpoles, and adults of native frogs (McCoid and Fritts 1980, Stebbins 2003). These nonindigenous frogs inhabit the Santa Clara River estuary in Ventura County, California, and include the endangered tidewater goby (*Eucyclogobius newberryi*) in their diet (Lafferty and Page 1997). Additional native Californian vertebrates consumed by the frog include western toads (*Bufo boreas*), arroyo chub (*Gila orcutti*), and the endangered threespine stickleback (*Gasterosteus aculeatus*) (Stebbins 2003). African clawed frogs are also known to carry a diverse parasite load (Prudhoe and Bray 1982, Tinsley 1996, Lafferty and Page 1997, Kuperman et al. 2004); however, there are no studies to verify if these parasites pose a direct threat to native wildlife. They are also asymptomatic carriers of the virulent amphibian fungus *Batrachochytrium dendrobatidis* (chytrid) (Kraus 2009). On the San Diego NWR, the Mother Miguel Pond supports a dense population of larval (and presumably adult) African clawed frogs.

Exotic turtles, such as red-eared sliders and spiny soft-shell turtles, present problems primarily for the management of the native southwestern pond turtle. Potential threats include serving as vectors for disease and parasites (Holland 1991, Holland 1994, Hays et al. 1999, Jacobson et al. 1999, Cadi and Joly 2004) and competition for resources, including food and basking sites (Spinks et al. 2003, Cadi and Joly 2003, Cadi and Joly 2004). Pond turtles in California have evolved without the presence of other turtles and may be more susceptible to diseases and competition, whereas most non-native species (native to other areas within the United States), such as the red-eared slider, have evolved in assemblages of multiple turtles and are more accustomed to inter-specific competition (Cadi and Joly 2003, Cadi and Joly 2004). Furthermore, pond turtles, which typically are smaller than most of the introduced species and other species of Emydid turtles, are known to display avoidance behavior with larger turtles (Bury and Wolfheim 1973, Lindeman 1999), so it is likely that the larger non-native turtles out-compete them for resources.

As described previously, the only fish on the Refuge are introduced, non-native fish, including mosquito fish. Although mosquito fish are known to prey on the eggs and larvae of desert fishes (Courtenay and Deacon 1983), no native fishes are known or suspected to occur on the Refuge. Therefore, it is not currently clear that mosquito fish affect important resources on the Refuge. They do however eat aquatic invertebrates (particularly mosquito larvae); therefore, they may compete with other native aquatic insectivores for prey. Laboratory and field studies (Blyth 1994, Webb and Joss 1997) of frogs in Australia showed direct predation on tadpoles, injuries to tadpoles in tanks or ponds with mosquito fish, and reduced survival and recruitment of frogs. Analysis of field data from Australia (Webb and Joss 1997) demonstrated a significant drop in frog abundance when mosquito fish were present.

Largemouth bass, together with the bullfrog, is probably the most serious obstacle to management for native aquatic vertebrates on the Refuge. Largemouth bass are native to the eastern half of the United States and Canada, from Quebec and Ontario to the Gulf Coast. Highly prized by anglers, largemouth bass have been introduced as game species throughout the United States and the world (Lee et al. 1980). They are long-lived, large in size, and predatory, eating a wide variety of invertebrates and vertebrates; young fish feed on zooplankton. Their habitat requirements include low turbidity, moderate amounts of cover, moderate to high oxygen content, and low alkalinities (Sigler and Sigler 1996). Largemouth bass are extremely territorial. They spawn at age two or three years, when they dig and defend a nest. From 2,000 to 90,000 eggs are laid in this nest, which the male defends for approximately two weeks. Their nests are negatively influenced by declining water levels. Bass are essentially "gape-limited" predators, meaning that they will eat any animal that they can fit in their mouth. A moderate-sized bass 11.8 inches (300 millimeters) in length has a gape of approximately 1.4 inches (36 millimeters). A hatchling southwestern pond turtle with a 0.9 to 1.2-inch (23 to 31-millimeter) long carapace (Holland 1994), an adult arroyo toad, an adult red-legged frog, or any native amphibian on the San Diego NWR could easily be eaten by a large-mouth bass. Bass are relatively common in the Sweetwater River as it passes through the Refuge. Individual bass exceeding 15.7 inches (40 centimeters) in length have been

observed here. Bass occur in Loveland Reservoir upstream of the Refuge, as well as in Sweetwater Reservoir downstream of the Refuge; therefore, large populations of bass are within easy dispersal distance of Refuge waters and are likely to provide a ready source of colonists.

Green sunfish, common in the Sweetwater River, are predatory centrarchid fish, with a length of 3.15 to 7.1 inches (8 to 18 centimeters). Their diet includes a wide variety of aquatic invertebrates (e.g. crayfish, small fish, aquatic and terrestrial insects, other arthropods). They are known to prey on amphibian larvae, including those of lowland leopard frog (*Rana yavapaiensis*) (Rosen and Schwalbe 2002). It is reasonable to assume that they would prey on other ranid larvae such as red-legged frog, as well as other amphibian larvae on the Refuge.

Another aquatic exotic species established in the Sweetwater River on San Diego NWR is the Asian clam (*Corbicula fluminea*). It is not currently known to negatively affect wildlife species of management concern but, in large concentrations, may reduce the amount of planktonic fauna in the water, reducing food resources for native species.

#### 3.3.5.3 Vectors and Other Pests

A vector is any insect or other arthropod, rodent, or other animal of public health significance capable of causing human discomfort or injury, or capable of harboring or transmitting the causative agents of human disease. The vectors of most interest in open space areas are ticks and mosquitoes. Ticks are blood-eating parasites that live and feed on mammals, birds, and reptiles; they are known carriers of diseases such as Lyme disease and Tularemia, a rare but very infectious disease. Nine cases were reported in San Diego County in 2011. Adult ticks find hosts by "questing," a process in which ticks crawl up the stems of grasses and weeds or perch on the edges of leaves with their front legs extended. When a potential host passes by their extended legs, the ticks climb onto the host. Questing occurs in the fall and potential hosts range from deer, dogs, cats, and horses to humans and other mammals (County of San Diego Vector Control Website, accessed 2/1/12).

Mosquitoes, which are a natural component of wetland ecosystems, including those on the Refuge, are known carriers of disease. To date, 12 mosquito-borne viruses have been identified in California, including western equine encephalomyelitis virus, St. Louis encephalitis virus, and West Nile virus. Of these, West Nile virus is the most prevalent mosquito-borne disease in the United States. The County of San Diego, Department of Environmental Health, Vector Surveillance and Control Program is responsible for the monitoring and control of vectors. Mosquito monitoring is not currently occurring on the Refuge, but it does occur in various locations throughout the county. Vector Control staff is also responsible for monitoring West Nile virus in the county. They do this by trapping and testing mosquitoes and maintaining a database that is shared with other agencies in the State.

A pest of interest to the Refuge that does not affect the health of humans but that can have a devastating effect on mature oak trees is the goldspotted oak borer (*Agrilus auroguttatus*), a beetle native to oak forests in southeastern Arizona. This beetle, which was first detected in San Diego County in 2004, has contributed to the mortality of more than 80,000 trees in southern California (UCR, Center of Invasive Species Research 2011). Coast live oak, which occurs on the Refuge, is one of the oak species susceptible to this pest. Management of the borer is still being developed, but ensuring that infected wood is not transported to other locations is essential to the control of this pest.

# 3.3.6 Federal and State Listed Endangered and Threatened Species

Species included on the Federal and/or State of California list of endangered and threatened species, as well as species proposed for listing, which currently and/or historically occurred within the boundaries of the San Diego NWR, or species that could be present on the Refuge, but have not yet been documented, are described here and listed in Table 3-6. The areas of the Refuge designated as Critical Habitat, per the ESA, are illustrated in Figures 3-19 and 3-20.

Table 3-6 Federal and/or State Listed and Candidate Species Currently Present or Suitable Habitat Present on the San Diego NWR							
Common Name	Scientific Name	Status	Type of Organism	Habitat or Soil Type on the Refuge			
Least Bell's Vireo <sup>1</sup>	Vireo bellii pusillus	FE/SE	Bird	Riverine and floodplain habitats and adjacent native shrubland (Otay- Sweetwater Unit only)			
California Coastal Gnatcatcher <sup>1</sup>	Polioptila californica californica	FT	Bird	Coastal sage scrub			
Southwestern Willow Flycatcher <sup>1</sup>	Empidonax traillii extimus	FE/SE	Bird	Historically, but not currently present on the Otay-Sweetwater Unit; typically nests in riparian habitats			
Yellow-billed Cuckoo	Coccyzus americanus occidentalis	PT/SE	Bird	Not currently present; suitable riparian habitat on the Otay- Sweetwater Unit			
San Diego Ambrosia	Ambrosia pumila	FE	Plant	Coarse sandy loam near drainages and upland areas on clay slopes (Otay-Sweetwater Unit only)			
San Diego Thornmint <sup>1</sup>	Acanthomintha ilicifolia	FT/SE	Plant	Open, isolated patches of clay soil (Otay-Sweetwater Unit only)			
Otay Tarplant <sup>1</sup>	Deinandra conjugens	FT/SE	Plant	Open areas with high clay content soils (Otay-Sweetwater Unit only)			
Mexican Flannelbush <sup>1</sup>	Fremontodendron mexicanum	FE/SR	Plant	Intermittent drainages with southern mixed chaparral (Otay-Sweetwater Unit only)			
Del Mar Manzanita <sup>1</sup>	Arctostaphylos glandulosa ssp. crassifolia	FE	Plant	Presence on the Refuge unknown; possibly in southern maritime chaparral on the Del Mar Mesa Vernal Pool Unit			
Encinitas Baccharis	Baccharis vanessae	FT/SE	Plant	Presence on the Refuge unknown; possibly in chaparral in the Otay Lakes and Mesa area			
San Diego Mesa Mint <sup>1</sup>	Pogogyne abramsii	FE/SE	Plant	Vernal pools (Del Mar Mesa Vernal Pool Unit only)			

Table 3-6 Federal and/or State Listed and Candidate Species Currently Present or Suitable Habitat Present on the San Diego NWR							
Common Name	Scientific Name	Status	Type of Organism	Habitat or Soil Type on the Refuge			
Otay Mesa Mint <sup>1</sup>	Pogogyne nudiuscula	FE/SE	Plant	Vernal pools (Otay-Sweetwater Unit only)			
San Diego Button-celery <sup>1</sup>	Eryngium aristulatum var. parishii	FE/SE	Plant	Vernal pools			
Spreading Navarretia <sup>1</sup>	Navarretia fossalis	FT	Plant	Vernal pools			
California Orcutt Grass <sup>1</sup>	Orcuttia californica	FE/SE	Plant	Vernal pools (Otay-Sweetwater Unit only)			
San Diego Fairy Shrimp <sup>1</sup>	Branchinecta sandiegonensis	FE	Invertebrate	Vernal pools			
Riverside Fairy Shrimp <sup>1</sup>	Streptocephalus woottoni	FE	Invertebrate	Not documented on the Refuge as of 2013; suitable vernal pool habitat on the Otay-Sweetwater Unit			
Quino Checkerspot <sup>1</sup> Butterfly	Euphydryas editha quino	FE	Invertebrate	Shrublands with appropriate primary/secondary host plants (Otay-Sweetwater Unit only)			
Hermes Copper	Hermelycaena (Lycaena) hermes	FC	Invertebrate (butterfly)	Spiny redberry in coastal sage scrub/southern mixed chaparral (Otay-Sweetwater Unit only)			
Arroyo Toad <sup>1</sup>	Anaxyrus (Bufo) californicus	FE	Amphibian	Historically occurred on the Otay- Sweetwater Unit; typically found in slow streams next to uplands			
California Red- legged Frog	Rana draytonii	FT	Amphibian	Historically occurred on the Otay- Sweetwater Unit; typically occurs in riparian and other aquatic habitats			

FE – Federally endangered; FT – Federally threatened; PT – Proposed for listing as federally threatened; FC – Federal candidate species; SE – State endangered; SR – State rare



Figure 3-19. Designated Critical Habitat on the Otay-Sweetwater Unit



Figure 3-20. Designated Critical Habitat - Del Mar Mesa Vernal Pool Unit

In the five-year review for the least Bell's vireo (USFWS 2006b), the Service recommended downlisting the least Bell's vireo from endangered status to threatened status due to an increase in population size since its listing in 1986, an increase in the number of breeding locations throughout southern California, and the success of regional efforts to conserve and manage suitable breeding habitat for the species throughout its range (UFSWS 2006b).

The final rule describing the areas designated as critical habitat for the least Bell's vireo was published in the *Federal Register* on February 2, 1994 (59 FR 4845). This critical habitat encompasses approximately 38,000 acres (15,378 hectares) in 10 areas in Santa Barbara, Ventura, Los Angeles, San Bernardino, Riverside, and San Diego counties, California. The physical and biological features essential to the conservation of this species, referred to as primary constituent elements, include riverine and floodplain habitats (particularly willow-dominated riparian woodland with dense understory vegetation maintained, in part, in a non-climax stage by periodic floods or other agents) and adjacent coastal sage scrub, chaparral, or other upland plant communities (USFWS 1994).

Within the Otay-Sweetwater Unit, critical habitat for the least Bell's vireo has been designated along the Sweetwater River. This portion of the vireo's critical habitat extends along the river floodplain from the northeastern end of Sweetwater Reservoir to about one mile (1.6 kilometers) east of the intersection of Highways 54 and 94 (refer to Figure 3-19). Critical habitat for the least Bell's vireo has also been designated along Jamul/Dulzura Creek to the north of the Lower Otay Reservoir, just outside the Refuge boundary.

The least Bell's vireo is a covered species in two landscape level habitat conservation plans: the San Diego County Multiple Habitat Conservation Plan and the San Diego MSCP. These plans designate large reserve systems that include substantial habitat for the least Bell's vireo and include requirements for monitoring and management actions beneficial to the long-term conservation of the species. Public lands and lands to be conserved through habitat conservation planning efforts include 7,071 acres of riparian habitat.

#### **Species and Habitat Description**

The least Bell's vireo is a small insectivorous, Neotropical migrant songbird. It is drab olivegray in color above and mostly white below, with some gray on the upper breast and yellow on the flanks (USFWS 1998b). This subspecies has indistinct white spectacles and two faint wing bars, with males and females having identical plumage. Male least Bell's vireos are easily distinguished by their song, which consists of a rapid series of harsh, slurred notes that increase in intensity as the song progresses (Grinnell and Storer 1924, Pitelka and Koestner 1942, Barlow 1962, Beck 1996). Phrases of the least Bell's vireo song are alternatively slurred upward and downward and exhibit a "question-and-answer" quality (Grinnell and Storer 1924, Beck 1996). The least Bell's vireo is in the family Vireonidae and is one of four subspecies of Bell's vireo (*Vireo bellii*) that have been recognized (AOU 1957), with each subspecies believed to be isolated from one another throughout the year (Hamilton 1962, USFWS 1998b).

Least Bell's vireos are obligate riparian breeders, typically inhabiting structurally diverse woodlands along watercourses that feature dense cover within three to six feet (0.9 to 1.8 meters) of the ground and a dense, stratified canopy (Goldwasser 1981, Salata 1983a, USFWS 1998b). The understory in these areas is typically dominated by mulefat, California wild rose, poison oak, sandbar willow, young individuals of other willow species, and several perennial species (USFWS 1998b). Important canopy species include mature arroyo and Goodding's willows and occasional cottonwoods, western sycamore, or coast live oak. Least Bell's vireos

primarily forage and nest in riparian habitat, but they may also use adjoining upland scrub habitat (Salata 1983a, Salata 1983b, Kus 2002).

Least Bell's vireos primarily feed on invertebrates, especially lepidopteran larvae, within willow stands or associated riparian vegetation (Miner 1989, Brown 1993), while also occasionally foraging beyond the limits of riparian vegetation, entering adjacent coastal sage scrub, chaparral, and oak woodland vegetation. Foraging in these upland habitats usually occurs within 100 feet (30.5 meters) of the edge of riparian vegetation (Salata 1983a, Salata 1983b, Kus 2002). Least Bell's vireo feeding behavior largely consists of gleaning prey from leaves or woody surfaces while perched or hovering and, less frequently, by capturing prey by aerial pursuit (Salata 1983a, Salata 1983b, Miner 1989).

Least Bell's vireos winter in southern Baja California, Mexico, where they occupy a variety of habitats, including mesquite scrub within arroyos, palm groves, and hedgerows bordering agricultural and residential areas (Kus 2002). These birds generally arrive in southern California breeding areas by mid-March to early April, with males arriving before females and older birds arriving before first-year breeders (Kus 2002). Least Bell's vireos generally remain on the breeding grounds until late September, although some post-breeding migration may begin as early as late July (USFWS 1998b).

Nest site fidelity is high among adults, with individuals typically returning to established breeding territories year after year (Greaves and Labinger 1997, Salata 1983a, Salata 1983b) and in many cases establishing nests in the same shrub that was used in the previous year (Kus 2002). On average, 20 percent of first-time breeders select nesting sites away from their natal drainages (Kus 2002).

Male least Bell's vireos establish and defend breeding territories through singing and physically chasing intruders (Barlow 1962, Beck 1996, USFWS 1998b). Territories range in size from 0.5 to 7.5 acres (0.2 to 3.0 hectares) (USFWS 1998b); however, to date, no significant factors have been identified that account for the variability in territory size throughout this vireo's breeding range (Newman 1992, Kus 2002).

Nest building commences a few days after pair formation, typically in late March, with the female selecting a nest site location and both sexes constructing the nest (Pitelka and Koestner 1942, Barlow 1962, USFWS 1998b). Nests are typically suspended in forked branches about three feet (one meter) above the ground (Nolan 1960, Barlow 1962). No clear preference is indicated for any particular plant species as the nest host (USFWS 1998b). Typically, three to four eggs are laid on successive days shortly after nest construction (Kus 2002). The eggs are incubated by both parents for about 14 days with the young remaining in the nest for another 10 to 12 days (Pitelka and Koestner 1942, Nolan 1960, Barlow 1962). Each nest appears to be used only once, with new nests constructed for each nesting attempt (Greaves 1987). Least Bell's vireos may attempt up to five nests within a breeding season, but they are typically limited to one or two successful nests within a given breeding season (USFWS 1998b).

Fledgling least Bell's vireos expand their dispersal distances from about 35 feet (10.7 meters) the first day to about 200 feet (61 meters) several weeks after fledging (Hensley 1950, Nolan 1960). This distance has been shown to increase to at least one mile (1.6 kilometers) prior to their first fall migration (Gray and Greaves 1984).

Multiple long-term monitoring studies indicate that approximately 59 percent of nests successfully produce fledglings, although on average only 1.8 chicks fledge per nest (USFWS

1998b). Although least Bell's vireo nests appear to be more accessible to terrestrial predators because of their relatively low placement (Franzreb 1989), western scrub-jays (*Aphelocoma californica*) account for the majority of documented depredation events (Peterson et al. 2004). Predation rates can exceed 60 percent of least Bell's vireo nests in a given area within a year (Kus 1999), but typical nest predation rates average around 30 percent (Franzreb 1989), which is comparable to predation rates for other North American passerines (Martin and Clobert 1996, Grishaver et al. 1998, Ferree 2002).

Nest parasitism by cowbirds is another major source of failure for least Bell's vireo nests (Franzreb 1989, USFWS 1998b, Kus 1999, Kus 2002, Griffith and Griffith 2000, Sharp 2002); nests that are parasitized are either abandoned or fledge cowbird chicks rather than least Bell's vireos. It is believed that cowbirds did not historically occur within the least Bell's vireo's range, and therefore, least Bell's vireos have not evolved adequate defenses to avoid loss of productivity due to parasitism (Franzreb 1989, Kus 2002). Parasitism of least Bell's vireo nests may exceed 42 percent in some locations (Kus 1999), but extensive cowbird trapping and focused nest monitoring can substantially reduce parasitism or its effects (Franzreb 1989, USFWS 1998b, Griffith and Griffith 2000, Kus 2002).

Some individual least Bell's vireos have been documented to live at least seven years (Brown 1993, USFWS 1998b), but the average lifespan for this species is substantially lower. First-year survivorship has been estimated to average approximately 25 percent (Greaves and Labinger 1997, USFWS 1998b), which is typical for small passerines. Annual survivorship in subsequent years is estimated to be approximately 47 percent (USFWS 1998b). Annual survival of females appears to be slightly lower than that for males, presumably due to the higher energetic costs of egg production by females (USFWS 1998b).

The least Bell's vireo population in the U.S. has increased tenfold since its listing in 1986, and the number of known territories has increased from 291 to 2,968. The population has grown during each five-year period since the original listing, although the rate of increase has slowed over the last 10 years. Population growth has been greatest in San Diego and Riverside counties, with lesser but significant increases in Orange, Ventura, San Bernardino, and Los Angeles counties. At the time of the listing in 1986, greater than 99 percent of the remaining least Bell's vireos were concentrated in southern California (Santa Barbara County and southward), with San Diego County containing 77 percent of the population (USFWS 1986). Greater than 99 percent of least Bell's vireos still remain in southern California, south of the Tehachapi Mountains and northwestern Baja California (Wilbur 1980, Garrett and Dunn 1981, Franzreb 1989), although the populations are now more evenly distributed with 54 percent of the total population occurring in San Diego County and 30 percent of the population occurring in Riverside County (USFWS 2006b). There has only been a slight shift northward in the species' overall distribution; therefore, despite a significant increase in overall population numbers, the population remains restricted to the southern portion of its historic range (USFWS 2006b).

Several large, regional habitat conservation plans in southern California have addressed the effects of urban development on this species. These plans are expected to provide long-term protection of core occurrences of least Bell's vireos in western Riverside, Orange, and San Diego counties. In addition, compliance-driven and voluntary riparian restoration activities throughout the historic range may have contributed to an increase in riparian habitat since the listing of the least Bell's vireo (USFWS 2006b). In addition, habitat quality has been improved in some areas by removing invasive plant species such as giant reed, salt cedar, perennial pepperweed, and non-native palms.

Cowbird trapping has proven to be a successful tool in halting least Bell's vireo population declines over the short term within a limited area. However, Kus and Whitfield (2005) believe trapping may not be the best method for long-term recovery of the least Bell's vireo because maintaining cowbird populations at low levels may not allow the least Bell's vireo to evolve resistance to cowbird parasitism. Other studies conducted by Sharp and Kus (2006) indicate that managing for dense understory cover may reduce parasitism of least Bell's vireos. Additional research, which is ongoing, will likely provide land managers with a combination of options for addressing the impacts of cowbird nest parasitism on least Bell's vireos.

### Status of the Species within the Refuge

In the early 1990s, the portion of the Sweetwater River that now occurs within the Refuge was believed to support a core population of the endangered least Bell's vireo. From 1987 through 1991, this area supported an average of 30 pairs of vireos, with 30 to 48 territories identified within the reach of the Sweetwater River between the Sweetwater Authority boundary and the Cottonwood golf course. From 2001 through 2011, there has been a significant downward trend in the number of territories identified in this same area. As previously discussed, cowbird parasitism is not the likely cause of the local decline. The observed decline in vireo numbers is highly localized. Vireo populations on adjacent habitat on Sweetwater Authority property, immediately downstream of San Diego NWR, have not declined; however, they were affected by loss of habitat due to wildfire. The spatial pattern of decline suggests that the cause is not a wide-ranging phenomenon such as brood parasites or disease but rather is limited to the habitat on the Refuge. Possible causes for this slow steady decline include successional changes in the riparian vegetation structure in the area and human disturbance.

In addition to the moderate number of vireo territories along the Sweetwater River, the Refuge supports low numbers of territories in small disjunct patches of suitable habitat, such as Steele Canyon Creek, Coon Canyon to the west of San Miguel Mountain, and at Mother Miguel Pond.

#### 3.3.6.1 California Coastal Gnatcatcher (Polioptila californica californica)

#### **Listing and Conservation Status**

The Service listed the coastal California gnatcatcher as threatened on March 30, 1993 (58 FR 16742), stating that the "habitat and range of the gnatcatcher [had] been significantly reduced," and further noting that coastal sage scrub was "one of the most depleted habitat types in the United States" (58 FR 16751). At the time of listing, 58 to 61 percent of coastal sage scrub habitat had been lost in the three counties that supported about 99 percent of the U.S. gnatcatcher population (58 FR 16751). The primary causes for habitat destruction were identified as urban and agricultural development. In addition, wildland fire was identified as a temporary impact that could also lead to permanent habitat degradation. Fragmentation and nest parasitism were also cited as threats.

A final rule establishing critical habitat for the gnatcatcher was published in the *Federal Register* on December 19, 2007 (72 FR 72010) and went into effect on January 18, 2008. As a result, 197,303 acres (79,846 hectares) of Federal, State, local, and private land divided among 11 critical habitat units was designated as critical habitat, including approximately 14,898 acres (6,029 hectares) within Unit 1 (South San Diego County).

The Service completed a five-year review of the coastal California gnatcatcher in September 2010 and concluded that no change in the listing status of the gnatcatcher was warranted for

several reasons, including the fact that the threat of habitat type conversion increased throughout the range of the gnatcatcher since its listing in 1993.

On October 26, 2011, the Service issued a 90-day finding on a petition to delist the coastal California gnatcatcher (76 FR 66255), finding that the petition did not present substantial scientific or commercial information to indicate that delisting of the subspecies may be warranted.

The coastal California gnatcatcher is also designated as a Bird Species of Special Concern by the State of California and is a focal species under California's Natural Community Conservation Planning (NCCP) program. It is also a covered species under the San Diego MSCP, as this MSCP proposes to conserve 68 percent (57,874 acres) of habitat supporting core gnatcatcher populations (City of San Diego 1998), some of which is included within the Refuge. Several subregional coastal sage scrub focused habitat conservation plans, which specifically address the conservation of this species, have been approved or in the late planning stages throughout southern California.

#### **Species and Habitat Description**

The coastal California gnatcatcher is a small, long-tailed member of the thrush family (Muscicapidae) that is endemic to cismontane southern California and northwestern Baja California, Mexico (Atwood 1980, Atwood 1991, AOU 1983). Its body plumage is dark bluegray above and grayish-white below, while the tail is mostly black. The male has a distinctive black cap that is absent during the winter, and both sexes have a slight white eye-ring. Its distinctive call is a rising and falling kitten-like mew note. The gnatcatcher is distinguished from the black-tailed gnatcatcher (*Polioptila melanura*) by its darker body plumage, less extensive white on tail feathers (rectrices 5 and 6), and longer tail.

The gnatcatcher is found on the coastal slopes of southern California, from southern Ventura southward through Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties into Baja California, Mexico, to approximately 30 degrees North latitude near El Rosario (AOU 1957, Atwood 1980). Within its range, the distribution of coastal California gnatcatcher is further defined by relatively narrow elevation limits (Atwood and Bolsinger 1992). In general, inland populations of the gnatcatcher can be found below the 1,640-foot (500-meter) elevation, and coastal populations tend to be found below an elevation of 820 feet (250 meters) (Atwood and Bolsinger 1992). Relatively isolated populations also remain in portions of its former range in Los Angeles, San Bernardino, and southern Ventura counties (USFWS 2010b).

This gnatcatcher typically occurs in or near coastal sage scrub, a habitat characterized by relatively low growing, dry-season deciduous, and succulent plants. Characteristic plants of these communities include California sagebrush, California buckwheat, laurel sumac, lemonade berry, bush penstemon, and various species of sage (*Salvia* spp.) (Atwood 1990, Beyers and Wirtz 1997, Braden et al. 1997a, Weaver 1998). Because the distribution of coastal sage scrub is patchy and its structure and composition is variable throughout the range of the species, gnatcatchers are not uniformly distributed within available coastal sage scrub. Rather, gnatcatchers occur most frequently within California sagebrush dominated stands of coastal sage scrub (Atwood 1990, Atwood et al. 1998, Beyers and Wirtz 1997), particularly on mesas, gently sloping areas, and along the lower slopes of the coast ranges (Atwood 1990).

Gnatcatchers are found in moderately dense stands of coastal sage scrub (Atwood 1980). Beyers and Wirtz (1997) found that nesting territories typically have greater than 50 percent shrub cover and an average shrub height that exceeds 3.3 feet (one meter). The relative density of shrub cover influences gnatcatcher territory size, with territory size increasing as shrub cover decreases, probably due to limited resource availability. Gnatcatchers will use sparsely vegetated coastal sage scrub as long as perennial shrubs are available, although there appears to be a minimum cover threshold below which the habitat becomes unsuitable (Beyers and Wirtz 1997).

Gnatcatchers also use chaparral, grassland, and riparian plant communities when these communities occur adjacent to or are intermixed with coastal sage scrub (Campbell et al. 1998). The use of non-coastal sage scrub habitat is thought to be most common in areas where gnatcatchers in high density are adjacent to productive non-coastal sage scrub habitat areas. Both adults and juvenile gnatcatchers have been observed foraging in non-coastal sage scrub habitats for extended periods of time, especially from midsummer to fall, when volume and quality of drought-deciduous coastal sage scrub foliage declines (Campbell et al. 1998, Preston et al. 1998a). Use of these habitats appears to be less frequent during the breeding season; however, breeding territories have been documented in non-sage scrub habitats (e.g., chaparral, grassland, ruderal habitats). Potential factors contributing to the gnatcatcher's use of alternative habitats may include more abundant food resources, higher survival rates during dispersal, fire avoidance, and cooler microclimate during hot weather (Campbell et al. 1998).

Other parameters that contribute to the quality of habitat for the gnatcatcher include slope, aspect, temperature, and precipitation. In an evaluation of a model used to predict habitat quality for the gnatcatcher, Winchell and Doherty (2008) found higher gnatcatcher occupancy probabilities corresponded with areas that had less than 40 percent slopes, annual precipitation of less than or equal to 13.2 inches (33.5 centimeters), and an average January minimal temperature of greater than or equal to 41 °F. Slope, temperature, and precipitation were also found to have a stronger influence on occupancy than patch size (Winchell and Doherty 2008).

Several studies have suggested that gnatcatchers nest infrequently on very steep slopes (greater than 40 percent) (Bontrager 1991) and Grishaver et al. (1998) demonstrated that nests were more likely to be successful on shallow slopes (less than 19.9 percent slope) than on steeper slopes. However, over a landscape of varied topography, steep slopes are part of gnatcatcher territories. Nesting may be less frequent on steep slopes because these areas are more prone to erosion than gradual slopes and are therefore less likely to meet the minimum vegetation cover threshold necessary for the habitat to be considered suitable for the gnatcatcher (Beyers and Wirtz 1997). The grade of the slope may also affect the type of plant community present, thereby reducing the suitability of the area for nesting. North- and east-facing slopes tend to support chaparral rather than coastal sage scrub communities, whereas gnatcatchers are primarily found in coastal sage scrub (Weaver 1998).

The gnatcatcher is primarily insectivorous, and its diet appears to consist of small arthropods, especially leaf-hoppers (Homoptera), and spiders (Araneae), while true bugs (Hemiptera) such as wasps, bees, and ants (Hymenoptera) are minor components (Burger et al. 1999). Both adults and young consume more sessile than active prey items (Burger et al. 1999).

Gnatcatchers are non-migratory and exhibit strong site tenacity (Atwood 1990). Pairs strongly defend territories during the breeding season against other gnatcatchers and predators, and some will defend territories throughout the year (Preston et al. 1998a). Breeding season territories range in size from less than 2.5 acres (one hectare) to 25 acres (10 hectare) (Atwood et al. 1998, Preston et al. 1998a), with mean territory size generally greater for inland populations than coastal populations (Preston et al. 1998a). During the non-breeding season,

gnatcatchers have been observed to wander in adjacent territories and unoccupied habitat increasing their home range size to approximately 78 percent larger than their breeding territory (Preston et al. 1998a).

Most gnatcatchers first breed at one year of age (Atwood and Bontrager 2001). The gnatcatcher breeding season extends from late February through early August, with the peak of nesting attempts occurring from mid-March through mid-May (Grishaver et al. 1998, Atwood and Bontrager 2001). Nests are constructed over a 4- to 10-day period and are most often placed in perennial species of coastal sage scrub about three feet (1.2 meters) above the ground (Atwood 1990).

Gnatcatchers typically lay clutches of three to five eggs (Atwood 1990, Galvin 1998, Grishaver et al. 1998), and clutch sizes may be influenced by the amount of precipitation immediately preceding nest initiation (Patten and Rotenberry 1999). The egg incubation period is 14 days, and the nestling period is 10 to 15 days (Grishaver et al. 1998). Both sexes participate in all phases of the nesting cycle, and gnatcatcher pairs may produce more than one brood in a nesting season (Atwood 1990, Grishaver et al. 1998).

Juveniles remain within their natal territories up to five weeks after fledging from the nest (Grishaver et al. 1998), with juveniles subsequently dispersing to find their own foraging and nesting territories. Juveniles have been observed to disperse up to 6.2 miles (10.0 kilometers) from their natal territory (Atwood and Bontrager 2001), but they generally disperse less than 1.9 miles (3.0 kilometers) on average (Bailey and Mock 1998, Galvin 1998, Atwood and Bontrager 2001). Dispersing gnatcatchers are apparently able to traverse highly human-modified landscapes for at least short distances (Bailey and Mock 1998). Juveniles begin to establish territories as early as late spring, and territories are established by the end of October (Preston et al. 1998a).

Similar to other passerine species, gnatcatcher mortality is highest for the youngest age class, with much of this attributable to predation of young in nests (Atwood 1990, Braden et al. 1997b) and high mortality rates among dispersing juveniles, as indicated by low re-sighting of banded birds (Bailey and Mock 1998, Galvin 1998). Sources of mortality for gnatcatchers have not been well studied, although physiological stress during cold, wet winter months when food availability may be low is probably the main source of mortality among adults and dispersing juveniles (Atwood 1990, Atwood and Bontrager 2001). Mean average survivorship of gnatcatchers during their first year is estimated to be 29 percent, with annual survivorship for adults 57 percent, although there is probably a high annual variation within and between populations (Atwood and Bontrager 2001). The oldest documented individual was a female at least eight years old (Atwood and Bontrager 2001).

Gnatcatchers develop vocalizations within two weeks of fledging (Grishaver et al. 1998). Male gnatcatchers call more frequently than females; the greatest vocalization rates occur in February, just prior to nest building (mean 238 vocalizations per hour) and lowest in June during brooding of nestlings (mean 67 vocalizations per hour) (Preston et al. 1998b). Calls have been recorded in association with mobbing potential predators, during pair interactions (i.e., pair bonding, copulation, nest building, or delivery of food to nestlings), and following the loss of a mate during the breeding season (Preston et al. 1998b, Atwood and Bontrager 2001).

Since the listing of the gnatcatcher, the Service has worked with proponents of development projects to offset the loss of occupied or potential gnatcatcher habitat. This has been achieved through conservation, enhancement, and/or restoration of coastal sage scrub. Several regional

habitat conservation plans have been designed to provide long-term protection of gnatcatchers in western Riverside, Orange, and San Diego counties through the conservation and management of relatively large contiguous blocks of habitat. In San Diego County, the Otay-Sweetwater Unit protects important blocks of gnatcatcher habitat, with the majority of this habitat designated as critical habitat supporting core populations of the species.

### Status of the Species within the Refuge

Within the Otay-Sweetwater Unit, gnatcatcher populations occur in high-quality coastal sage scrub and persist in high densities. Prior to the Harris Fire in 2007, the Refuge supported approximately 6,175 acres (2,500 hectares) of high-quality coastal sage scrub. Today, in the aftermath of the fire, the Refuge supports only about 3,610 acres (1,460 hectares) of this high-quality habitat, which is distributed in areas such as the lower slopes of McGinty Mountain, the north side of the Las Montañas area, the ridge and associated slopes along the south side of the Par Four area, and the slopes to the west of the Sweetwater River south of Highway 94.

The gnatcatcher population on the Refuge has not been monitored since 2001, well before portions of the Refuge's gnatcatcher habitat were lost to the Otay Fire of 2003 and the Harris Fire of 2007. Studies conducted by Preston et al. (1998a) on the territorial behavior of the California gnatcatcher concluded that the average size of a gnatcatcher territory in high-quality coastal sage scrub habitat is 14.8 acres (six hectares). Using this information, along with an estimate of the high-quality coastal sage scrub habitat still present on the Refuge, it is assumed that suitable habitat on the Refuge could have supported roughly 243 pair of gnatcatchers in 2011.

### 3.3.6.2 Southwestern Willow Flycatcher (Empidonax traillii extimus)

#### Listing and Conservation Status

The southwestern willow flycatcher was listed as endangered by the State of California in 1991 and listed as endangered by the Service effective March 29, 1995 (60 FR 10694). This species is also covered under the San Diego MSCP, because 76 percent (4,900 acres) of potential habitat for this species is to be conserved. Some of these conserved lands are included within the Refuge.

The decision to list this subspecies as endangered under the ESA was based on extensive loss and modification of breeding habitat, with consequent reductions in population levels. This situation was compounded by increases in brood parasitism by the brown-headed cowbird, resulting in reduced reproductive success and further reductions in population levels (USFWS 2002a). A final recovery plan for the southwestern willow flycatcher was prepared in 2002. The recovery plan established management units within larger recovery units for the flycatcher, and recovery goals were set for each management unit. Pending preparation of a five-year review for this subspecies was announced in 2008, but the review has yet to be completed.

Critical habitat for this species was first designated in 1997 (62 FR 44228) and was subsequently revised when the final rule was published in the *Federal Register* on October 19, 2005 (70 FR 60886). As a result of a lawsuit over the 2005 critical habitat designation, the Service agreed to reconsider the critical habitat designations for the flycatcher; on August 15, 2011, a proposed rule to revise the critical habitat designations was published in the *Federal Register* (76 FR 50542). The Service issued the final rule regarding revised critical habitat in the *Federal Register* (78 FR 344) on January 3, 2013. As a result, approximately 160 acres of the Refuge has been designated as critical habitat for the southwestern willow flycatcher.

Specifically, the riparian habitat that extends along the Sweetwater River from approximately 0.5 miles east of the Sweetwater Reservoir to just west of the intersection of Jamacha Road and Willow Glen Drive has been designated as critical habitat for the flycatcher.

### Species and Habitat Description

The southwestern willow flycatcher, a recognized subspecies of the willow flycatcher (*Empidonax traillii*), is a small Neotropical migratory bird that breeds in riparian ecosystems in the southwestern United States and is believed to winter in the vicinity of Costa Rica (Sogge et al. 2010) in habitats where water or saturated soils are present. This passerine bird measures approximately 5.75 inches (15 centimeters) in length and weighs about 0.42 ounces (12 grams) (USFWS 2002a). It has a grayish-green back and wings, whitish throat, light greyolive breast, and pale yellowish belly. Two wingbars are visible; the eye ring is faint or absent. The upper mandible is dark; the lower is light with a yellowish tone. The song is a sneezy "fitzbew," the call a repeated "whitt" (Unitt 1987). Although males are the primary singers, females also sing occasionally (Sogge et al. 1997; USFWS 2002a).

The nesting habitat of this subspecies is generally restricted to relatively dense riparian habitats associated with rivers, swamps, and other wetlands, including lakes and reservoirs (Bent 1960, USFWS 2002a). Surface water or saturated soil are typically, but not always, present year round or seasonally, and ground water is generally at a depth of less than 6.5 to 10 feet (two to three meters) within or adjacent to nesting habitat (USFWS 2002a, Sogge et al. 2010).

Breeding habitat vegetation generally includes dense tree or shrub cover, with or without a higher overstory, that is at least 10 feet (three meters) tall and has a dense twig structure, with considerable green foliage (Sogge et al. 2010). Many patches within the habitat that typically include tall canopy vegetation also support dense midstory vegetation that ranges from 6.5 to 16.4 feet (two to five meters) in height (Sogge et al. 2010). This flycatcher has, however, demonstrated adaptability in habitat selection, as it has been observed nesting in habitats with great variability in dominant plant species (both native and exotic), as well as variability in the size and shape of the breeding patch and the height and structure of the tree and/or shrub canopy (USFWS 2002a). Despite this variability in plant species composition or height, occupied sites almost always have dense vegetation in the patch interior, and these patches are often interspersed with small openings, open water, or shorter/sparser vegetation, creating a mosaic that is not uniformly dense (Sogge et al. 2010).

Southwestern willow flycatchers typically arrive on breeding grounds between early May and early June (Ellis et al. 2008, Moore and Ahlers 2009), with the males generally arriving first. The males establish and defend their territories through singing and aggressive interactions. These territories tend to get smaller once a breeding pair is established. Breeding territory size is not consistent and can vary widely depending upon differences in population density, habitat quality (including vegetation density and food availability), and nesting stage (Sogge et al. 2010).

Willow flycatchers are generally considered monogamous during the breeding season (Sedgwick 2000); however, some populations have a relatively high degree of polygyny (i.e., a male having more than one breeding female in its territory). Polygynous males generally have two females in their territory, but up to four have been recorded (Sogge et al. 2010). Willow flycatchers usually begin building nests within a week or two after pair formation. Eggs can be present as early as mid-May but more often are laid in late May to mid-June. Chicks can be hatched from late May through early August and typically fledge from mid-June through mid-

August. The later fledglings are often the result of re-nesting attempts. Breeding adults generally leave the breeding grounds in early to mid-August but may stay later if young are fledged late in the season (Sogge et al. 2010).

The southwestern willow flycatcher is an insectivore that forages within and above dense riparian vegetation, taking insects on the wing or gleaning them from foliage (Bent 1960). It also forages in areas adjacent to nest sites, which may be more open. Although the diet of breeding flycatchers can vary between years and habitat types, their diet can include a wide range of insects such as bugs (Hemiptera), bees and wasps (Hymenoptera), flies (Diptera), leafhoppers (Homoptera), and dragonflies (Odonata) (Sogge et al. 2010).

### Status of the Species within the Refuge

The southwestern willow flycatcher does not currently breed within the Refuge, nor were the habitats within the Refuge occupied at the time this species was listed. Over the years several surveys have documented a single flycatcher territory at the upper end of the Sweetwater Reservoir, including surveys conducted between 1997 to 1999 (Sogge and Durst 2008). Between May and July 1998, a pair unsuccessfully nested in this area. The following year, only a male was detected in the area, but surveys conducted in 2000 and 2001 indicated that the male did not return after 1999 (Unitt 2004). Within the segment of the Sweetwater River that extends through the Refuge, southwestern willow flycatcher surveys have been conducted incidental to least Bell's vireo surveys in various years (1987-1993, 1995, 1996, 1998, 2001, 2002, 2005, and 2007-2011). No southwestern willow flycatcher territories were identified on the Refuge during these surveys (pers comm. John Martin, San Diego NWR). Small numbers of willow flycatchers of undetermined subspecies are sometimes encountered during surveys but do not remain to establish territories. These birds may include individual *E.t. extimus* that use the Refuge as migratory stopover habitat and continue north to nest in other riparian habitat areas (e.g., Marine Corps Base Camp Pendleton).

Although this flycatcher is not currently nesting on the Refuge, areas of suitable habitat are present along the Sweetwater River. The Service states in the proposed rule to revise the critical habitat designations for this subspecies (76 FR 50542) that "because riparian vegetation typically occurs in floodplain areas that are prone to periodic disturbance, suitable habitats will be ephemeral and their distribution dynamic in nature. Suitable habitat patches may become unsuitable through maturation or disturbance (though this may be only temporary, and patches may cycle back into suitability). Therefore, it is not realistic to assume that any given suitable habitat patch (occupied or unoccupied) will remain continually occupied and/or suitable over the long-term. Unoccupied suitable habitat will therefore play a vital role in the recovery of the flycatcher, because it will provide suitable areas for breeding flycatchers to: (a) colonize as the population expands (numerically and geographically), and (b) move following loss or degradation of existing breeding sites. Indeed, many sites will likely pass through a stage of being suitable but unoccupied before they become occupied. Potential habitats that are not currently suitable will also be essential for flycatcher recovery, because they are the areas from which new suitable habitat develops as existing suitable sites are lost or degraded." Based on this analysis, the segment of the Sweetwater River between the Sweetwater Reservoir and the golf course to the north should be and is considered important habitat for the recovery of the southwestern willow flycatcher.

## 3.3.6.3 Yellow-billed Cuckoo (Coccyzus americanus occidentalis)

## Listing and Conservation Status

The Service was petitioned on May 20, 1986, to list the subspecies throughout California, Washington, Oregon, Idaho, and Nevada (52 FR 2239). The Service considered the entire subspecies throughout its range as a candidate species for listing as Category 2, comprising species for which listing is possibly appropriate but for which conclusive data are not available to support a proposed rule. A 12-month finding on December 29, 1988, found the listing not warranted (53 FR 52746), but on February 17, 2000, a 90-day finding found substantial evidence for listing. The 12-month finding dated July 25, 2001, found that listing was warranted but precluded by higher listing priorities. On October 26, 2011, another 12-month finding also reached a warranted but precluded finding.

On October 3, 2013, the Service published a proposed rule in the *Federal Register* (78 FR 61622) announcing a proposal to list the yellow-billed cuckoo in the western portion of the United States, Canada, and Mexico (western yellow-billed cuckoo) as a threatened distinct population segment under the ESA. The comment period was reopened on December 26, 2013 (78 FR 78321) to provide additional time for comments. Listing is considered warranted based on several factors including the curtailment, degradation, fragmentation, and loss of habitat for the western yellow-billed cuckoo, which is ongoing and, absent changes in the landscape, hydrology, or other factors, this habitat will likely continue to be negatively impacted or lost into the future.

The State of California listed this species as threatened in 1971, and reclassified the species as endangered on March 26, 1988.

## **Species and Habitat Description**

The yellow-billed cuckoo is a member of the family Cuculidae whose approximately 128 members share the common feature of a zygodactyl foot, in which two toes point forwards and two toes point backwards. The yellow-billed cuckoo is a medium-sized bird of about 12 inches (30 centimeters) in length, and weighing about two ounces (60 grams). The species has a slender, long-tailed profile, with a fairly stout and slightly down-curved bill, which is blue-black with yellow on the basal half of the lower mandible. Plumage is grayish-brown above and white below, with rufous primary flight feathers. The tail feathers are boldly patterned with black and white below. The legs are short and bluish-gray, and adults have a narrow, yellow eye ring. Juveniles resemble adults, except the tail patterning is less distinct, and the lower bill may have little or no yellow. Males and females differ slightly. Males tend to have a slightly larger bill, and the white in the tail tends to form oval spots, whereas in females the white spots tend to be connected and less distinct.

The yellow-billed cuckoo is a Neotropical migrant bird that winters in South America and breeds in North America. In the western U.S., this bird breeds in large blocks of riparian habitats, particularly woodlands with cottonwoods and willows (Ehrlich et al. 1988). Dense understory foliage appears to be an important factor in nest site selection, while cottonwood trees are an important foraging habitat in areas where the species has been studied in California (Hughes 1999). At the landscape level, the amount of cottonwood-willow-dominated vegetation cover in the landscape and the width of riparian habitat appeared to influence cuckoo distribution and abundance. Clutch size is usually two or three eggs, and development of the young is very rapid, with a breeding cycle of 17 days from egg laying to fledging of young. Although yellow-billed cuckoos usually raise their own young, they are facultative

brood parasites, occasionally laying eggs in the nests of other yellow-billed cuckoos or of other bird species (Hughes 1999).

The Service considers the yellow-billed cuckoos that occur in the western United States as a distinct population segment. Based on historic accounts, the species was widespread and locally common in California in the 1930s, with the species widely distributed in suitable river bottom habitats (Grinnell and Miller 1944, Small 1994). Yellow-billed cuckoos nested primarily in coastal counties from San Diego County near the Mexico border to Sonoma County in the San Francisco Bay region, in the Central Valley from Kern County through Shasta County, and along the lower Colorado River (Dawson 1923, Grinnell and Miller 1944, Gaines and Laymon 1984, Small 1994). Laymon and Halterman (1987a) estimate that in California, the species' range is now about 30 percent of its historical extent. There is clearly a broad unanimity among modern investigators that a catastrophic decline of the cuckoo in California occurred following the start of the major era of development beginning about the mid-1800s (Gaines and Laymon 1984, Laymon and Halterman 1987b, Launer et al. 1990). The yellow-billed cuckoo was never common in San Diego County. The closest breeding record to the Refuge is for Bonita in 1932 (Unitt 2004); the species is now only a rare and sporadic summer visitor (Unitt 2004).

### Status of the Species within the Refuge

No populations of this species are currently present within the Refuge; however, suitable habitat is present along the Sweetwater River in the Otay-Sweetwater Unit of the Refuge.

### 3.3.6.4 San Diego Ambrosia (Ambrosia pumila)

### Listing and Conservation Status

The Service listed San Diego ambrosia as endangered on July 2, 2002 (67 FR 44372). The species was listed following an analysis of historical and remaining occurrences within the known species range. At the time of listing, of the approximately 50 known historical occurrences in the United States, it was believed that there remained only 15 extant native occurrences. The loss of this species is attributed to destruction, fragmentation, and degradation of habitat, primarily by construction and maintenance of highways and utility easements; residential, commercial, and recreational development; potential competition, encroachment, and other negative impacts from non-native plants; mowing and disking for fuel modification; and trampling, including soil compaction by horses, humans, and vehicles. Nearly all U.S. populations occur in sites that are disturbed and frequently affected by secondary impacts (e.g., trampling, competition from non-native plants). One of the most serious threats to this species is ground disturbance that results in the establishment of non-native, invasive weeds in the immediate vicinity of established ambrosia populations (USFWS 2010c).

A recovery plan has not yet been developed for this species, but a five-year review for the species was completed in July 2010 (USFWS 2010c). The five-year review recommended no change in the status of San Diego ambrosia. The critical habitat that was designated for this species on November 30, 2010 (75 FR 74546), includes various locations on the Otay-Sweetwater Unit. These areas are identified as Unit 7, Sweetwater River Watershed, and include approximately 28 acres (11 hectares) to the north and south of Highway 94 along the Sweetwater River floodplain and 118 acres (48 hectares) north of Highway 94 and south of the Sweetwater River in an area referred to as Par Four.

San Diego ambrosia is a covered species under the San Diego MSCP because of the conservation of 90 percent of the major population of this species (located in Mission Trails Regional Park) within the MSCP boundary. The populations of this species present on the Refuge are also acknowledged in the MSCP Plan, along with requirements for site-specific measures such as monitoring and protection from edge effects to achieve conservation of the species throughout the preserve.

#### **Species and Habitat Description**

San Diego ambrosia is a clonal, perennial herb in the Asteraceae (sunflower) family. Observations indicate that it is sensitive to seasonal conditions and variations, causing the amount of above ground mass to fluctuate from year to year. San Diego ambrosia spreads vegetatively by means of slender, branched, underground root-like rhizomes from which new above ground stems (aerial stems or ramets) sprout each year (Nuttall 1840, Munz 1974, Payne 1993). Individual stems, which are densely covered with short hairs, are generally 2 to 12 inches (5 to 30 centimeters) tall but may grow to 20 inches (50 centimeters). All aerial stems growing from the same root system are genetically identical. The leaves of this species are pinnately divided into many small segments and covered with short, soft, gray-white, appressed (lying flat on surface) hairs. San Diego ambrosia can be distinguished from other species of *Ambrosia* in the area by its twice divided leaves, lack of hooked spines on the involucres (cup-like structures), and lack of longer stiff hairs on the stems and leaves (USFWS 2010c).

San Diego ambrosia flowers from May through October and is thought to be wind-pollinated (Payne 1976). This plant species is monoecious (possessing separate male and female flowers on the same plant). Male flowers, which have no petals, are yellow to translucent and are borne in clusters on terminal flower stalks. Female flowers, which also have no petals, are yellowish-white and occur in clusters in the axils of the leaves below the male flower clusters (USFWS 2010c). Female flowers produce a dry, single-seeded fruit called an achene.

Genetic research confirms the presence of multiple stems of multiple genotypes at nine plots across three populations in San Diego and western Riverside counties (McGlaghlin and Friar 2007), suggesting that sexual reproduction has occurred sometime in the past. This research indicates that closely associated stems within an occurrence are not always clones of a single genotype but can consist of distinct genotypes. Other studies related to genetics and seed viability indicate that sexual reproduction likely occurs infrequently; however, little information is available regarding the timing and extent of this sexual reproduction (Dudek & Associates 2000).

San Diego ambrosia is endemic to southern California from northwestern Riverside County, south through western San Diego County, to northwestern Estado de Baja California, Mexico (CNDDB 2010). It is generally found at or below elevations of 1,600 feet (487 meters) in Riverside County and at 600 feet (183 meters) in San Diego County (CNDDB 2010). The species generally occurs in open habitats in coarse substrates near drainages and in upland areas on clay slopes. San Diego ambrosia also occurs in a variety of associations dominated by sparse grasslands or marginal wetlands, such as river terraces, pools, and alkali playas (Munz 1974).

Protection of sandy loam or clay soils (regardless of disturbance status) is essential to the conservation of this species. Such soils include (but are not limited to) Placentia (sandy loam), Diablo (clay), and Ramona (sandy loam) soil series that occur near a river, creek, or other drainage, or within the watershed of a vernal pool. This species may also be supported on

these soils when they occur on an upper terrace (flat or gently sloping areas of 0 to 42 percent slopes). The species may be located in a grassland or ruderal habitat type, or in openings within coastal sage scrub, on the soil types and topography described here when provided with adequate sunlight and airflow for wind pollination (USFWS 2010c).

#### Status of the Species within the Refuge

San Diego ambrosia occurs in several locations within the Sweetwater River area of the Otay-Sweetwater Unit, including a relatively large occurrence in the northeastern portion of the Sweetwater River area along an existing trail off Par Four Drive. The other occurrences, which are much smaller, are located along the north side of Highway 94 to the west of Bright Valley Farms and to the south of Highway 94, just south of the old steel bridge. In 2008 and 2010, five San Diego ambrosia population groups were established on the Otay-Sweetwater Unit in an area to the east of the Sweetwater River floodway and the south of Highway 94. The closest population group is located about 900 feet (275 meters) to the south of Highway 94, and the remaining groups extend south in a relatively linear fashion, with the last group located approximately 2,100 feet (640 meters) to the south of Highway 94. The five populations were established using plants cultivated in a nursery from rhizomes collected from the natural occurrences on the Refuge. In total, 1,000 plants were installed and, to date, survival rates are very high, far exceeding the initial success criteria of 75 percent survival (RECON 2011). Planted individuals have spread by underground rhizomes at least 0.5 meters from the planting site.

### 3.3.6.5 San Diego Thornmint (Acanthomintha ilicifolia)

#### Listing and Conservation Status

San Diego thornmint was listed as endangered by the State of California in 1982 and listed as threatened by the Service on October 13, 1998 (63 FR 54938). This species is also covered under the San Diego MSCP. A recovery plan has not yet been prepared for this species. A five-year review of the species status was completed in August 2009 (USFWS 2009a), which recommended no change in the current listing status of the species. Critical habitat was designated for this species on August 26, 2008 (73 FR 50496). The Otay-Sweetwater Unit includes portions of Unit 4 (Subunits 4A and 4C), which have been identified as some of the most stable populations of San Diego thornmint. Units 4A and 4C are located on southwestern slope of McGinty Mountain. The final rule designating these critical habitat areas identifies the need for special management to address threats to these populations from exotic plant species and recreational activities.

### **Species and Habitat Description**

San Diego thornmint is an annual aromatic herb in the mint family (Lamiaceae). This low annual, with stems branching from the base, ranges from two to six inches (five to 15 centimeters) in height. It has white, two-lipped, tubular flowers with rose-colored markings on the lower lip (Jokerst 1993). Members of this genus have paired leaves and several sharp, spiny bracts (modified leaves) below whorled flowers. San Diego thornmint can be distinguished from other members of its genus by its flower, which has hairless anthers and style. The only other *Acanthomintha* species occurring in southern California (*A. obovata*) has four fertile, woolly, or pubescent anthers and is known from north Ventura County.

San Diego thornmint flowers from April to May (Munz 1974) and remains erect, retaining its distinct shape well into the dry season (Reiser 1996). San Diego thornmint is an outcrosser that is pollinated by insects; however, information regarding the plant's breeding system is limited. It has however been determined that other members of the genus *Acanthomintha* are

self-compatible. During a pollinator study conducted from 2007 through 2009 (Klein 2009), it was observed that very few insects visited San Diego thornmint plants; based on the limited visitors, it appears that this species does not rely on any specific species for pollination. The dominant visitors, and more effective pollinators, were bees in the Families Apidae and Halictidae. This species may rely on animal vectors, in part, for seed dispersal.

This species, which can be found at elevations that range from sea level to 3,000 feet (915 meters), is endemic to San Diego County, California and northwestern Baja California, Mexico. In San Diego County, the species is known from 55 extant occurrences (USFWS 2009a). The occurrences are located across the county from Oceanside and San Marcos in the north, near the Sweetwater River and on Otay Mesa in the south, and to the north and east in Ramona and Alpine (Beauchamp 1986, USFWS 2009a). There are 13 historical occurrences in Baja California, Mexico; however, there is little data available on the current status of this species in Mexico (USFWS 2009a).

Populations of San Diego thornmint generally occur in openings within coastal sage scrub, chaparral, and native grassland habitats (Beauchamp 1986, Reiser 2001), where isolated patches of clay soils, referred to as "clay lenses," are present (USFWS 2009a). In fact, San Diego thornmint is believed to be restricted to gabbro soils derived from igneous rock and gray calcareous clay soils derived from soft calcareous sandstone (Oberbauer and Vanderwier 1991). Service data indicate that San Diego thornmint occurs on soils mapped as Las Posas, Olivenhain, Redding, Huerhuero, Altamont, Cieneba, and Linne (USFWS 2009a). The open areas of clay lenses where San Diego thornmint occurs can generally be described as areas of southeast- to west-facing gentle slopes with friable soil, meaning that the soil has a loose, crumbly texture. An analysis of 20 sites occupied by San Diego thornmint found that the slopes range from 0 to 25 degrees, with the majority of the sites having slopes less than 20 degrees (Bauder et al. 1994).

The texture and structure of the clay lenses are essential for supporting the seedling establishment and growth of San Diego thornmint. This soil provides many small pockets and deeper fissures where seeds from San Diego thornmint become lodged as they fall from decomposing plants (Bauder and Sakrison 1999). The seeds stay in the soils until the temperatures become cooler in the winter months and the soil becomes saturated with the winter rains (Bauder and Sakrison 1997). When the conditions are right, the seeds germinate and grow to mature plants. These plants do best when they are not crowded or shaded by other plants (Bauder and Sakrison 1999).

Populations of this species range from just a few individuals to several thousand plants. The majority of the known populations range from 50 to 2,000 plants. The abundance of standing individuals of San Diego thornmint fluctuates annually at each occurrence. At occurrences surveyed over a number of years, the size of an occurrence can differ by an order of magnitude (City of San Diego 2005). A uniform surveying methodology has not been used throughout the species range, and occurrences have not been surveyed consistently on an annual basis. Therefore, the abundance of San Diego thornmint is difficult to compare between sites and over time.

Currently, the greatest threat to San Diego thornmint is the invasion by non-native plants in the open areas that support this species. When exotic plant species become established, they can outcompete San Diego thornmint for light, water, nutrients, and space. Another threat to this species is trampling of vegetative material, compaction of soil, and ongoing recreational activities in the vicinity of extant populations of this plant. Fire also poses a potential threat to this species' habitat. Coverage of this species under the San Diego MSCP requires avoidance of impacts to all populations and the implementation of measures to protect populations from edge effects.

#### Status of the Species within the Refuge

San Diego thornmint is present in at least three locations on McGinty Mountain. An additional population is located immediately adjacent to the Refuge on land owned by The Nature Conservancy. The third Refuge population was identified in 2011 by San Diego Natural History Museum personnel during surveys conducted in association with the San Diego Plant Atlas. This previously unrecorded population appears to consist of 6,000 to 7,000 plants.

### 3.3.6.6 Otay Tarplant (Deinandra conjugens)

#### Listing and Conservation Status

Otay tarplant was listed as endangered by the State of California in 1979 and listed as threatened by the Service effective November 12, 1998 (63 FR 54938). A final rule designating approximately 6,330 acres (2,562 hectares) of critical habitat was published in the *Federal Register* on December 10, 2002 (67 FR 76030). Three critical habitat units have been designated for Otay tarplant in San Diego County with Unit 1, the Sweetwater/Proctor Valley Critical Habitat Unit, encompassing large areas of the Otay-Sweetwater Unit of the Refuge (refer to Figure 3-19). Unit 1 contains populations in the northern and eastern extent of Otay tarplant's historical distribution, which is considered essential for its conservation (67 FR 76030). The final recovery plan for Otay tarplant was issued in December 2004 (USFWS 2004b).

Designated critical habitat is intended to include sufficient habitat to maintain self-sustaining populations of a listed species throughout its range. The three units designated as critical habitat for Otay tarplant contain the physical and biological features determined to be essential to the conservation of this species, including soils with a high clay content (generally greater than 25 percent) or clay intrusions or lenses that are associated with grasslands, open coastal sage scrub, or maritime succulent scrub communities between 80 and 1,000 foot (24 to 305 meter) in elevation (67 FR 76040). As part of the critical habitat designation, the Service also determined whether the areas within the geographical area occupied at the time of listing would require special management considerations or protection. Examples of special management actions that may be necessary to protect essential habitat features and thus prevent further declines and loss of populations of Otay tarplant include: 1) actions to prevent the degradation and/or type conversion of grasslands, open coastal sage scrub, or maritime succulent scrub into other unsuitable habitats; and 2) actions to restore degraded habitat areas. Threats include habitat degradation, fragmentation, or loss and competition with invasive non-native plant species.

Recovery objectives for this species include:

- stabilizing and protecting habitat that supports known populations of Otay tarplant within areas identified for conservation under the MSCP;
- identifying and protecting extant populations of Otay tarplant and available suitable unoccupied habitat that are important to maintain genetic diversity and connectivity between established reserves;
- reducing and managing threats (e.g., invasion and competition by non-native weeds, factors that reduce or limit genetic diversity within areas that preserve Otay tarplant populations); and

• conducting research (e.g., on Otay tarplant necessary to refine recovery criteria (USFWS 2004b).

The recovery plan also states that management plans should be developed for areas established to conserve Otay tarplant to address the biological and ecological needs of Otay tarplant. In addition, to ensure the long-term preservation of this species, habitat protection, management, and monitoring efforts must occur in perpetuity (USFWS 2004b).

#### **Species and Habitat Description**

Otay tarplant is an annual herbaceous plant in the Asteraceae (sunflower family). Individual plants are less than 16 inches (40.6 centimeters) tall, with lobed leaves and yellow flowers arranged in heads of 8 to 10 ray flowers and 13 to 21 disk flowers. This species has a branching stem with deep green or gray-green leaves covered with soft, shaggy hairs.

Otay tarplant occurs within the range of *Deinandra fasciculata* [= *H. fasciculata*] (fasciculated tarplant) and *Deinandra paniculata* [= *H. paniculata*] (San Diego tarplant) and can be distinguished from other members of the genus by its ridged phyllaries, black anthers (part of the flower that produces pollen), and the number of disk and ray flowers. The disk and ray flowers each produce different types of fruits (heterocarpy), which has been correlated to differential germination responses (Tanowitz et al. 1987).

The presence of Otay tarplant is strongly correlated with clay soils, subsoils, or lenses (Bauder et al. 2002). Such soils typically support grasslands, but they may also support some woody vegetation. Much of the area with clay soils and subsoils within the historical range of Otay tarplant likely was once vegetated with native grassland, open coastal sage scrub, and maritime succulent scrub, which provided suitable habitat for Otay tarplant (USFWS 2004b). Based on GIS analysis, most current and historical Otay tarplant occurrences are found on clay soils or lenses in one of the following soil series: Diablo, Olivenhain, Linne, Salinas, Huerhuero, Auld, Bosanko, Friant, and San Miguel-Exchequer rocky silt loams (Bauder et al. 2002).

Otay tarplant, as with most other tarplants, is self-incompatible (Keck 1959, USFWS 2004b); therefore, gene flow among plant populations through pollination is important for its long-term survival (Ellstrand 1992). The movement of pollen among occurrences of Otay tarplant is critical to maintaining genetic diversity between extant populations and within the species. As a result, smaller populations of Otay tarplant are believed to be essential to the survival and conservation of the species because they may be strategically located between larger populations, facilitating gene flow among them. These smaller populations may also contain unique frequencies of self-incompatible alleles (USFWS 2004b). Likely pollinators of Otay tarplant include, but are not limited to, bee flies (Bombylliidae), hover flies (Syrphidae), digger bees (Apidae), carpenter and cuckoo bees (Anthophoridae), leaf mason and leaf cutting bees (Megachilidae), and metallic bees (Halictidae) (Krombein et al. 1979, Bauder et al. 2002). Otay tarplant fruits are each one-seeded and are likely to be dispersed by small to large-sized mammals and birds based on the sticky nature of the remaining flower parts that are attached to the fruits (USFWS 2004b). Potential seed/fruit dispersal organisms known to occur in the region include but are not limited to southern mule deer, gray fox, coyote, black-tailed jackrabbit, bobcat, striped skunk, opossum (Didelphis virginiana), raccoon, and various small land birds.

A seed bank (a reserve of dormant seeds, generally found in the soil) is important for year-toyear and long-term survival of many annual or short-lived perennial species, including Otay tarplant (Rice 1989, Given 1994). The extent and nature of the seed bank can influence the number and location of standing tarplant in a population. Additional factors, including the amount and timing of rainfall, temperature, and soil conditions, also influence germination. As a result, the extent and distribution of observable standing plants may not coincide with the full extent of the seed bank. Large annual fluctuations in the number of standing plants of Otay tarplant in a given population have been documented. For example, within the San Miguel Mountain area, the number of standing plants of Otay tarplant has ranged from about 280,000 in one year to 1.9 million in another year (Merkel & Associates 1999, CNDDB 2002).

Otay tarplant has a narrow geographic and elevational range that is restricted to southwestern San Diego County and adjacent Baja California, Mexico. There are currently 34 extant occurrences distributed discontinuously in southwestern San Diego County (USFWS 2009b), including several located on the Refuge.

Otay tarplant's annual habit and self-incompatible breeding system may make this species vulnerable to threats associated with population fluctuations, reduced populations of appropriate pollinators, and declines in genetic variation. Maintenance of the genetic variability within the species, through cross-pollination, may be critical to this species' longterm survival. The extensive fragmentation of the remaining populations may exacerbate these threats by reducing connectivity between populations and potentially limiting suitable pollinators, and hence gene flow between populations (USFWS 2004b, USFWS 2009b). Although it is difficult to predict the exact effects of climate change on Otay tarplant, it is likely that changes in climate will exacerbate identified threats and may introduce new threats. Five factors associated with a changing climate that may affect the long-term viability of Otay tarplant occurrences in its current habitat configuration are: 1) drier conditions that may result in a lower percent germination and smaller population sizes; 2) higher temperatures may inhibit germination: 3) a shift in the timing of the annual rainfall that could favor non-native species; 4) changes in the timing of pollinator life cycles that may become out-of sync with the timing of flowering; and 5) drier conditions that may result in increased fire frequency, making the ecosystems in which Otay tarplant currently grows more vulnerable to the threats of subsequent erosion and non-native or native plant invasion.

#### Status of the Species within the Refuge

Otay tarplant occurs in several locations within the San Miguel Mountain area of the Otay-Sweetwater Unit, as well as on a portion of the Jamacha parcel, located in the Sweetwater River area. Surveys conducted in 2010 of known San Diego tarplant populations on the Refuge documented a population on the Jamacha parcel covering approximately two acres (0.8 hectare); a population of approximately 800 very large plants on the Shinohara site, near the southwestern most portion of the Otay-Sweetwater Unit; and a population on the lower northeastern slopes of Mother Miguel Mountain covering approximately1.2 acres (0.5 hectares). A 6.9-acre (2.8-hectar) area on the lower northwestern slopes of Mother Miguel Mountain was documented in 2008 but was not present during the 2010 survey.

At the southwestern edge of the San Miguel Mountain area (see Figure 3-15) is a 67-acre (27-hectare) boot-shaped parcel, referred to as the San Miguel Ranch Otay Tarplant Preserve (also known as the Trimark parcel). From 2005 through 2010, an intensive invasive plant removal and Otay tarplant seeding program was implemented on portions of this parcel. In 2011, after completing this intensive management effort, Otay tarplant occupied about 13.4 acres of the site, the largest coverage of Otay tarplant on the site since the management effort began.

Incidental sightings of Otay tarplant in other areas of the Refuge have also been recorded in various years. One such site was identified in 2010 in the Sweetwater River area. All of the incidental sightings of this species on the Refuge have been small occurrences.

### 3.3.6.7 Mexican Flannelbush (Fremontodendron mexicanum)

### Listing and Conservation Status

Mexican flannelbush was listed as a rare species by the State of California in July 1982. The Service listed this species as endangered in 1998. The final listing rule was published in the *Federal Register* (63 FR 54956) on October 13, 1998, and became effective on November 12, 1998. Mexican flannelbush was listed as endangered due to its small population size and the threat that an altered fire regime poses to the ultimate survival of this species. At the time of listing, only a single occurrence was believed to exist in the United States, and another single occurrence was believed to exist in the United States, and another single occurrence was believed to exist in the United States, and another single or drafted for this species.

Approximately 228 acres (93 hectares) were designated as critical habitat for this species in a final rule published in the *Federal Register* on September 27, 2007 (72 FR 54984). None of the lands designated as critical habitat for this species are located on Refuge land.

A five-year review for this species was completed in August 2009. In addition to the threats identified at the time of listing, additional threats to Mexican flannelbush were identified as part of the review. These included competition with non-native invasive plant species and impacts from border control activities. It was determined, however, that because these threats could be managed, they represented only a moderate threat to the species. The five-year review recommended no change in the current status of Mexican flannelbush. Another recommendation in the review was to support and assist the San Diego NWR in the effort to introduce new populations of Mexican flannelbush to suitable unoccupied habitat within the Otay-Sweetwater Unit.

### **Species and Habitat Description**

Mexican flannelbush is a small, perennial tree or shrub in the Malvaceae (mallow family); this species was included as part of the Sterculiaceae (cacao family) when it was listed. This evergreen plant, which can grow to a height of 5 to 20 feet (1.5 to 6.0 meters), has palmately (leaflets radiating from one point) lobed leaves one to two inches (25 to 50 millimeters) wide. Flowers, which are present from March to June (Munz 1974), can be up to about 2.7 inches (69 millimeters) wide and lack petals. The showy orange to dark yellow sepals are sometimes reddish toward the bases. The plants flower annually and produce seeds that are held on the plants in dry pods until the fall and winter months when the capsules open to release seeds.

The showy nature of the flower and the presence of nectar pits at the base of the sepals suggest that pollen is transferred from flower to flower by insect pollinators, but a focused pollination study has not been conducted. *Fremontodendron mexicanum* is distinguished from *F. californicum* by its orange sepals with basal pits generally lacking long hairs, and shiny black, glabrous (smooth) seeds that lack caruncles (outgrowths) (Kelman 1991).

Mexican flannelbush is endemic to southern California and northwestern Baja California, Mexico, with native populations occurring in intermittent drainages with closed-cone coniferous forest and southern mixed chaparral habitats. Generally found at elevations that range from sea level to 3,000 feet (1,000 meters), Mexican flannelbush often occurs on alluvial benches consisting of silty loam soils derived from metavolcanic and metabasic bedrock, associated with ephemeral drainages, as well as on the associated canyon slopes (USFWS 2009c). This species is thought to be a relict genus left over from approximately 60 million years ago when California had a more tropical climate (Kelman 1991). Apparently, at least two historical populations of this species have been extirpated; these were located at Boundary Monument near the coast and in the Jamul Mountains, both in San Diego County (USFWS 2009c). In the U.S., this species occurs partially in the BLM's Otay Mountain Wilderness Area and partially on private lands that are part of the historical Otay Ranch property.

This species, which grows in chaparral habitat, appears to have adapted to survive fires, as it has the ability to resprout from underground roots after a fire. Another fire adaption strategy of this species is the ability of its seeds to survive a fire and then sprout following the fire (USFWS 2007).

Habitat factors that support this species include: 1) alluvial terraces, benches, and associated slopes within 500 feet (152 meters) of streams, creeks, and ephemeral drainages where water flows primarily after peak seasonal rains with a gradient ranging from three to seven percent; and stabilized north- to east- facing slopes associated with steep (9 to 70 percent) slopes and canyons that provide space for growth and reproduction; and 2) silty loam soils derived from metavolcanic and metabasic bedrock, mapped as San Miguel-Exchequer Association soil series, that provide the nutrients and substrate with adequate drainage to support seedling establishment and growth.

In the United States, Mexican flannelbush is found only on the northwest side of Otay Mountain in southern San Diego County, California. To better document the range of this species, surveys were conducted from 2005 to 2007 on the northwest side of Otay Mountain in areas that were identified as potential habitat for Mexican flannelbush. As a result, occurrences were documented in Cedar Canyon (2,500 plants), Little Cedar Canyon (31 plants), and an unnamed canyon on Otay Mountain (3,500 plants). Therefore, rather than being limited to a single canyon on Otay Mountain, as was known at the time of listing, this species was found in three adjacent canyons, though its distribution is still extremely localized. All of the currently known extant natural occurrences of this species occur in an area approximately three miles (4.8 kilometers) from north to south and 3.5 miles (5.6 kilometers) from east to west. In 2009, the Service estimated that there were approximately 6,000 Mexican flannelbush plants on Otay Mountain.

#### Status of the Species within the Refuge

Mexican flannelbush was not known to be present on the Refuge at the time of listing in 1998. In 2005 and 2007, surveys on Otay Mountain identified a population of Mexican flannelbush in Little Cedar Canyon, and in 2014, Mexican flannelbush was document on the Otay-Sweetwater Unit, within the southern end of the Otay Lakes and Mesa management area (pers comm. John Martin, San Diego NWR).

In 2006, the San Diego NWR was awarded a Service Preventing Extinction Grant to fund a project on the Refuge that has resulted in the establishment of two new occurrences of Mexican flannelbush in suitable previously unoccupied habitat on the Refuge. To meet the purpose of this grant, which was to decrease the vulnerability of Mexican flannelbush to extinction, seeds were collected from specimens within the existing native populations, germinated and raised as seedlings in a nursery, and then planted in suitable habitat areas on the Refuge. Seeds were collected from the Little Cedar Canyon population in 2007. In 2009, approximately 70 specimens were planted in the San Miguel Mountain area in a canyon to the north of Mother Miguel Mountain. In 2010, an additional 140 plants were installed at two sites:

one in the area of Wildman Canyon to the south of Mother Miguel Mountain and the other in a drainage extending north of the saddle between Mother Miguel and San Miguel Mountains. As of the summer of 2011, plant mortality was relatively low (25 to 30 percent), with many specimens measuring up to about three feet (one meter) in height. In February 2012, 33 of 80 plants remained alive at the Wildman Canyon site.

## 3.3.6.8 Del Mar Manzanita (Arctostaphylos glandulosa ssp. crassifolia)

### Listing and Conservation Status

The Service issued a final rule to list Del Mar manzanita as endangered on October 7, 1996 (61 FR 52370). This species is not designated as an endangered, threatened, or rare species by the State of California, but is a covered species under the San Diego MSCP. A recovery plan has not been prepared for this species; however, recovery and protection actions for this species are addressed in various habitat conservation plans, including the San Diego MSCP (City of San Diego 1998a). No critical habitat has been designated for Del Mar manzanita. The five-year review for Del Mar manzanita, completed August 13, 2010 (USFWS 2010d), recommended no change in the current status of this species.

### Species and Habitat Description

Del Mar manzanita is a perennial burl-forming shrub in the Ericaceae (heath family) that ranges from 3.3 to 4 feet (1 to 1.2 meters) in height. It has a smooth red bark and thick, leathery leaves that are dark grey-green, sometimes with a reddish margin. Compared to other subspecies, the globose fruits of Del Mar manzanita are small and markedly depressed, and the twigs lack glandular hairs. These are among the diagnostic features of the taxon (USFWS 2010d).

The small, urn-shaped flowers of Del Mar manzanita are white to pink in color and appear between late winter and early spring. Del Mar manzanita flowers, which are self-incompatible, are visited by flies, bees, and bee flies. The fruits of this plant produce an average of six seeds embedded in a hard resinous endocarp surrounded by a pulpy pericarp (USFWS 2010d). There does not appear to be any specialized seed dispersal mechanism, and the fruits generally fall close to the parent plant in late summer.

This shrub, which occurs within southern maritime chaparral in central coastal San Diego County, can regenerate from burls (lignotubers) and from seeds. Buds present on the burls will typically sprout after the shrub stems have been removed or damaged by fire or other means. Occasionally some buds will sprout in the absence of fire. Because the plant can regenerate from the burls, Del Mar manzanita is generally resilient to fire and can potentially be very long lived (USFWS 2010d).

Historically, Del Mar manzanita was believed to be restricted to sandstone terraces and bluffs along the immediate coast in San Diego County, California, from Carlsbad south to Torrey Pines State Reserve. Based on morphologic traits, researchers have since restricted the distribution to within three miles, or possibly six miles (5 to 10 kilometers), of the coast from Encinitas in San Diego County, south to Baja California (USFWS 2010d). In 1982, prior to listing, approximately 16,600 to 17,600 Del Mar manzanita plants were known from about 21 populations. Other populations likely existed before 1982, but their numbers were not quantified prior to their habitats being lost (USFWS 2010d). In 2010, there were 50 known populations of Del Mar manzanita in the United States. This species is known to occur in two locations within the Del Mar Mesa Preserve.

## Status of the Species within the Refuge

Within the San Diego NWR, the only area in which Del Mar manzanita has the potential to occur is within the Del Mar Mesa Vernal Pool Unit. As of 2011, no directed searches for this species on Refuge lands have been conducted. There are known occurrences of Del Mar manzanita on lands located near the Refuge, but as of the writing of this document, there are no records of this species occurring on the Refuge.

## 3.3.6.9 San Diego Mesa Mint (Pogogyne abramsii)

### Listing and Conservation Status

The Service listed San Diego mesa mint as endangered on September 28, 1978 (43 FR 44811), after determining that the continued existence of the species was being threatened by loss of habitat to housing development, highway construction, off-road vehicle use, illegal dumping, and agricultural uses (USFWS 1998a). This species was listed by the State of California as endangered in 1979. It is also a covered species under the San Diego MSCP. No critical habitat has been designated for this species.

The Service completed three status reviews for the species in 1985, 1987, and 1992. In all cases, the reviews recommended no change in status. A five-year review of the species was most recently completed on September 1, 2010 (USFWS 2010e). It, too, recommended no change in the status of this species. Additional recommendations included: 1) continued support for the conservation, management, and monitoring of San Diego mesa mint habitat to include acquisition of occupied sites; 2) development of a coordinated interagency invasive species prevention and eradication program for all vernal pool habitat where San Diego mesa mint is extant; 3) identification of the conditions and areas necessary to support all essential biotic interactions (e.g., pollination, seed dispersal, population movement) for the species; and 4) monitoring of restored/enhanced habitat to determine its suitability and impact in furtherance of recovery of the species (USFWS 2010e).

In 1998, the Service prepared the Vernal Pools of Southern California Recovery Plan ("vernal pool recovery plan") (USFWS 1998a), which addresses seven vernal pool species: San Diego mesa mint, Otay mesa mint, San Diego button-celery, spreading navarretia, California Orcutt grass, San Diego fairy shrimp, and Riverside fairy shrimp. The strategies for the recovery of the species addressed within the vernal pool recovery plan focus primarily on eliminating and reducing the primary threats to the habitats that support these species. This approach was necessary due to the complexity of vernal pool habitats and associated watershed, the wide geographic distribution of the various pool species, and the unique ecological parameters associated with each listed species (USFWS 1998a). The recovery goal for federally listed endangered species covered by this plan, including San Diego mesa mint, is to conserve and enhance southern California vernal pool ecosystems, with specific emphasis on stabilizing and protecting existing populations of the endangered species the pools support. Removing the listed species addressed in the vernal pool recovery plan from protection under the ESA would only be considered once populations have secure habitat, populations are stabilized or increasing (and where necessary, new populations are established), and populations are shown to be self-sustaining (USFWS 1998a).

### **Species and Habitat Description**

San Diego mesa mint, an annual herb in the Lamiaceae (mint family), is restricted to vernal pool habitat in southern California. Plants can reach about one foot (30 centimeters) or more in height, and flowers are arranged in whorls that typically bloom from May or June through early July. Key characters of the genus *Pogogyne* include floral bracts and calyx lobes that are

"conspicuously hirsute and bristlyciliate" (Howell 1931). The flowers are strikingly patterned with a rich rosy-purple limb and throat and white tube; the middle lobe of the lower lip has a yellow central area spotted with deep purple. The plants give off a strong, sweet mint odor.

In the past, San Diego mesa mint has been misidentified as Otay mesa mint, which also occurs in San Diego County. There are several distinct differences between the two species: San Diego mesa mint usually has two flowers per node, while Otay mesa mint has six or more; the vegetative portions of San Diego mesa mint develop a reddish tinge during maturation, while Otay mesa mint does not develop this reddish tinge until after the flowering period; San Diego mesa mint has a hairy calyx, while Otay mesa mint has a smooth calyx; and the bracts and leaves of San Diego mesa mint are narrower than Otay mesa mint (Howell 1931, Munz 1974, USFWS 1998a).

San Diego mesa mint is restricted to vernal pools (seasonal depression wetlands) in San Diego County, California. As described in greater detail earlier, vernal pools are ephemeral wetlands, occurring from southern Oregon through California into northern Baja California, Mexico, that require a unique combination of climatic, topographic, geologic, and evolutionary factors for their formation and persistence (USFWS 1998a). Vernal pools typically form in regions with Mediterranean climates where shallow depressions fill with water during fall and winter rains and then dry up when the water evaporates in the spring (Collie and Lathrop 1976, Holland 1976, Holland and Jain 1977, Holland and Jain 1988, Thorne 1984). Downward percolation of water within the pools is prevented by an impervious subsurface layer consisting of claypan, hardpan, or volcanic stratum (Holland 1976, Holland 1988).

Vernal pools containing San Diego mesa mint typically occur on coastal terraces at 328 to 656 feet (100 to 200 meters) in elevation on gravelly loams that are saturated or inundated seasonally and subsequently dry out and remain dry for about six to eight months through the summer. The surface substrates are predominately underlain by Redding soils with a subsoil of clay or a silica-cemented hardpan layer that prohibits drainage and creates a perched water table that forms the vernal pool.

The life cycle of the San Diego mesa mint is dependent on the function of the vernal pool ecosystem. San Diego mesa mint seeds germinate with the first significant fall and winter rains. As the season progresses, temperature increases and rainfall declines result in increased evaporation. More rapid growth of young plants is stimulated as the pools begin to dry out. Flowering commences in May and continues through June or July, and the pools become dry by early to mid-summer.

Field investigation involving the monitoring of insect visits to individual San Diego mesa mint plants on Del Mar Mesa found that Eurasian honey bee (*Apis mellifera*) and two anthophorid bees (*Exomalopsis nitens* and *E. torticornis*) were the most common visitors and most likely pollinators of these plants (Schiller et al. 2000). Schiller et al. (2000) also documented that San Diego mesa mint is self-fertile but has greater seed set when it is cross-pollinated.

Gene dispersal among San Diego mesa mint plants may occur via pollen or seed distribution (USFWS 2010e). Although none of the *Pogogyne* species have seed morphology associated with animal or wind dispersal, scattered occurrences of pool plants along well-worn trails that link individual pools over wide areas suggest large animals may contribute to seed dispersal (Cole 1995). Waterfowl use pools, especially the larger ponds or vernal lakes, and they are presumed to carry seeds from pool to pool (Proctor et al. 1967, Zedler 1987). Zedler and Black (1992) also found that San Diego mesa mint seeds germinated and grew from pellets of brush
rabbits and Audubon's cottontail rabbits, which were collected from vernal pools on Del Mar Mesa and Miramar Mesa. They postulated that rabbit movement might be a potential mechanism for dispersal and genetic mixing of vernal pool obligate species. In addition, San Diego mesa mint seeds float, which may result in limited dispersal opportunities when pools interconnect or lakes fill their basins in years of greater than average precipitation (Scheidlinger 1981).

San Diego mesa mint is endemic to San Diego County, growing in vernal pools on the coastal central mesas of the county. The northern limit of its distribution is Del Mar Mesa. It also occurs to the south on Mira Mesa, Marine Corps Air Station (MCAS) Miramar, and Kearny Mesa, with a few scattered populations in western Tierrasanta. San Diego mesa mint populations have been extirpated from the Linda Vista area, from the vicinity of Balboa Park and Normal Heights, and from the area surrounding San Diego State University. Although most of these extirpated populations from the San Diego mesa are labeled as Otay mesa mint on herbarium collections, these specimens have not been annotated and should be considered San Diego mesa mint (USFWS 2010e).

No estimate of numbers of San Diego mesa mint plants is available; however, it is known to occur from approximately 19 acres (7.7 hectares) of vernal pool basins on MCAS Miramar and approximately 0.8 acre (0.32 hectares) outside the boundary of MCAS Miramar (City of San Diego 2004, MCAS Miramar 2006). This lack of an estimate for San Diego mesa mint plants is likely due to the difficulty of measuring temporal abundance at each occurrence. Local site conditions, rainfall, and freshwater pooling are likely the factors that most influence the numbers of standing plants and their local distribution (Schiller et al. 2000). Like most annual plants, the germination success of San Diego mesa mint differs annually depending on temperature, timing, and rainfall, as well as the reproductive success of previous cohorts, the number of seeds deposited in the soil seed bank, and the survivorship of the annual seedling cohort in the year the survey was conducted. In 2003, the City of San Diego conducted a survey of vernal pools within their jurisdiction, revealing that, of the 1,142 vernal pools surveyed, San Diego mesa mint was found in 373 pools with a mean percent cover per pool of 6.2 percent (City of San Diego 2004).

Threats to San Diego mesa mint are generally the same as threats to vernal pool habitat. These include: 1) direct destruction of vernal pools from human activity; 2) indirect threats that degrade or destroy vernal pools (e.g., altered hydrology, draining, competition by introduced species, habitat fragmentation); and 3) potential long-term, cumulative impacts, such as the effects of isolation on genetic diversity and locally adapted genotypes, air and water pollution, drastic climatic variations, and changes in nutrient availability (Bauder 1986).

San Diego mesa mint may also be affected by factors associated with climate change, although it is unclear how climate may change within it range. Potential changes may include: 1) drier conditions, resulting in fewer suitable pool complexes, a lower percent germination and smaller population sizes, and fewer and less reliable recovery cycles of abundant individuals; 2) higher temperatures, which could inhibit germination, speed desiccation of pools, and affect pollinator services; 3) a shift in the timing of the annual rainfall that favors non-native species; 4) changes in the timing of pollinator life cycles; and 5) drier conditions that could result in increased fire frequency. In a changing climate, conditions could change in a way that would allow both native and non-native plants to invade the habitat where San Diego mesa mint occurs (Bauder 2005).

As with other vernal pool species, conservation of San Diego mesa mint is dependent on maintaining hydrology and the surrounding watershed for the occupied vernal pools, as well as protecting adjacent upland habitats for pollinators. Due to its restricted range and small population size, conservation of San Diego mesa mint is dependent on preservation of extant populations as well as the reestablishment of populations of mint within other pools.

### Status of the Species within the Refuge

San Diego mesa mint is known to occur in some of the vernal pools present within the Del Mar Mesa Vernal Pool Unit of the Refuge; however, as of 2011, annual surveys of these pools have not been conducted by Refuge staff.

#### 3.3.6.10 Otay Mesa Mint (Pogogyne nudiuscula)

#### Listing and Conservation Status

Otay mesa mint was listed by the State of California as an endangered species in January 1987, and was federally listed as an endangered species on August 3, 1993 (58 FR 41384). The primary threats at the time of listing were habitat loss and degradation due to urban development, agricultural activities, off-road vehicle use, and trampling, as well as competition with invasive, non-native plants, alteration of the watershed, and drought. Recovery and protection actions for this species are included within the vernal pool recovery plan (USFWS 1998a), as described in the section addressing San Diego mesa mint. No critical habitat has been designated for this species. Otay mesa mint is a covered species under the San Diego MSCP.

The only review of the listing status for this species occurred during a five-year review completed by the Service in September 2010. Based on the results of the review, no change in the status of Otay mesa mint was recommended (USFWS 2010f).

#### **Species and Habitat Description**

Otay mesa mint is an annual herb in the mint family (Lamiaceae) that can reach approximately one foot (30 centimeters) or more in height with flowers arranged in whorls that typically bloom from May or June through early July. The plants usually give off a strong, turpentine mint odor. Leaves are spatulate, obtuse and subglabrous, and are approximately one inch (one to two centimeters) long with short petioles. Otay mesa mint typically has six flowers (occasionally more) per stem node. The flowers are purple with a white throat, and the calyx is glabrous to minutely pubescent (hairy). In the past, Otay mesa mint has been misidentified as San Diego mesa mint; the differences between the two species are described under San Diego mesa mint.

Otay mesa mint seeds germinate depending on the inundation and drying cycles of vernal pools, which is the habitat type to which this species is restricted (USFSW 2010f). For many vernal pool plant taxa, temperature and moisture affect the timing of plant germination (Myers 1975). The link between the onset of germination, temporal conditions associated with vernal pool inundation, temperature, and moisture are critical to the germination, maturation, flowering, and fruiting of this species. The interaction of these factors provides the plant favorable conditions to complete its life cycle in the spring rather than in the summer, autumn, or winter. Natural differences in the precipitation and the inundation/drying time of the vernal pool from year to year may result in significant differences in the distribution and abundance of this species, making it difficult to obtain an accurate measure of the population (USFWS 2010f). Additionally, a portion of the population is represented by seeds remaining in the seed bank and is not accounted for each year that surveys occur.

Otay mesa mint usually blooms after the vernal pool water evaporates (Munz 1974). The plants then produce fruit, dry out, and senesce in the hot, dry summer months. There is little documented information regarding pollination and seed dispersal mechanisms for this species. Observations in the field suggest that native syrphid flies (Syrphidae) and bee flies (Bombyliidae) are the most common pollinators (USFWS 2010f). Eurasian honeybees (Apidae) have also been seen pollinating Otay mesa mint. Research on San Diego mesa mint indicates that it is self-fertile (Schiller et al. 2000). Research is needed to determine if this is also the case Otay mesa mint.

Otay mesa mint is endemic in southern San Diego County, California, where it is only found in vernal pool (seasonal depression wetlands) habitat on Otay Mesa. At the time of Federal listing, this species was known to occur at four locations on Otay Mesa but currently is extant at only three locations on Otay Mesa. Historically, Otay mesa mint was found beyond Otay Mesa, with herbarium records indicating that it occurred at 10 locations in southern San Diego County, including University Heights, Balboa Park, and Mission Valley (USFWS 2010f). This species also occurred in Mexico at the eastern edge of the City of Tijuana, but is has likely been extirpated from its Mexican locations.

Little species-specific data exist detailing the habitat requirements for this species other than it is found exclusively associated with vernal pools. Vernal pools that support Otay mesa mint are found on Huerhuero or Stockpen soils (Beauchamp and Cass 1979). The life cycle of the Otay mesa mint is dependent on the function of the vernal pool ecosystem described earlier.

Threats to this species from human activities, non-native plant invasion, and climate change are similar to those described for San Diego mesa mint. Due to its restricted range and small population size, conservation of Otay mesa mint is dependent on preservation of extant populations, as well as reestablishment of populations of mint within other pools on Otay Mesa (USFWS 2010f). Since the listing of this species, a number of vernal pools containing Otay mesa mint have been restored by either creating new basins within historical habitat or enhancing existing habitat by reshaping the pool or transplanting inoculum containing Otay mesa mint seeds (USFWS 2010f). The long-term success of this practice is unknown, and suitable habitat for vernal pool restoration is limited.

### Status of the Species within the Refuge

Prior to the 2011 growing season, Otay mesa mint seed (collected at the Cal Terraces vernal pool preserve on Otay Mesa) was introduced into nine pools within the vernal pool complex ("S" series) located just south of the Sweetwater Reservoir on a site identified as the Shinohara parcel, located within the Otay-Sweetwater Unit of the San Diego NWR. The seeds germinated and plants matured in all nine of the pools in which seed was introduced. Riverside fairy shrimp are also present in the vernal pool complex located on Caltrans property in Otay Mesa, property that is expected to be conveyed to the Refuge at some future date.

#### 3.3.6.11 San Diego Button-Celery (Eryngium aristulatum var. parishii)

#### Listing and Conservation Status

The State of California listed San Diego button-celery as endangered in July 1979, and the Service listed this plant as endangered on August 3, 1993 (58 FR 41384). Recovery and protection actions for this species are included within the vernal pool recovery plan (USFWS 1998a), as described in the section addressing San Diego mesa mint. No critical habitat has been designated for San Diego button-celery. The five-year review for San Diego button-

celery, completed September 1, 2010 (USFWS 2010g), recommended no change in the current status of this species. This species is also covered under the San Diego MSCP.

#### **Species and Habitat Description**

San Diego button-celery, in the family Apiaceae (parsley/carrot family), is a biennial or longer lived perennial gray-green herb that has a storage taproot. It has a spreading shape and reaches a height of 16 inches (40 centimeters) (Constance 1993). The stems and lanceolate leaves give the plant a prickly appearance. San Diego button-celery is one of three varieties of *Eryngium aristulatum* (Constance 1993). It is separated from *Eryngium aristulatum* var. *aristulatum* (common) by having styles in fruit that are about the same length as the calyx (outer whorl of protective structures around the flower), and from *Eryngium aristulatum* var. *hooveri* (Hoover's button-celery) by having bractlets (modified leaves) without callused margins (Constance 1993).

San Diego button-celery is a clay soil, surface and non-surface hardpan vernal pool obligate taxon. Zedler (1987) hypothesizes that the patchy distribution of button-celery may be attributed to the extreme desiccation which vernal pools undergo in summer; hence, the species favors pools with a deep clay subsoil that do not dry as rapidly or as completely as those with shallower or more coarsely textured soils. San Diego button-celery seems more tolerant of peripheral vernal pool habitat than most obligate vernal pool species. It is specifically adapted to surviving in vernally wet conditions due to the presence of aerenchyma tissue (air channels in the roots) that facilitate necessary gas exchange in submerged plants (Keeley 1998).

San Diego button-celery blooms from April to June; the small white flowers vary in length from 0.067 to 0.11 inch (1.7 to 2.8 millimeters) (Munz 1974, Constance 1993). Species-specific studies have not been conducted for San Diego button-celery regarding pollination, dispersal, population ecology, and genetics. It survives the dry summer and autumn months through dormant seeds and perenniating vegetative structures.

San Diego button-celery is believed to be insect pollinated; the species is known to be visited and possibly pollinated by wasp-like bees from the family Colletidea (i.e., *Hylaeus episcopalis episcopalis, Hylaeus polifolii, Hylaeus conspicuous,* and *Hylaeus mesillae cressoni),* leaf cutting bees from the family Megachilidae (i.e., *Heriades occidentalis, Ashmeadiella cactorum basalis,* and *Megachile brevis onobrychidis*), and bumble or honey bees from the family Apidea (i.e., *Anthophora urbana urbana* and *Ceratina acanthi*) (Krombein et al. 1979).

San Diego button-celery is restricted to southern coastal California, with few occurrences in northern Baja California, Mexico. The species' historical distribution included a coastal swath from Mesa de Colonet and San Quintín in Baja California, Mexico, north to Los Angeles County, California, in the U.S. San Diego button-celery currently occurs in 14 geographic areas in Riverside and San Diego counties. The current status of the species in Mexico is unknown.

Within San Diego County, this species occurs in 10 regional locations: Camp Pendleton, Carlsbad, San Marcos, Ramona, Del Mar Mesa, Carmel Mountain, Mira Mesa, Marine Corps Air Station (MCAS) Miramar, Otay Lakes, and Otay Mesa. San Diego button-celery can be locally abundant in remnant vernal pools; however, the distribution of this variety has been dramatically reduced due to loss of most of the vernal pool habitat in San Diego County (Oberbauer and Vanderwier 1991). There is little data available regarding population size and trends. Surveys conducted in 2003 by the City of San Diego revealed that of the 69 sites surveyed, 28 contained San Diego button-celery.

### Status of the Species within the Refuge

San Diego button-celery seed that was collected at the Cal Terraces vernal pool preserve on Otay Mesa was distributed within two pools at the Shinohara site in 2010. In 2011, both pools supported mature San Diego button-celery plants. San Diego button-celery is also present in some of the vernal pools within the Del Mar Mesa Vernal Pool Unit.

### 3.3.6.12 Spreading Navarretia (Navarretia fossalis)

### **Listing and Conservation Status**

Spreading navarretia was listed as threatened on October 13, 1998 (63 FR 54975). This species is not listed by the State of California as a rare, threatened, or endangered species, but is a covered species under the San Diego MSCP. The Service published a final rule designating approximately 652 acres (264 hectares ) as critical habitat for spreading navarretia in the *Federal Register* on October 18, 2005 (70 FR 60658). In 2007, the Center for Biological Diversity filed a lawsuit challenging the validity of the information and reasoning used to exclude areas from the 2005 critical habitat designation for spreading navarretia. As a result, on October 7, 2010, a final rule revising the critical habitat for this species was published in the *Federal Register* (75 FR 62192). Effective November 8, 2010, approximately 6,720 acres (2,456 hectares) of habitat for spreading navarretia was included within the boundaries of the critical habitat designation. A portion of the critical habitat included in Subunit 5A, an area located to the southeast of Sweetwater Reservoir near the Shinohara vernal pools, extends into the Otay-Sweetwater Unit. Subunit 5F is located to the northeast of the Refuge in Proctor Valley.

Recovery and protection actions for this species are included within the vernal pool recovery plan (USFWS 1998a), as described in the section addressing San Diego mesa mint, and a five-year review was completed by the Service in August 2009. The review concluded that spreading navarretia still meets the definition of threatened and recommended no change in its listing status (USFWS 2009d).

### **Species and Habitat Description**

Spreading navarretia, a member of the Polemoniaceae (phlox family), is a low, mostly spreading or ascending annual plant, four to six inches (10.2 to 15.2 centimeters) tall. The leaves are 0.4 to 2 inches (one to 1.5 centimeters) long and finely divided into slender spine-tipped lobes. The lower portions of stems are mostly hairless (glabrous), and the flowers are arranged in flat-topped, compact, leafy heads. The white to lavender-white petals (corolla) are joined at their bases to form a tube, although the tips (lobes) are free. The fruit is an ovoid, two-chambered capsule, with each seed covered by a layer that becomes sticky and viscous when the capsule is moistened.

The range of *N. fossalis* overlaps with two other species in the genus *Navarretia*: *N. intertexta* (needle-leaved navarretia) and *N. prostrata* (prostrate navarretia). Spreading navarretia is distinguished from the other two species by its linear corolla lobes, spreading or ascending position, flat topped inflorescences, calyx size and shape (sepals collectively), and the position of the corolla relative to the calyx (Day 1993).

Spreading navarretia is considered an obligate wetland species (found almost always in wetland areas) but is more tolerant of the ephemeral inundation of vernal pool habitat than a true wetland plant. Within San Diego County, spreading navarretia is typically found in vernal

pools and depressions and ditches in areas that once supported vernal pools (Tierra Madre Consultants 1992, Day 1993, Reiser 1996).

Spreading navarretia depends on the inundation and drying cycles of its habitat for survival. This regime allows for germination and other life history phases of the plant. This annual species germinates from seeds left in the seed bank. For many vernal pool plant species, temperature and moisture affect the timing of plant germination (Myers 1975). Although not proven, it is likely that this species uses these same cues for germination. Most *Navarretia* species have indehiscent fruit or fruit with fibers that absorb water and expand to break open the fruit after a substantial rain (Spenser and Riesberg 1998). The timing of germination is important so that the plant germinates under favorable conditions in the spring rather than the summer, autumn, or winter.

The plant usually flowers in May and June as the vernal pool dries out. No studies have been conducted for this species regarding reproduction. Specific data regarding pollinators and seed viability are lacking. The species is capable of self-pollination, but it can also outcross to other plants. Outcrossing can be an important factor in regaining the genetic diversity lost with the disappearance of occurrences. Upon fruiting, this species fades rapidly and can be difficult to detect late in the dry season or in dry years. The number of individuals of spreading navarretia at a given population site varies annually in response to the timing and amount of rainfall and temperature (USFWS 2009d).

Spreading navarretia is distributed from northwestern Los Angeles County and western Riverside County, south through coastal San Diego County, California, to San Quintín in northwestern Baja California, Mexico, from near sea level to 4,200 feet (1,280 meters) (Day 1993; Munz 1974). Currently there are 48 extant occurrences of spreading navarretia in the U.S., with nearly 60 percent of the known populations concentrated in three locations: Otay Mesa in southern San Diego County; along the San Jacinto River in western Riverside County; and near Hemet in Riverside County (Bauder 1986, Bramlet 1993, CNDDB 1999). Smaller populations are scattered in southern Riverside County, Los Angeles County, and coastal San Diego County. In Mexico, spreading navarretia is known from fewer than 10 populations clustered in three areas: along the international border; on the plateaus south of the Rio Guadalupe; and on the San Quintín coastal plain (Moran 1977).

Range wide, comprehensive surveys for spreading navarretia have not occurred, but some survey work has been completed to various areas within this species range. In 2003, the City of San Diego conducted a survey of vernal pools within their jurisdiction. Of the 1,142 vernal pools surveyed, spreading navarretia was found in 99 pools with a mean percent cover per pool of 2.4 percent (City of San Diego 2004).

Threats to this species are similar to those described for other listed vernal pool species: habitat destruction; indirect effects related to altered hydrology, competition with invasive species, and habitat fragmentation; and cumulative impacts related to isolation of genetic diversity, pollution, climate change, and changes in nutrient availability (Bauder 1986).

### Status of the Species within the Refuge

Spreading navarretia seed that was collected from an adjacent vernal pool restoration site on Sweetwater Authority lands was sown in three pools on the Shinohara site in 2010; in 2011, mature plants were present in all three of the pools. This species is not present in the pools on the Del Mar Mesa Vernal Pool Unit.

### 3.3.6.13 California Orcutt Grass (Orcuttia californica)

#### Listing and Conservation Status

California Orcutt grass was listed by the State of California as an endangered species in September 1979, and was federally listed as an endangered species on August 3, 1993 (58 FR 41384). The primary threats at the time of listing are similar to those described previously for other listed vernal pool species, including habitat loss and degradation, invasion of weedy nonnative plants, alteration of the watershed, and drought. Recovery and protection actions for this species are included within the vernal pool recovery plan (USFWS 1998a), as described in the section addressing San Diego mesa mint. No critical habitat has been designated for this species. This species is a covered species under the San Diego MSCP.

The only review of the listing status for this species occurred during a five-year review completed by the Service in March 2011. Based on the results of the review, no change in the listing status of California Orcutt grass was recommended (USFWS 2011a).

#### **Species and Habitat Description**

California Orcutt grass, a member of the grass family (Poaceae), is a small, inconspicuous, prostrate, sparsely hairy, tufted annual grass. Reeder (1982) describes it as reaching about four inches (1.6 centimeters) in height, with bright green leaves that secrete sticky droplets that taste bitter. Pink inflorescences (flowers) are borne from April through June and consist of seven spikelets arranged in two ranks, with the upper spikelets overlapping on a somewhat twisted axis. California Orcutt grass can be distinguished from other species in the genus by the length (no longer than 0.2 inches [5 millimeters]) and shape (sharp-pointed) of the teeth of lemma (bract enclosing the floret); prostrate culms (stems), length of the caryopsis (fruit); and spikelets that are remote on the axis below, crowded toward the apex.

The leaf and root anatomy and physiology of this plant is adapted to the conditions that occur within the wettest, longest lasting portion of vernal pools (Munz 1974, Reeder 1993). The presence of aerenchyma tissue for submerged gas exchange described by Keeley (1990) as Crassulacean Acid Metabolism (CAM) photosynthesis makes this species specifically adapted to survive in vernally wet conditions. Its seeds germinate in the saturated and/or submerged soil of vernal pools. As the pools that support California Orcutt grass dry up and the plant becomes more exposed, the plant structure, which began the season nearly prostrate, produces more erect glandular pubescent stems. During this drying period, the plants also produce flowers and subsequently set seed (USFWS 2011a). Like most grasses, California Orcutt grass flowers are wind pollinated; however, this plant species relies on fungi to play a role in stimulating germination (Griggs 1976, Griggs 1981, Keeley 1988).

This species is an obligate vernal pool species and often occurs in pools with a loamy soil surface and clay hardpan bottom that restricts or precludes drainage from the pool site. This species is less abundant at the shallow periphery of vernal pools that are subject to more rapid changes in moisture and are generally more abundant in portions of pools that retain water for the longest period of time (longer inundation time).

The historic distribution of California Orcutt grass ranged from Ventura County to northern Baja California, Mexico, below 2,300 feet (700 meters) in elevation. At the time of listing, it was thought to be restricted to four general localities in California: Santa Rosa Plateau, Skunk Hollow, and Salt Creek (now identified as the Stowe Pools) in Riverside County, and Otay Mesa in San Diego County. The species was likely never widespread compared to other obligate vernal pool plant species because deeper pools with longer inundation times (longer seasonal ponding) are less common in southern California.

In 2011, California Orcutt grass was considered to be extant at 28 occurrences: 3 occurrences in Ventura County, 3 occurrences in Los Angeles County, 9 occurrences in Riverside County, and 13 occurrences in San Diego County (USFWS 2011a). The population size of this species within these occurrences fluctuates at any given time with rainfall variability, so the number and distribution of occupied pool complexes is the appropriate unit for assessing California Orcutt grass populations.

The threats and conservation needs identified for San Diego button-celery are also applicable to California Orcutt grass.

### Status of the Species within the Refuge

California Orcutt grass seed that was collected at the Cal Terraces vernal pool preserve on Otay Mesa was distributed in four pools on the Shinohara site in 2010. In 2011, one of the seeded pools supported mature specimens of this species. This species does not occur in the vernal pools on the Del Mar Mesa Vernal Pool Unit.

### 3.3.6.14 Encinitas Baccharis (Baccharis vanessae)

### Listing and Conservation Status

Encinitas baccharis was listed as endangered by the State in 1987 and federally listed as threatened in 1996 (61 FR 52370). There is currently no recovery plan and no critical habitat rules have been published. Encinitas baccharis is a covered species under the San Diego MSCP with a requirement for area specific management directives that address the autecology and natural history of the species and include measures to reduce the risk of catastrophic fire and ensure appropriate male to female plant ratios (City of San Diego 1997). The Service completed a 5-year review for this species in 2011 and concluded that no change in the current listing status of the species was warranted (USFWS 2011b).

### **Species and Habitat Description**

Encinitas baccharis, a member of the Asteraceae (sunflower) family, is a slender-stemmed, dioecious (separate male and female plants) shrub measuring 1.6 to 4.3 feet (0.5 to 1.3 meters) in height. Because this species is dioecious, both sexes must be in close proximity for pollination and subsequent seed production to occur. This species can be distinguished from other members of the genus by its numerous, erect, glabrous stems; linear, entire leaves with only one principal vein; and its delicate, narrowly tapered phyllaries (bracts that form the inflorescence), which are reflexed at maturity. The dark green leaves, which are thread-like, are narrower in width than the portion of the twig adjacent to the leaf (USFWS 2011b). The flower heads (capitulae) are cylindrical receptacles each containing clusters of tiny, whitish, flowers, with each flower head containing 15 to 22 flowers. The blooming period is between August and November.

Encinitas baccharis is probably pollinated by both wind and insects, and the pollinated flowers develop one-seeded dry fruits (achenes) that are each attached to a cluster of bristly hairs (a pappus), which facilitate wind dispersal (USFWS 2011b). The Service's 5-year review for this species (USFWS 2011b) notes that no Encinitas baccharis seedlings have been observed in the field since 1991, and the factors that may be limiting reproduction are currently unknown.

This species of *Baccharis* is unusual among the California species of *Baccharis* because it occurs mainly in chaparral rather than in riparian environments, washes, or otherwise disturbed lands (USFWS 2011b). It is found in several types of chaparral habitats distributed below 3,000 feet (914 meters) in areas where maritime climate prevails. Encinitas baccharis is difficult to locate in the field when not in flower. Plants may be confused with other co-occurring taxa (e.g., peak rush rose [*Helianthemum scoparium*], broom baccharis). For these reasons, it is possible that additional occurrences exist within the species' range, even in heavily urbanized areas. Surveys for this species should be conducted during the months when the species is in flower to facilitate detection and accurate identification.

### Status of the Species within the Refuge

No occurrences of this species have been recorded on the San Diego NWR. There are 30 known extant occurrences, but none occurs within or in proximity to the Del Mar Mesa Vernal Pool Unit. Two small populations are known from Otay Mountain and are presumed extant, but no populations have been identified on lands included within the Otay-Sweetwater Unit.

### 3.3.6.15 San Diego Fairy Shrimp (Branchinecta sandiegonensis)

#### Listing and Conservation Status

The Service listed the San Diego fairy shrimp, an invertebrate species, as endangered on February 3, 1997 (62 FR 4925). This species was listed as endangered because 90 to 97 percent of the vernal pool habitat on which the San Diego fairy shrimp depends and the watersheds that sustain the vernal pool habitat has been damaged or destroyed by a variety of human-caused activities, primarily urban development and agricultural conversion (62 FR 4925). In addition, the remaining vernal pools were vulnerable to disturbance due to a range of human activities associated with development, agriculture, and recreation. Recovery and protection actions for this species are included within the vernal pool recovery plan (USFWS 1998a), as described earlier in the section addressing San Diego mesa mint. This species has not been listed by the State of California as a rare, threatened, or endangered species, but is covered under the San Diego MSCP.

Critical habitat was first designated for this species in October 2000 (65 FR 63438), at which time a total of approximately 4,025 acres (1,629 hectares) in the counties of San Diego and Orange were included within the boundaries of designated critical habitat. As a result of a lawsuit, the areas designated for critical habitat were reconsidered, a proposed rule was issued on April 22, 2003 (68 FR 19888), and a final rule was published on December 12, 2007 (72 FR 70648). Today, approximately 3,082 acres (1,248 hectares) in the counties of San Diego and Orange are included within the boundaries of designated critical habitat including lands within the Del Mar Mesa Vernal Pool Unit of the Refuge (Critical Habitat Unit 4, Subunits 4 A/B). In September 2008, the Service completed a five-year review addressing the status of the San Diego fairy shrimp (USFWS 2008b). The five-year review recommended no change in the status of the San Diego fairy shrimp.

#### **Species and Habitat Description**

The San Diego fairy shrimp is a small, freshwater crustacean in the family Branchinectidae of the Order Anostraca. The species was originally described by Fugate (1993) from samples collected on Del Mar Mesa, San Diego County. Male San Diego fairy shrimp are distinguished from males of other *Branchinecta* species by differences found at the distal (located far from the point of attachment) tip of the second antennae. Females are distinguishable from females of other species of *Branchinecta* by the shape and length of the brood sac, the length of the ovary, and by the presence of paired dorsolateral (located on the sides, toward the back) spines

on five of the abdominal segments (Fugate 1993). Adult male San Diego fairy shrimp range in size from 0.35 to 0.63 inch (8.9 to 16 millimeters), and adult females are 0.31 to 0.55 inch long (7.9 to 14 millimeters). A genetic study based on mtDNA sequencing of San Diego fairy shrimp across its range found two evolutionary significant units (genetic clades A and B) (Bohonak 2005).

San Diego fairy shrimp are generally restricted to vernal pools and other non-vegetated ephemeral (i.e., containing water for a short time) basins 2 to 12 inches (5.1 to 30.5 centimeters) in depth in coastal southern California and northwestern Baja California, Mexico (USFWS 2008b). This habitat is essential to the hatching of San Diego fairy shrimp cysts. Their cysts cannot hatch in perennial (i.e., containing water year round) basins because the re-wetting of dried cysts is one component of a set of environmental stimuli that trigger hatching (Eriksen and Belk 1999). Temperature, water chemistry, and other factors may also play a role in trigger hatching (USFWS 2008b). San Diego fairy shrimp, which feed on algae, diatoms, and particulate organic matter (Parsick 2002), are usually observed from January to March when seasonal rainfall fills vernal pools and initiates cyst hatching. Individuals hatch and mature within 7 to 14 days of rainfall filling a pool, depending on water temperature (Hathaway and Simovich 1996, Simovich and Hathaway 1997). This hatching period may be extended in years with early or late rainfall.

Cysts produced from successful reproduction are dropped to the pool bottom or remain in the brood sac until the female dies and sinks. Cysts are capable of withstanding temperature extremes and prolonged drying. Only a portion of the cysts may hatch when pools refill in the same or subsequent rainy seasons; therefore, cyst "banks" develop in pool soils that are composed of cysts from several years of breeding. This partial hatching of cysts allows the San Diego fairy shrimp to persist in its extremely variable environment (USFWS 2008b). The ability of this species to develop and maintain cyst banks is vital to the long-term survival of San Diego fairy shrimp populations (Ripley et al. 2004).

The range of the San Diego fairy shrimp includes Orange and San Diego counties in southern California and northwestern Baja California, Mexico (Brown et al. 1993, USFWS 1998a). As of 2008, 137 complexes occupied by San Diego fairy shrimp have been identified in the U.S. (USFWS 2008b). It is currently not possible to survey San Diego fairy shrimp populations for changes in numbers of individuals and demographic trends over time due to the small size and life history traits of San Diego fairy shrimp. Research into the development of population assessment methods is, however, being pursued (USFWS 2008b).

### Status of the Species within the Refuge

Areas identified as occupied by San Diego fairy shrimp at the time of listing included the pools within the Del Mar Mesa Vernal Pool Unit and remnant pools on the Shinohara parcel in the Otay-Sweetwater Unit. In 2011, presence of the species was documented within 27 restored or enhanced vernal pools on the Shinohara site in the San Miguel Mountain area of the Otay-Sweetwater Unit.

### 3.3.6.16 Riverside Fairy Shrimp (Streptocephalus woottoni)

#### Listing and Conservation Status

The Service listed the Riverside fairy shrimp, an invertebrate species, as endangered on August 3, 1993 (58 FR 41384). Listing was deemed necessary because the habitat on which this species is dependent, vernal pools, and the species' overall range had been greatly reduced. At the time the listing rule was written, only five vernal pool complexes within the

U.S. and two complexes in Mexico were known to be occupied by Riverside fairy shrimp (USFWS 2008c). Recovery and protection actions for this species are included within the vernal pool recovery plan (USFWS 1998a), as described in the section addressing San Diego mesa mint. This species has not been listed by the State of California as a rare, threatened, or endangered species, but is covered under the San Diego MSCP.

Critical habitat was first designated for this species in May 2001 (66 FR 29384), at which time approximately 6,870 acres (2,790 hectares) in Los Angeles, Orange, Riverside, San Diego, and Ventura counties, California, were designated as critical habitat. As a result of a lawsuit, the areas designated for critical habitat were required by the court to be reconsidered. On April 27, 2004, a proposed rule was issued in the *Federal Register* (69 FR 23024) and a final rule was published on April 12, 2005 (70 FR 19154). The final rule, which became effective on May 12, 2005, designated approximately 306 acres (124 hectares) within Ventura, Orange, and San Diego counties, California, as critical habitat. None of this acreage is located within the boundaries of the San Diego NWR.

On January 14, 2009, the Center for Biological Diversity filed a lawsuit challenging the 2005 designation of critical habitat. As a result, the Service published a proposed rule on June 1, 2011, to once again revise the areas designated as critical habitat for this species (76 FR 31686). This proposed rule incorporates new information specific to Riverside fairy shrimp genetics across the species' range that was not available when the 2005 critical habitat designation was made final (70 FR 19154; April 12, 2005). In addition, it considered new information on the status and distribution of Riverside fairy shrimp that became available since the 2005 final critical habitat designation for this species. As currently proposed, approximately 2,678 acres (1,084 hectares) of critical habitat would be designated for this species. The proposed areas of critical habitat include habitat known to support Riverside fairy shrimp as well as surrounding upland areas (the contributing watershed) that contain the physical and biological features essential to support Riverside fairy shrimp. None of the lands within the San Diego NWR are proposed for inclusion in the areas being considered for designation as revised critical habitat for Riverside fairy shrimp. The five-year review completed for this species in September 2008 recommended no change in the status of the Riverside fairy shrimp (USFWS 2008c).

#### **Species and Habitat Description**

The Riverside fairy shrimp is a small freshwater crustacean in the Family Streptocephalidae of the Order Anostraca. The species was first collected in 1979 by Clyde Eriksen and formally described as a new species in 1990 (Eng et al. 1990). Riverside fairy shrimp, like all fairy shrimp in general, have stalked compound eyes, no carapace (hard outer shell), and 11 pairs of phyllopods (swimming legs that also function as gills). They swim or glide upside down by means of complex beating movements of the legs that pass, wave-like, in an anterior to posterior direction. The Riverside fairy shrimp can be distinguished from similar species by its red-colored cercopods (anterior appendages), which occur on all of the ninth and 30 to 40 percent of the eighth abdominal segments (Eng et al. 1990). Adult Riverside fairy shrimp may grow to a length of 0.5 to 1.0 inches (13 to 25 millimeters) (Eng et al. 1990).

Riverside fairy shrimp are restricted to vernal pools and vernal pool-like ephemeral basins (e.g., ruts in dirt roads and stock ponds). In contrast to San Diego fairy shrimp, Riverside fairy shrimp prefer deep—greater than 9 inches (22.9 centimeters) in depth—vernal pools that range in temperature from 50 to 77°F and remain filled for extended periods of time (Eng et al.199, Eriksen and Belk 1999). Water within pools supporting Riverside fairy shrimp may be clear, but more commonly it is moderately turbid (Eriksen and Belk 1999). Typically, pools

supporting this species have low total dissolved solids and alkalinity (means of 77 and 65 parts per million, respectively), in association with pH at neutral or just below (7.1 to 6.4) (Eng et al. 1990, Gonzalez et al. 1996, Eriksen and Belk 1999).

Riverside fairy shrimp may also be found in disturbed vernal pool habitats where basins have been compacted or artificially deepened, which allows the basins to hold water for longer periods. Although basins supporting populations often appear to be artificially created or enhanced, such basins are located within soils that are capable of seasonal ponding and are often surrounded by naturally occurring vernal pool complexes (USFWS 2008c). These "artificial basins" function in the same manner as naturally occurring vernal pools by filling with late fall, winter and/or spring rains that gradually dry up during the spring and/or summer (USFWS 1998a).

Riverside fairy shrimp are non-selective filter-feeders that filter suspended solids from the water column. Protozoa, rotifers, bacteria, algal cells, and bits of detritus between 0.3 to 100 microns may be filtered and ingested (Eng et al. 1990, Eriksen and Belk 1999). Riverside fairy shrimp are preyed upon by a wide variety of wildlife, including beetles, dragonfly larvae, other arthropods, frogs, salamanders, toad tadpoles, shorebirds, ducks and other migratory birds, and even other fairy shrimp (Eriksen and Belk 1999).

Freshwater crustaceans, including Riverside fairy shrimp, have a two-stage life cycle and spend the majority of their life cycle in the cyst stage (Templeton and Levin 1979, Schaal and Leverich 1981). After hatching, Riverside fairy shrimp require 48 to 56 days to reach sexual maturity in contrast with other fairy shrimp that can reach maturity in less than two weeks (Hathaway and Simovich 1996). Fairy shrimp mate upon reaching maturity, and female Riverside fairy shrimp produce between 17 and 427 cysts (eggs) over their lifetime (Simovich and Hathaway 1997).

The cysts are dropped by the females to settle into the mud at the bottom of the pool, or they remain in the brood sac until the female dies and sinks to the bottom (Eriksen and Belk 1999). The cysts will hatch in 7 to 12 days when water temperatures are between 50 to 77°F (Hathaway and Simovich 1996). A small percentage of cysts are likely to hatch in a season, thus providing a mechanism for survival if the inundation period is too short in a given year (Simovich and Hathaway 1997). Fairy shrimp cysts may persist in the soil for several years until conditions are favorable for successful reproduction (Simovich and Hathaway 1997).

Riverside fairy shrimp occurs within Riverside, Orange, and San Diego counties in California, as well as northern Baja California, Mexico. Its known localities are below 2,100 feet (640 meters) elevation and are within 50 miles (80 kilometers) of the Pacific Ocean. As of 2011, Riverside fairy shrimp were presumed to occupy 60 or fewer pool complexes throughout southern California.

The loss and modification of vernal pool habitat continues to be a significant threat to the Riverside fairy shrimp, especially in areas where urbanization is expected to expand. Acquisition of land and conservation easements have resulted in the preservation of vernal pool habitat for the species, but the trend of habitat loss and degradation continues, particularly on private lands. Additionally, even preserved lands are often subject to invasion by non-native plants and other impacts that lower the quality of habitat for Riverside fairy shrimp (USFWS 2008c).

Riverside fairy shrimp habitat is also threatened by indirect effects of development (including human access and disturbance impacts, runoff, illegal dumping, and water and air pollution) resulting from the proximity of Riverside fairy shrimp habitat to development. Non-native plants also threaten Riverside fairy shrimp throughout the range of the species. Riverside fairy shrimp habitat is naturally fragmented, but development projects continue to further fragment and isolate vernal pools within and between complexes, which may disrupt the population dynamics of the species. Conservation measures beyond habitat preservation, such as habitat and species management and monitoring, are necessary to ensure the long-term sustainability and persistence of this species throughout its range (USFWS 2008c).

#### Status of the Species within the Refuge

As of 2011, this species has not been documented anywhere on the Refuge, although suitable habitat to support this species does exist at the Shinohara site. It is presumed to be present in one or more pools on lands in Otay Mesa that Caltrans may be conveying to the Service for inclusion in the Refuge at some future date.

### 3.3.6.17 Quino Checkerspot Butterfly (Euphydryas editha quino)

#### Listing and Conservation Status

The Quino checkerspot butterfly was listed as endangered on January 16, 1997 (62 FR 2313). This subspecies was added to the endangered species list as a result of significant declines in both species distribution and abundance caused primarily by human actions that degraded, fragmented, and destroyed habitat essential for this subspecies' survival (USFWS 2003b). The Quino checkerspot butterfly is not included on the State of California's list of rare, threatened, or endangered species.

A final rule designating approximately 171,605 acres (69,440 hectares) in Riverside County and San Diego County, California, as critical habitat for the Quino checkerspot butterfly was published in the *Federal Register* on April 15, 2002 (67 FR 9476), and the *Quino Checkerspot Butterfly Recovery Plan* ("Quino recovery plan") was approved in 2003. Following the filing of a lawsuit by the Homebuilders of Northern California, *et al.* challenging the merits of the 2002 critical habitat designation, the Service agreed in 2005 to reevaluate the areas designated as critical habitat for this species. As a result, on June 17, 2009 (74 FR 28776), the Service published a final revised critical habitat rule that designated approximately 62,125 acres (25,141 hectares) of critical habitat for this butterfly in San Diego and Riverside counties. Only a small portion of the Refuge, an area adjacent to Proctor Valley Road, has been designated as critical habitat for this subspecies and recommended no change in the status of the Quino checkerspot butterfly (USFWS 2009e).

#### **Species and Habitat Description**

The Quino checkerspot butterfly is a recognized subspecies of Edith's checkerspot butterfly (*Euphydryas editha*) and a member of the Nymphalidae family, the brush-footed butterflies. The Quino checkerspot butterfly differs from the other Edith's checkerspot subspecies in size, wing coloration, and larval and pupal phenotypes (Mattoni et al. 1997). Among the other subspecies of Edith's checkerspot, the Quino checkerspot butterfly is moderate in size with a wingspan of approximately 1.5 inches (38 millimeters). The dorsal (top) side of its wings is covered with a red, black, and cream colored checkered pattern; the ventral (bottom) side is mottled with tan and gold. The abdomen generally has bright red stripes across the top. Quino checkerspot butterfly larvae are black, and they have a row of nine orange-colored

tubercles (fleshy/hairy extensions) on their back. Pupae are extremely cryptic and are mottled black and blue-gray (USFWS 2003b).

Quino checkerspot butterfly habitat is characterized by patchy shrub or small tree landscapes with openings of several meters between large plants, or a landscape of open swales alternating with dense patches of shrubs; such habitats are often collectively termed "scrublands." Quino will frequently perch on vegetation or other substrates to mate or bask, and they require open areas to facilitate movement (USFWS 2009e). In fact, open areas within a given vegetation community seem to be critical landscape features for Quino checkerspot butterfly populations (USFWS 2003b). Optimal habitat appears to contain little or no invasive exotic vegetation and a well-developed cryptogamic crust. Sustained drought conditions can lead to extirpation of local populations, and broad scale climate anomalies may lead to phenological incompatibility between Quino checkerspot butterfly and their host plants.

The life cycle of the Quino checkerspot butterfly typically entails one generation of adults per year, with a four- to six-week flight period occurring between January and May, depending on weather conditions (USFWS 2003b). During the flight period, adult butterflies move about and search for nectar sources, mates, and oviposition sites. Females lay multiple masses of 20 to 150 eggs, with a single female capable of producing more than 1,000 eggs (USFWS 2003b).

After hatching from eggs, the small, cryptic, larvae normally consume the plant on which they hatch and then move in search of additional plants (USFWS 2003b). Food plants dry up as summer approaches. In their third or fourth instar, larvae enter into an obligatory diapause. Diapause is a low-metabolic resting state that may last for a year or more, depending on conditions. Diapause allows larvae to survive the regular seasonal climatic extremes and to better survive times of extended adverse conditions, such as drought. After termination of diapause, larvae become active and feed. They then enter their pupal stage and within two to six weeks transform into adults and emerge as butterflies. The butterflies feed, disperse, mate, reproduce, and then die. Adults live for a period of approximately 10 to 14 days.

Adult butterflies will only deposit eggs on species they recognize as host plants. The primary host plants or larval food sources for the Quino checkerspot butterfly are dwarf plantain (*Plantago erecta*), white snapdragon (*Anterrhinum coulterianum*), woolly plantain (*Plantago patagonica*), and Chinese houses (*Collinsia concolor*). Larval Quino checkerspot butterfly may also use other species of native plantain (*Plantago* sp.), as well as purple owl's clover (*Castilleja exserta*) and thread-leaved bird's beak (*Cordylanthus rigidus*), as primary or secondary host plants (USFWS 2003b). The use of purple owl's clover and thread-leaved bird's beak however is rare, and these species alone are not believed to support Quino breeding (USFWS 2003b).

Newly hatched pre-diapause larvae cannot move more than an inch or so (a few centimeters) during the first two instars, restricting their development during this stage to the individual host plant where the eggs were deposited. Older pre-diapause larvae usually wander independently in search of food and may switch to feeding on a different species of host plant (USFWS 2003b). Larval Quino checkerspot butterfly are thought to diapause in or near the base of native shrubs. While the use patterns of primary and secondary larval host plants are not fully understood, there is evidence that both may be necessary for the survival of Quino checkerspot butterfly larvae (USFWS 2003b). Quino checkerspot butterflies, which use a number of flowering plants as nectar sources, appear to prefer flowers with a platform-like surface on which they can remain upright while feeding (USFWS 2003b).

Adult Quino checkerspot butterflies are sedentary by nature and generally fly close to the ground. Many experts familiar with the Quino checkerspot butterfly believe that populations separated by more than two miles may be demographically isolated. These butterflies may, however, travel greater distanced when influenced by abiotic factors, such as weather (Ehrlich and Murphy 1987). In addition, it appears that Quino checkerspot butterfly populations have evolved to respond to shifting habitat patch suitability. Adult Quino checkerspot butterfly are also known to congregate on hilltops, ridgelines, and other prominent geographic features; however, whether this behavior (referred to as "hilltopping") is related to mating has yet to be confirmed (Mattoni et al. 1997).

Quino checkerspot butterfly population density appears to fluctuate dramatically in response to annual climate variability (Murphy and White 1984). This population variability likely leads to extirpation and recolonization of local populations or metapopulation structure. Because local populations of Quino checkerspot butterfly are likely susceptible to extirpation, it is important to maintain connectivity among local populations to allow for recolonization from nearby local populations (USFWS 2003b).

The Quino checkerspot butterfly was historically found from the coastal slopes of Los Angeles, Orange, and San Diego counties, as well as northern Baja California, Mexico, east to southwestern San Bernardino County and the western edge of the upper Anza-Borrego desert. Today, the Quino checkerspot butterfly is only known from western Riverside County, southern San Diego County, and northern Baja California, Mexico. Significant areas of remaining Quino checkerspot butterfly habitat are now protected through inclusion in habitat conservation plan preserve areas.

### Status of the Species within the Refuge

The pattern of occurrence of the Quino checkerspot butterfly on the Otay-Sweetwater Unit is small numbers of butterflies in a given location with inconsistent numbers from year to year. This inconsistency may be the result of annual variations in climate, including the amount and timing of rainfall, as well as the range of temperatures in a given year. Historically, this species has been documented in small numbers on at least 13 distinct locations within this unit, including on hilltops and ridges within the Sweetwater River and San Miguel areas, and within the Otay Lakes and Mesa area. In 2009, seven Quino checkerspot butterflies were documented on the Otay-Sweetwater Unit. There are at least eight areas of high-quality habitat (hilltops or ridgelines in open-canopy coastal sage scrub, with primary and secondary larval host plants, abundant and diverse nectar sources, and minimal annual weed invasion) on the Refuge. This species is not known to occur in the Del Mar Mesa Vernal Pool Unit.

### 3.3.6.18 Hermes Copper (Hermelycaena [Lycaena] hermes)

#### Listing and Conservation Status

On April 14, 2011, the Service determined in a 12-month finding that listing of the Hermes copper butterfly as endangered or threatened is warranted (76 FR 20918). However, due to higher priority actions to amend the lists of endangered and threatened wildlife and plants, the Hermes copper butterfly was added to the Service's candidate species list with the intent of developing a proposed rule to list the butterfly as priorities allow. This species is not included on the State of California's list of rare, threatened, or endangered species.

#### **Species and Habitat Description**

The Hermes copper butterfly is a small, brightly colored butterfly approximately 1.0 to 1.25 inches (2.5 to 3.2 centimeters) in length, with one tail on the hindwing. On the upperside, the

forewing is brown with a yellow or orange area enclosing several black spots, and the hindwing has orange spots that may be merged into a band along the margin. On the underside, the forewing is yellow with four to six black spots, and the hindwing is bright yellow with three to six black spots.

Hermes copper butterfly is endemic to the southern California region, primarily occurring in San Diego County, California, and a few records of the species have been documented in Baja California, Mexico (Faulkner and Klein 2005). The species inhabits coastal sage scrub and southern mixed chaparral (Marschalek and Deutschman 2008) and is dependent on its larval host plant, spiny redberry, to complete its lifecycle.

Adult Hermes copper butterflies lay single eggs on spiny redberry stems where they hatch and feed until pupation occurs at the base of the plant. Hermes copper butterflies have one flight period occurring in mid-May to early July, depending on weather conditions and elevation (Faulkner and Klein 2005).

Adult Hermes copper butterflies have been known to feed on flower nectar in coastal sage scrub and chaparral ecosystems, particularly on the flowers of chamise, California buckwheat, slender sunflower (*Helianthus gracilentus*), poison oak, and short-podded mustard (*Hirshfeldia incana*). This butterfly is rarely observed far from its nectar source or host plant (Faulkner and Klein 2005, Marschalek and Deutschman 2008).

Historical data indicate Hermes copper butterflies ranged from Fallbrook, California, in northern San Diego County to 18 miles (29 kilometers) south of Santo Tomas in Baja California, Mexico, and from Pine Valley in eastern San Diego County to Lopez Canyon in western San Diego County. Range-wide species surveys have not been completed; therefore, it is difficult to assess the extent of occupation throughout the historical range.

Threats to this species include degradation, fragmentation, and loss of suitable habitat due to development and other human activity. Another potential threat is increased fire frequency. As indicated previously, Hermes copper butterflies are dependent upon spiny redberry, a wide-ranging perennial coastal sage scrub and chaparral-associated species, as its larval host and for completion of its lifecycle (Thorne 1963). The habitats in which this plant is found have been subject to multiple fires in recent years. If this pattern of increased fire frequency continues, it is possible that suitable larval host plant or nectar plant availability for Hermes copper butterflies could be significantly reduced. However, to date, no quantitative studies have been conducted to test this hypothesis. Extensive wildfires in 2003 and 2007 eliminated the species from large portions of its former range in San Diego County, such that the vast majority of the species' current known distribution lies in an area between the footprints of the Cedar Fire of 2003 and the Harris Fire of 2007. A fire of large magnitude occurring in this area (which has not burned since 1970) could potentially eliminate over 80 percent of the locations where the species is currently known to occur (Deutschman et al. 2011).

### Status of the Species within the Refuge

Prior to the 2007 Harris Fire, this species occurred in various locations throughout the Otay-Sweetwater Unit; however, surveys conducted in 2010 only observed this species in appropriate intact habitat on McGinty Mountain and the northern portion of Las Montañas, lands that were not burned in the Harris Fire. Surveys conducted at sites within the Harris Fire footprint that were known to be occupied prior to the fire were negative (Deutschman et al. 2010). The results of the 2010 survey, which included a single day maximum count of 26 of these butterflies on McGinty Mountain (Deutschman et al. 2010), suggests that there is an abundant population of Hermes copper in this area. General observations of the species indicate that this species is slow to recolonize areas of habitat that have burned, so it will likely be some time before Hermes copper are once again present in historically occupied sites on the Otay-Sweetwater Unit. Hermes copper has not been documented in the Del Mar Mesa Vernal Pool Unit (Deutschman et al. 2010).

### 3.3.6.19 Arroyo Toad (Anaxyrus californicus)

#### Listing and Conservation Status

The Service listed the arroyo toad as endangered on December 16, 1994 (59 FR 64859), citing the extensive loss of essential native habitat as the primary reason for the decline in numbers of this species. From about 1920 through 1980, significant areas of arroyo toad habitat were lost to dam and reservoir construction, urban development, major road construction, expanding agricultural practices, and new recreational facilities, all of which contributed to the extirpation of some arroyo toad populations and significant reductions in the size of other arroyo toad populations (USFWS 1999b). This species is not included on the State of California's list of rare, threatened, or endangered species, but is a covered species under the San Diego MSCP.

The Service completed the Arroyo Southwestern Toad (Bufo microscaphus californicus) Recovery Plan ("arroyo toad recovery plan") in September 1999, and a five-year review for the arroyo toad was completed on August 3, 2009 (USFWS 2009f). The five-year review concluded that the level of threat to the arroyo toad remains basically the same as when it was listed in 1994. Although some threats such as habitat loss due to dam construction have diminished, other threats, including habitat alteration due to invasive non-native plants (e.g., tamarisk and Arundo), and the introduction of non-native predators such as bullfrogs, green sunfish, and African clawed frogs, are now substantial threats to the arroyo toad (USFWS 2009f). Threats identified subsequent to listing of the arroyo toad include the chytrid fungus disease and wildfire suppression activities. Despite continued threats to the species, the status of the arroyo toad has improved since it was listed, and new conservation measures have been implemented that are providing benefits for the arroyo toad. As a result, the five-year review recommended that this species be downlisted to threatened status.

Critical habitat was designated for the arroyo toad on February 7, 2001 (66 FR 9474), but it was vacated by court order on October 30, 2002, and remanded for redesignation. On April 13, 2005, a final rule redesignating critical habitat was published in the *Federal Register* (70 FR 19562). In 2007, a complaint was filed challenging the 2005 critical habitat designation and as a result, critical habitat for this species was once again revised and a final rule was published in the *Federal Register* on February 9, 2011 (76 FR 7245). Approximately 2.9 acres of designated critical habitat for arroyo toad occurs within the Refuge boundary along a portion of the Sweetwater River located in the McGinty Mountain management area.

#### **Species and Habitat Description**

The currently recognized nomenclature for the arroyo toad is *Anaxyrus californicus* (Frost et al. 2006, Crother 2008), while at the time of listing, the species was known as *Bufo* microscaphus californicus. This change does not alter the description or distribution of the animal.

The arroyo toad is a small, dark-spotted toad of the family Bufonidae. The parotoid glands, located on the top of the head, are oval-shaped and widely separated. A light or pale area or stripe is usually present on these glands and on top of the eyes. The toad's underside is buff-

colored and usually without spots (Stebbins 1985). Recently metamorphosed individuals will easily blend with the substrate and are usually found adjacent to water.

The habitat requirements for arroyo toads include shallow, slow-moving streams and riparian habitats with natural flooding regimes and areas of open, sparsely vegetated, sandy stream channels and terraces (USFWS 2009f). Optimal breeding habitat consists of low gradient stream reaches that have shallow pools with fine textured substrates (i.e., sand, gravel). Toads also use upland habitats consisting of alluvial scrub, coastal sage scrub, chaparral, grassland, and oak woodland during both the breeding and non-breeding seasons (Griffin et al. 1999, USFWS 2009f). Observations of this species indicate that these toads move approximately one mile (1,609 meters) within a stream reach and up to 0.9 mile (1,448 meters) away from the stream into native upland habitats (Sweet 1992, Holland and Goodman 1998). The extent to which this species moves within these areas may be regulated by topography and channel morphology (Holland and Sisk 2000). Toads are critically dependent on upland terraces and the marginal zones between stream channels and upland terraces during the non-breeding season, especially during periods of inactivity, generally late fall and winter (Sweet 1992). Adult and juvenile toads burrow into loose soils in stream terraces and in uplands, where they may remain during daylight hours or for longer periods during the dry season (Sweet 1992).

Toads typically breed from February to July on streams with persistent water (Griffin et al. 1999). Female toads must feed for a minimum of two months to develop the fat reserves needed to produce a clutch of eggs (Sweet 1992). Eggs are deposited, and larvae develop in shallow pools with minimal current and little or no emergent vegetation. The substrate in these pools is generally sand or fine gravel overlain with silt. Arroyo toads need breeding pools that are no more than six inches (15.2 centimeters) deep. Toad eggs hatch in four to five days, and the larvae are essentially immobile for an additional five to six days. They then begin to disperse from the pool margin into the surrounding shallow water, where they spend an average of 10 weeks.

After metamorphosis (June to July), the juvenile toads remain on the bordering gravel bars until the pool no longer persists (usually from eight to 12 weeks depending on-site and yearly conditions) (Sweet 1992). With some exceptions, male toads reach adulthood in one to two years, and females become sexually mature in two to three years. Outside of the breeding season, arroyo toads are essentially terrestrial and use a variety of upland habitats for foraging, burrowing, and dispersal that include but are not limited to sycamore cottonwood woodlands, oak woodlands, coastal sage scrub, chaparral, and grassland (Holland 1995, Griffin et al. 1999). During the non-breeding season, arroyo toads seek shelter during the day and other periods of inactivity by burrowing into the sandy areas of upland terraces. They also use the marginal zones between the stream channels and upland terraces for burrowing, especially during late fall and winter (Sweet 1992). Arroyo toads will go into aestivation in their burrows during the non-breeding season, starting in the later summer from approximately August through January (Ramirez 2003).

Toad larvae feed on loose organic material such as interstitial algae, bacteria, and diatoms but do not forage on macroscopic vegetation (Sweet 1992, Jennings and Hayes 1994). Juvenile toads rely on ants almost exclusively (USFWS 1999b). By the time they reach 0.7 to 0.9 inches (1.8 to 2.3 centimeters) in length, they expand their diet to include beetles and ants (USFWS 1999b). Adult toads probably consume a wide variety of arthropods, including ants, beetles, spiders, caterpillars, and others. The toad was historically found in California from Monterey County to San Diego County and southward to the vicinity of San Quintín, Baja California, Mexico. They have been extirpated from an estimated 75 percent of their former range in the U.S. and in areas where they continue to occur, they are found primarily in small, isolated areas in the middle to upper reaches of streams. The current distribution of the toad in the United States is from the Salinas River Basin in Monterey County, south to the Tijuana River and Cottonwood Creek Basin along the border with Mexico. The current elevational range for most arroyo toad populations in San Diego County is about 1,000 to 4,600 feet (305 to 1,402 meters), although they were historically known to extend into the lower portions of most river basins (USFWS 1999b), and populations on Camp Pendleton extend down to just above sea level (Holland and Goodman 1998).

Toad populations vary considerably from year to year, depending on environmental conditions. Approximately threefold changes have been observed from one year to the next (Sweet 1993), and greater variations would likely be observed with more data on toad populations. Because female toads lay an average of approximately 5,000 eggs during the breeding season (Sweet 1992), there is the potential for rapid increases in population size given favorable conditions, but toad recruitment reflects the inherent variability of their environment. During years of drought, pools may dry before larvae have reached metamorphosis, and females may forego breeding altogether. If flooding occurs after eggs have been laid, a large percentage of the eggs and larvae can be lost. Finally, heavy predation pressure by birds, mammals, reptiles, and other amphibians on metamorphosing and newly metamorphosed juveniles can drastically reduce recruitment. Once toads have reached the subadult stage, survivorship is higher. Annual mortality of adults and subadults has been estimated between 35 percent and 70 percent (Sweet 1993, Holland and Sisk 2000, Holland and Sisk 2001), which would mean that few toads survive past five years in the wild.

Stream order, elevation, and floodplain width are important factors in determining the size and long-term viability of a toad population (Sweet 1992, Barto 1999, Griffin 1999). Streams with the greatest potential to support self-sustaining populations are typically of a high stream order (i.e., 3rd to 6th order), at low elevations below 3,000 feet (914 meters), with wide floodplains. Because of the dynamic nature of toad populations and their habitat, movements of individuals are likely important for colonizing areas where toads have been locally extirpated or where new habitat has been created due to flooding events or changes in human management.

#### Status of the Species within the Refuge

This species was last observed on the Otay-Sweetwater Unit in 1997 when several adults and a few larvae were identified on Sweetwater Authority lands between the upper end of the Sweetwater Reservoir and the Refuge boundary. Since then, annual surveys conducted through 2005 (with the exception of 2004, when no survey was conducted) have yielded no observations of the arroyo toad on the Refuge. Madden-Smith et al. (2005) identified an area of high-quality habitat on the Refuge within the McGinty Mountain area during surveys conducted in 2002 and 2003. This high-quality habitat, which is currently unoccupied, is located in the Sweetwater River floodway, just south of the Sycuan golf course. Good quality habitat for the arroyo toad was also identified during this study at the south end of the Cottonwood golf course. Arroyo toads are known to be present in Sloane Canyon, an area of the Sweetwater River located upstream of the Refuge.

# 3.3.6.20 California Red-legged Frog (Rana draytonii)

### Listing and Conservation Status

The California red-legged frog was listed by the Service as threatened on May 23, 1996 (61 FR 25813). It has been extirpated from 70 percent of its former range. The California red-legged frog is threatened within its remaining range by a wide variety of human impacts, including urban encroachment, construction of reservoirs and water diversions, introduction of exotic predators and competitors, livestock grazing, and habitat fragmentation. A five-year review of the status of this species was initiated in May 2011 (76 FR 30377); however, it was not yet completed at the writing of this document. The California red-legged frog is not included on the State of California's list of rare, threatened, or endangered species, but is included as a covered species under the San Diego MSCP because 70 percent of its potential habitat will be conserved.

A recovery plan for the red-legged frog was approved in 2002, and critical habitat was first designated for this species in March 2001 (66 FR 14626). The Service's critical habitat designation was challenged in court, and a final rule redesignating critical habitat for this species are published in the *Federal Register* in April 2006 (71 FR 19244). After questions were raised about the integrity of scientific information used to develop the 2006 final rule on critical habitat, the Service reviewed the results of the 2006 critical habitat designation and determined that is was necessary to once again review the critical habitat designation for this species. In accordance with a consent decree, the Service on March 17, 2010 published a final rule redesignating critical habitat for the red-legged frog. No portions of the Refuge are designated as critical habitat for the red-legged frog.

### **Species and Habitat Description**

The California red-legged frog, which is the largest native frog in the western United States (Wright and Wright 1949), was referred to as *Rana aurora draytonii* at the time of its listing as a federally threatened species. Today, the accepted taxonomic name for the California red-legged frog is *Rana draytonii*.

This frog is named for its largely red abdomen and hind legs. Its back is characterized by small black flecks and larger irregular dark blotches with indistinct outlines on a brown, gray, olive, or reddish background color. Adult red-legged frogs can range from 1.5 to 5.1 inches (4 to 13 centimeters) in length (Stebbins 1985), with adult females attaining a significantly longer body length than males (Hayes and Miyamoto 1984).

These frogs may breed from November through April, with males appearing at breeding sites from two to four weeks before females (Storer 1925). To attract females to breeding sites, males frequently call in small groups of two to seven individuals, although in some instances they may call individually (USFWS 2002c). A pair in amplexus (breeding position) moves to an oviposition site (the location where eggs are laid), and the eggs are fertilized while being attached to a brace such as emergent vegetation (e.g., bulrushes, cattails) or roots and twigs. The egg masses, which contain about 2,000 to 5,000 dark reddish brown eggs measuring about 0.08 to 0.11 inches (2.0 to 2.8 millimeters) (Storer 1925), float on the surface of the water (Hayes and Miyamoto 1984).

Eggs hatch in 6 to 14 days depending on water temperatures, and tadpoles typically require 11 to 20 weeks to develop into terrestrial frogs (USFWS 2002c). Egg predation is infrequent, but egg mortality can occur in higher salinity environments. Most predation occurs during the tadpole stage (Licht 1969). Male red-legged frogs reach sexual maturity at about two years of

age, while females reach maturity at about three years of age (Jennings and Hayes 1985). These frogs have a potential life span of 8 to 10 years (Jennings et al. 1992).

The diet of California red-legged frogs is highly variable. The larvae are thought to be algal grazers, while adult frogs forage most commonly on invertebrates. Larger adult frogs may also prey on the Pacific tree frog (*Hyla regilla*) and California mouse (USFWS 2002c).

The California red-legged frog, which is endemic to California and Baja California, Mexico, occupies a combination of habitats, including a variety of aquatic habitats used as breeding sites and ponds, riparian areas, or other aquatic habitats that are used during the rest of the year (Fellers and Kleeman 2007). This frog can be found at elevations that range from sea level to about 5,200 feet (1,500 meters). Nearly all sightings have occurred below 3,500 feet (1,050 meters) (CNDDB 2001). Historically, the California red-legged frog was known in 46 counties in California, with a range that extended from coastal Marin County inland to Shasta County and southward into northwestern Baja California, Mexico (USFWS 2002c). At the time of listing, the taxon had been extirpated from 24 counties in California.

Breeding adults are often associated with deep (greater than two feet [0.7 meter]) still or slow moving water and dense, shrubby riparian or emergent vegetation (Hayes and Jennings 1988), but frogs have also been observed in shallow sections of streams that are not cloaked in riparian vegetation. While frogs successfully breed in streams, high flows and cold temperatures in streams during the spring often make these sites risky environments for eggs and tadpoles. These frogs are also known to breed in artificial impoundments such as stock ponds; however, management of hydroperiod, pond structure, and vegetative cover and control of non-native predators, may be necessary to ensure a persistent population at these sites.

Research on the habitat requirements of this taxon indicate that during periods of wet weather, starting with the first rains of fall, some individuals may make overland excursions through upland habitats. Most of these overland movements occur at night (USFWS 2002c). The manner in which California red-legged frogs use upland habitats is still being researched.

These frogs spend considerable time resting and feeding in riparian vegetation when it is present. It is believed that the moisture and cover of the riparian plant community provide good foraging habitat and may facilitate dispersal in addition to providing pools and backwater aquatic areas for breeding. In the summer, California red-legged frogs may disperse from their breeding habitat to forage and seek summer habitat if water is not available. This summer habitat could include spaces under boulders or rocks and organic debris, such as downed trees or logs, small mammal burrows, moist leaf litter, or large cracks in the bottom of dried ponds (USFWS 2002c). Although not all populations of red-legged frogs disperse into other habitats, recent research indicates that for those populations that do disperse, management and protection of all habitats, including breeding, nonbreeding, and dispersal corridors, as well as the establishment of adequate buffers around these habitats, is necessary to maintain such populations (Fellers and Kleeman 2007).

#### Status of the Species within the Refuge

The California red-legged frog has been extirpated from San Diego County; therefore, no populations of this species are currently present within the Refuge. Historically, this taxon did occupy portions of the Sweetwater River watershed, including portions of the watershed located within the Otay-Sweetwater Unit of the Refuge. The recovery plan for this species identifies portions of the Sweetwater River within the boundaries of the Refuge as one of the core areas within southern California where recovery actions for this species will be focused

(USFWS 2002c). The recovery plan includes this area of the Refuge as an area where restoration of habitat to support the red-legged frog is feasible and pilot reestablishment efforts are most likely to be successful. USGS is investigating reintroducing red-legged frogs to San Diego County, including at a site on the Refuge.

# 3.3.7 MSCP-Covered Species and Other Special Status Species

# 3.3.7.1 MSCP-Covered Species

The San Diego MSCP, a comprehensive habitat planning program for about 900 square miles in southwestern San Diego County, provides a framework for both protecting the species and habitat diversity of southwestern San Diego and accommodating urban development within the region. With respect to species and habitat conservation, the intent of the MSCP is to protect interconnected blocks of different vegetation communities and habitat types to maximize protection of the region's most sensitive species. To achieve this goal, a preserve area was defined that would include a range of habitat types interconnected by conserved corridors of native vegetation. The need to consider the habitat requirements of 85 species of plants and animals (City of San Diego 1998a) was essential to the design of the preserve. The lands within the San Diego NWR are considered part of the overall MSCP-preserved lands system and their acquisition by the Federal government represents the Service's contribution to the implementation of the MSCP.

Local jurisdictions and special districts are responsible for implementing their respective portions of the MSCP through subarea plans, which describe specific implementing mechanisms. The combination of the subregional MSCP Plan and the required subarea plans serves as a multiple species Habitat Conservation Plan pursuant to Section 10(a)(1)(B) of the Federal Endangered Species Act and a Natural Community Conservation Plan (NCCP) pursuant to the California Natural Community Conservation Planning Act of 1991 and the State Endangered Species Act. The subarea plans are intended to contribute collectively to the conservation of the preserve and its connecting corridors and form the basis for the contract, or "Implementing Agreement," between the local jurisdiction/special district and wildlife agencies (the Service and CDFW). The management goals, objectives, and policies included within these subarea plans are also reflected in the management strategies implemented on the San Diego NWR.

The City of San Diego MSCP Subarea Plan established a Multi-Habitat Planning Area (MHPA) that is designed to address the needs of the indicator species described in the MSCP Plan and delineate core biological resource areas and corridors targeted for conservation. The Del Mar Mesa Vernal Pool Unit is located within the City's MHPA (City of San Diego 1997), and the majority of the Otay-Sweetwater Unit is included within the South County Segment of the San Diego County MSCP Subarea Plan. Of the 85 species covered by the City of San Diego and County of San Diego MSCP Subarea Plans, 56 species (including the 17 federally listed species already addressed in this chapter) have been observed or have the potential to occur within the San Diego NWR (Table 3-7). Quino checkerspot butterfly is a covered species under the Chula Vista MSCP Subarea Plan and as of 2012, the County of San Diego was processing an amendment to the South County MSCP Subarea Plan to add this species to the list of species covered by that Subarea Plan.

Table 3-7 <sup>1</sup> San Diego MSCP-covered Species Observed or Expected to Occur within the San Diego NWR				
Common Name	Scientific Name	Habitat	Observed or Expected	
Otay manzanita	Arctostaphylos otayensis	Southern mixed chaparral	Observed	
Encinitas baccharis	Baccharis vanessae	Southern maritime chaparral	Expected at Del Mar Mesa Unit	
Orcutt's brodiaea	Brodiaea orcuttii	Grasslands, vernal pools	Expected	
Dunn's mariposa lily	Calochortus dunnii	Southern mixed chaparral, coastal sage scrub	Observed	
Wart-stemmed ceanothus	Ceanothus verrucosus	Southern maritime chaparral	Observed	
Tecate cypress	Cupressus forbesii	Southern mixed chaparral, closed-cone coniferous forest	Observed	
Variegated dudleya	Dudleya variegata	Coastal sage scrub, grassland	Observed	
Palmer's ericameria	Ericameria palmeri	Riparian terraces, coastal sage scrub	Observed	
San Diego barrel cactus	Ferocactus viridescens	Coastal sage scrub	Observed	
Gander's pitcher- sage	Lepichinia ganderi	Southern mixed chaparral	Observed	
Felt-leaved monardella	Monardella hypoleuca ssp. lanata	Chamise chaparral, southern mixed chaparral	Observed	
San Diego goldenstar	Muilla clevelandii	grasslands	Observed	
Dehesa beargrass	Nolina interrata	Southern mixed chaparral in gabbro soils	Observed	
Snake cholla	Opuntia parryi var. serpentina	Coastal sage scrub	Observed	
San Miguel savory	Satureja chandleri	Southern mixed chaparral	Observed	
Gander's butterweed	Senecio ganderi	Southern mixed chaparral in gabbro soils	Observed	
Narrow-leaved nightshade	Solanum tenuilobatum	Coastal sage scrub	Observed	
Parry's tetracoccus	Tetracoccus dioicus	Southern mixed chaparral	Observed	
Thorne's hairstreak	Callophrys gryneus thornei	Southern mixed chaparral, closed-cone coniferous forest, within 1 km of Tecate cypress	Observed on nearby Otay Mountain, coextensive with Tecate cypress (Lucas et al. 2013)	
Southwestern pond turtle	Actinemys marmorata pallida	Rivers, streams, ponds, lakes, and associated uplands	Observed	
Orange-throated whiptail	Cnemidophorus hyperythrusbeldingi	Coastal sage scrub	Observed	

Table 3-71   San Diego MSCP-covered Species Observed or Expected to Occur   within the San Diego NWR				
Common Name	Scientific Name	Habitat	Observed or Expected	
San Diego horned lizard	Phrynosoma coronatum blainvillei	Coastal sage scrub, chaparral	Observed	
Northern harrier	Circus cyaneus	Grasslands, coastal sage scrub	Observed	
Cooper's hawk	Accipiter cooperii	Oak riparian woodland, cottonwood/willow riparian forest, urban fringe with tall trees	Observed	
Swainson's hawk	Buteo swainsoni	Grasslands, coastal sage scrub. On the Refuge, primary habitat feature is probably San Miguel Mountain	Observed	
Ferruginous hawk	Buteo regalis	Grasslands, coastal sage scrub	Observed	
Golden eagle	Aquila chrysaetos	Chaparral, coastal sage scrub, grasslands, vertical rock outcrops for nesting	Observed	
American peregrine falcon	Falco peregrinus	Forages over any non- forested area; suitable nesting habitat (tall vertical cliffs) probably does not occur on the Refuge	Observed	
Burrowing owl	Athene cunicularia	Grasslands, coastal sage scrub	Observed	
Cactus wren	Campylorhynchus bruneicapillus	Coastal sage scrub including cactus over one meter tall	Observed	
Western bluebird	Sialia mexicana	Grassland, coastal sage scrub at margins of riparian forest or woodland	Observed	
California rufous- crowned sparrow	Aimophilia ruficeps canescens	Coastal sage scrub, chaparral	Observed	
Tricolored blackbird	Agelaius tricolor	Nests in emergent aquatic vegetation in lakes and ponds, forages in grasslands	Expected	
American badger	Taxidea taxus	Grasslands, coastal sage scrub	Historically observed	
Mountain lion	Felis concolor	Forests, woodlands, chaparral, coastal sage scrub	Observed	
Southern mule deer	Odocoileus hemionus fuliginata	Forests, woodlands, chaparral, coastal sage scrub	Observed	

<sup>1</sup> MSCP-covered species that are also listed as threatened or endangered species under the Federal ESA are discussed in the section titled Federally and State Listed Endangered and Threatened Species.

### 3.3.7.2 Other Special Status Species

#### **Birds of Conservation Concern**

The 1988 amendment to the Fish and Wildlife Conservation Act mandates the Service to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973." The most recent effort to carry out this proactive conservation mandate is the approval of the Service's report, *Birds of Conservation Concern* 2008 (USFWS 2008d).

The overall goal of the report is to accurately identify bird species at each geographic scale that represent Service conservation priorities and draw attention to species in need of conservation action. The bird species identified are primarily derived from prioritization scores from three major bird conservation plans: The Partners in Flight, U.S. Shorebird Conservation Plan, and North American Waterbird Conservation Plan (Kushlan et al. 2002). Birds included in the Birds of Conservation Concern 2008 report are deemed priorities for conservation action. These lists are to be consulted in accordance with Executive Order 13186 "Responsibilities of Federal Agencies to Protect Migratory Birds."

The 2008 report encompasses three distinct geographic scales including the Bird Conservation Regions (BCR) of the United States and Canada, along with the cross-border BCRs agreed on with Mexico as part of the North American Bird Conservation Initiative; the USFWS Regions, which each consist of several states in the same geographic area; and the National List, which encompasses the United States, including U.S. island "territories" in the Caribbean and Pacific. The determination of which species are included on the lists for each of these geographic scales was made using assessment scores based on several parameters including population trend, threats, distribution, abundance, and the importance of an area to a species. These assessment scores were developed by Partners in Flight, a coalition of Federal and State government agencies, non-governmental organizations, and private interests out of concern for the sharp declines in many North American landbirds.

Birds of Conservation Concern supported by the San Diego NWR are included in the BCR 32 (Coastal California) List, USFWS Region 8 List, and the National List. Table 3-8 lists the Birds of Conservation Concern that have been observed on the San Diego NWR.

Table 3-8 Birds of Conservation Concern Documented on the San Diego NWR						
	Foraging Abundance on the Incl				ded on BCC List	
Common Name	Scientific Name	Habitat(s)	Refuge <sup>1</sup>	BCR 32	Region 8	U.S. <sup>2</sup>
Bald eagle	Haliaeetus Ieucocephalus	Wetlands	Rare (winter)	Yes	Yes	Yes
Swainson's hawk	Buteo swainsoni	Uplands	Rare (spring migrant))	No	No	Yes
Peregrine falcon	Falco peregrinus	Uplands, wetlands, aerial	Uncommon	Yes	Yes	Yes
Burrowing owl	Athene cunicularia hypugaea	Grasslands	Uncommon	Yes	Yes	No
Costa's hummingbird	Calypte costae	Coastal sage scrub	Uncommon (spring, summer); Occasional (fall, winter)	Yes	Yes	Yes
Rufous hummingbird	Selasphorus rufus	Uplands	Common (spring migrant); Uncommon (fall migrant)	No	No	Yes
Allen's hummingbird	Selasphorus sasin	Uplands	Rare (spring migrant)	Yes	Yes	Yes
Calliope hummingbird	Stellula calliope	Uplands	Rare (spring migrant)	No	Yes	Yes
Nuttall's woodpecker	Picoides nuttallii	Riparian and oak woodlands	Common	No	Yes	Yes
Olive-sided flycatcher	Contopus cooperi	Uplands	Occasional (spring, fall migrant)	No	Yes	Yes
Willow flycatcher	Empidonax traillii	Wetlands, riparian forest	Occasional (spring, fall migrant); Rare (summer breeder)	No	Yes	Yes
Loggerhead shrike	Lanius Iudovicianus	Grassland, Coastal sage scrub	Uncommon	Yes	Yes	Yes
Horned lark	Eremophila alpestris strigata	Grasslands	Uncommon (spring, summer breeder); Common (fall, winter)	No	No	Yes
Oak titmouse	Baeolophus inornatus	Oak Woodlands	Uncommon	Yes	Yes	Yes
Cactus wren	Campylorhynchu s brunneicapillus	Coastal sage scrub	Uncommon	Yes	Yes	No
Sage thrasher	Oreoscoptes montanus	Grassland, Coastal sage scrub	Rare (fall migrant); Occasional (winter)	No	Yes	No

Table 3-8   Birds of Conservation Concern Documented on the San Diego NWR						
	Foraging Abundance on the Included on BCC Li			List		
Common Name	Scientific Name	Habitat(s)	Refuge <sup>1</sup>	BCR 32	Region 8	U.S. <sup>2</sup>
Yellow warbler	Dendroica petechia brewsteri	Riparian forest	Common (spring, summer); Occasional (fall); Rare (winter)	Yes	Yes	No
Green-tailed towhee	Pipilo chlorurus	Chaparral, Coastal sage scrub	Rare (spring migrant)	No	Yes	No
Brewer's sparrow	Spizella breweri	Grassland, Coastal sage scrub	Occasional (fall migrant)	No	Yes	Yes
Black-chinned sparrow	Spizella atrogularis	Chaparral	Common (spring, summer); Rare (fall)	Yes	Yes	Yes
Sage sparrow	Amphispiza belli	Coastal sage scrub, chamise chaparral	Uncommon	No	Yes	No
Tricolored blackbird	Agelaius tricolor	Wetlands	Occasional (fall, winter)	Yes	Yes	Yes
Lawrence's goldfinch	Carduelis Iawrencei	Grassland, Coastal sage scrub	Uncommon	Yes	Yes	Yes

<sup>1</sup> Present year-round unless otherwise noted. <sup>2</sup> National List Source: (USFWS 2008d)

# California Department of Fish and Wildlife Special Status Species

CDFW maintains a list a special status mammals, birds, reptiles, amphibians, and fish that is updated annually. The taxa on this list, which are considered to be of greatest conservation need in California, include species, subspecies, or distinct populations of a species native to California that generally fall into one or more of the following criteria:

- Officially listed or proposed for listing under the State and/or Federal ESA;
- State or Federal candidate for possible listing;
- Meet the criteria for listing, even if not currently included on any list;
- California Species of Special Concern, as defined by CDFW;
- Biologically rare, very restricted in distribution, declining throughout their range, or have a critical, vulnerable stage in their life cycle that warrants monitoring;
- Populations in California that may be on the periphery of a taxon's range but are threatened with extirpation in California;
- Closely associated with a habitat that is declining in California at an alarming rate; and
- Designated as a special status, sensitive, or declining species by other State or Federal agencies, or non-governmental organization.

The State also maintains a special plants list entitled "Special Vascular Plants, Bryophytes, and Lichens List" (CDFG 2012). Those plants identified as "Special Plants" represent all the plant taxa inventoried by the Department of Fish and Wildlife's California Natural Diversity Database (CNDDB), regardless of their legal or protection status. Special plant taxa, which can include vascular plants, high priority bryophytes (e.g., mosses, liverworts, hornworts), and

lichens, are species, subspecies, or varieties that fall into one or more of the following categories:

- 1) listed by the State or Federal government as endangered, threatened, or rare;
- 2) a candidate for State or Federal listing as endangered, threatened, or rare;
- 3) taxa that meet the criteria for listing, even if not currently included on any list, per the California Environmental Quality Act Guidelines;
- 4) BLM, USFWS, or U.S. Forest Service Sensitive Species;
- 5) taxa listed in the California Native Plant Society's *Inventory of Rare and Endangered Plants of California*;
- 6) taxa that are biologically rare, very restricted in distribution, or declining throughout their range but not currently threatened with extirpation;
- 7) population(s) in California that may be peripheral to the major portion of a taxon's range but are threatened with extirpation in California; and
- 8) taxa closely associated with a habitat that is declining in California at a significant rate.

Presented in Table 3-9 are plant and animal species, identified as Special Status Species by the State of California, which have been observed on the Refuge in the past or have the potential to occur on the Refuge based on their habitat needs and historic distribution.

Table 3-9 California Special Status Species Observed or with the Potential to Occur on the San Diego NWR				
Scientific Name	Common Name			
INSECTS				
Cicindela senilis frosti	senile tiger beetle			
REPTILES				
Anniella pulchra pulchra	silvery legless lizard			
Aspidoscelis hyperythra	orange-throated whiptail			
Phrynosoma coronatum blainvillii	coast (San Diego) horned lizard			
BIRDS				
Agelaius tricolor	tricolored blackbird			
Asio flammeus	short-eared owl			
Athene cunicularia	burrowing owl			
Aythya americana	redhead			
Circus cyaneus	northern harrier			
Cistothorus palustris clarkae	Clark's marsh wren			
Dendroica petechia	yellow warbler			
Lanius ludovicianus	loggerhead shrike			
Passerculus sandwichensis rostratus	large-billed savannah sparrow			
Pelecanus erythrorynchos	American white pelican			
Xanthocephalus xanthocephalus	yellow-headed blackbird			
MAMMALS				
Lepus californicus bennettii	San Diego black-tailed jackrabbit			
PLANTS				
Atriplex coulteri	Coulter's saltbush			
Atriplex serenana var. davidsonii	Davidson's saltscale			
Camissonia Iewisii	Lewis' evening primrose			
Centromadia parryi australis	southern tarplant			
Lasthenia glabrata coulteri	Coulter's goldfields			

# 3.4 Cultural Resources

# 3.4.1 Introduction

Requirements for Federal agencies to identify, evaluate, and protect cultural resources are outlined in several Federal regulations (described further in Chapter 5 of this document), including the National Historic Preservation Act (NHPA) of 1966, as amended (PL 89-665; 50 STAT 915; 16 USC 470 et seq. 36 CFR 800). The NHPA sets inventory, nomination, protection, and preservation responsibilities for federally-owned cultural properties and directs Federal agencies to take into account the effects of their actions on items or sites listed or eligible for listing in the National Register of Historic Places (NRHP). The criteria used to evaluate eligibility to the NRHP, as contained in 36 CFR 60.4, includes, among others, consideration of the quality of the property's significance in American history, architecture, archaeology, and culture and the property's known or likely ability to yield information important in prehistory or history. A historical property must also retain the integrity of its physical identity that existed during the resource's period of significance. Integrity is evaluated with regard to the retention of location, design, setting, materials, workmanship, feeling, and association.

In accordance with the applicable cultural resource regulations, a preliminary overview of cultural resources within the San Diego NWR was prepared in 2010. This overview was prepared to assemble known information about the cultural resources located within and near the Refuge, to identify gaps in the existing database, and to establish procedures for ensuring compliance with all applicable cultural resource regulations in the context of the CCP process. The findings of this overview are summarized in the sections that follow.

Also in accordance with applicable cultural resource regulations, the federally recognized tribes in San Diego County were initially contacted about the CCP process for the San Diego NWR in June 2006. At that time, comments regarding the process and any concerns related to tribal interests were solicited. No responses from the tribes were received, including any comments regarding traditional uses or the potential existence of sacred sites. Several Planning Updates have also been sent to all of the federally recognized tribes to keep them updated on the progress of the CCP. In 2010, Refuge staff met with representatives of the Sycuan Band of the Kumeyaay Nation to review the CCP process and discuss potential management alternatives.

# 3.4.2 Cultural Setting

The following sections describe the cultural setting in and around the lands included within the San Diego NWR. Cultural resources present on the Refuge include archaeological and historic sites, buildings, structures, and objects.

The prehistoric cultural sequence in San Diego County is generally conceived as comprising three basic periods: the Paleoindian, dated between about 11,500 and 8,500 years ago and manifested by the artifacts of the San Dieguito Complex; the Archaic, lasting from about 8,500 to 1,500 years ago and manifested by the cobble and core technology of the La Jollan Complex; and the Late Prehistoric, lasting from about 1,500 years ago to historic contact (i.e., common era 500 to 1769) and represented by the Cuyamaca Complex. This latest complex is marked by the appearance of ceramics, small arrow points, and cremation burial practices.

# 3.4.2.1 Paleoindian Period

The Paleoindian Period in San Diego County is most closely associated with the San Dieguito Complex, as identified by Rogers (1938, 1939, 1945). The San Dieguito assemblage consists of well-made scraper planes, choppers, scraping tools, crescentics, elongated bifacial knives, and leaf-shaped points. The San Dieguito Complex is thought to represent an early emphasis on hunting (Warren et al. 1993).

# 3.4.2.2 Archaic Period

The Archaic Period in coastal San Diego County is represented by the La Jolla Complex, a local manifestation of the widespread Millingstone Horizon. This period brings an apparent shift toward a collecting economy and an emphasis on seed resources, small game, and shellfish. The local cultural manifestations of the Archaic Period are called the La Jollan Complex along the coast and the Pauma Complex inland. Pauma Complex sites lack the shell that dominates many La Jollan sites. Along with an economic focus on gathering plant resources, the settlement system appears to have been more sedentary. La Jollan and Pauma assemblages are dominated by rough, cobble-based choppers and scrapers, and slab and basin metates. Elko series projectile points appeared late in the period. Large deposits of marine shell at coastal sites argue for the importance of shellfish gathering to the coastal Archaic economy (True 1980).

# 3.4.2.3 Late Prehistoric Period

Near the coast and in the Peninsular Mountains beginning approximately 1,500 years ago, patterns began to emerge which suggest the ethnohistoric Kumeyaay. This period is characterized by higher population densities and elaborations in social, political, and technological systems. Economic systems diversify and intensify during this period, with the continued elaboration of trade networks, the use of shell-bead currency, and the appearance of more labor-intensive, but effective, technological innovations. The late prehistoric archaeology of the San Diego coast and foothills is characterized by the Cuyamaca Complex. It is primarily known from the work of D.L. True (1970) at Cuyamaca Rancho State Park. The Cuyamaca Complex is characterized by the presence of steatite arrowshaft straighteners, steatite pendants, steatite comales (heating stones), Tizon Brownware pottery, ceramic figurines reminiscent of Hohokam styles, ceramic "Yuman bow pipes," ceramic rattles, miniature pottery, various cobble-based tools (e.g., scrapers, choppers, hammerstones), bone awls, manos and metates, mortars and pestles, and Desert Side-Notched and Cottonwood Series projectile points.

# 3.4.3 Ethnohistory

The Kumeyaay (also known as Kamia, Ipai, Tipai, and Diegueño) occupied the southern two-thirds of San Diego County. The Kumeyaay lived in semi-sedentary, politically autonomous villages or rancherias. A settlement system typically consisted of two or more seasonal villages with temporary camps radiating away from these central places (Cline 1984). Their economic system consisted of hunting and gathering, with a focus on small game, acorns, grass seeds, and other plant resources. The most basic social and economic unit was the patrilocal extended family. A wide range of tools was made of locally available and imported materials. Numerous other flaked-stone tools were made, including scrapers, choppers, flake-based cutting tools, and biface knives. Preferred stone types were locally available metavolcanics, cherts, and quartz. Obsidian was imported from the deserts to the north and east. Ground stone objects include manos and metates, and mortars and pestles typically made of locally available fine-grained granite. Both portable and bedrock types are known. The Kumeyaay made fine baskets. These employed either coiled or twined construction. The Kumeyaay also made pottery, using the paddle-and-anvil technique. Most were a plain brown utility ware called Tizon Brownware, but some were decorated (May 1978, Meighan 1954, Spier 1923).

# 3.4.4 Historic Period

San Diego was first settled by Spanish colonists in A.D. 1769, when the Mission San Diego de Alcalá and Presidio de San Diego were founded. The Spanish period (1769-1820) economy was based on cattle grazing. Missions were major population centers, and mission cattle roamed freely over open range, tended by Indian vaqueros. European contact substantially and pervasively stressed the social, political, and economic fabric of aboriginal culture (Shipek 1986, Shipek 1991). Disease, starvation, and a general institutional collapse caused emigration, birth rate declines, and high adult and infant mortality levels for the aboriginal groups in San Diego County (Shipek 1991).

Historical records from the Spanish Period indicate that missionary contact with the native inhabitants of the Jamacha Valley (portions of which are now located within the present day Refuge) first occurred in 1775 at the village of Jamacha (Van Wormer 1984). The Mission San Diego de Alcalá had ownership of the Jamacha Valley; by 1830, the valley provided grazing land for over 16,000 sheep and horses.

During this time, the citizens of Mexico began to revolt against the Spanish colonial authorities. After more than a decade of conflict, Mexico gained independence from Spain in 1821. The Mexican government secularized the missions in 1834 and opened vast tracts of former mission lands for private use and settlement.

Doña Apolinaria Lorenzana lived at Mission San Diego de Alcalá from the time she was 12 years old. Because of her devotion to the church, the missionaries in 1840 made it possible for her to receive a grant for 8,881 acres of land located almost entirely within the Jamacha Valley. This land grant included portions of the Sweetwater River, Steele Canyon, and the lower western slopes of San Miguel Mountain, areas that are now located within the Refuge. According to historical records, Doña Apolinaria first occupied the Jamacha Valley in 1831, when the land was still under the control of the mission. Various improvements were made to the land after 1840, including construction of a house, corral, and lime kiln on the west side of the valley (Van Wormer 1984). Wheat and corn were planted in the valley to the east of the Sweetwater River, and other areas were set aside for grazing by sheep and goats (Van Wormer n.d.).

The U.S took over the northern half of Mexico as a result of the Mexican–American War in 1848, and California became a state in 1850. American settlement in southern California was slow during the Gold Rush, when northern California experienced a dramatic population explosion (Rolle 1998). Due to the population increase in northern California, livestock prices increased, causing ranches in southern California to prosper. Rancho Jamacha, where the Second Infantry grazed livestock in the early 1850s, was purchased from Doña Apolinaria in 1853. The land soon became the property of four partners who used a portion of it to grow wheat, barley, oats, rye, and vegetables. In addition, they raised sheep, horses, cattle, mules, and hogs. This ranch is credited as being the first successful large-scale agricultural enterprise in San Diego County (Van Wormer 1984). However, by 1860, ranching was no longer a profitable business and operations at Rancho Jamacha ended.

By the late 1800s, the county witnessed the beginnings of a recognizable downtown San Diego area and the gradual development of a number of outlying communities such as the Jamacha Valley, many of which were established around previously defined ranchos and land grants. These communities were composed of an aggregate of people who lived on scattered farmsteads tied together through a common school district, church, post office, and country store (Hector and Van Wormer 1986, Pourade 1963). In 1980, Caltrans conducted an investigation of the area in and around Jamacha Road and Highway 94 for the presence of the Jamacha Adobe built by Doña Apolinaria Lorenzana; however, no evidence of the adobe was found (Mooney-Levine and Associates 1987).

Cultural resource surveys of the areas to the west of Mother Miguel Mountain on the San Miguel Mountain portion of the Otay-Sweetwater Unit have identified evidence of ranching and farming activity dating back to the early 1900s. Historic farming sites have been identified to the north of Proctor Valley Road, where household fragments and structures date back to between the late 1800s and the early 1900s, a dairy farm complex constructed between the 1930s and the 1940s, and a historic farming complex, identified on a 1943 USGS map as the Williams Ranch. In 1975, when the site was recorded, citrus trees were noted as present on-site (Brian F. Smith and Associates 1997).

Evidence of early ranching activities is also present further to the east within the Las Montañas portion of the Otay-Sweetwater Unit. Land ownership searches for the site referred to as the "Barn at the Oaks" indicated that a ranch operated at this site between 1893 and 1928. Between 1928 and 1957, the barn and other structures around the barn were used for the Oaks School for Boys (Dudek & Associates 1996).

Extensive farming activity also occurred in the Jamacha Valley from the early 1900s through the 1940s. Crops included olives, oranges, grapes, walnuts, alfalfa, hay, melons, and a variety of vegetables (Van Wormer n.d.). Dairy and poultry farms were also present in the valley. This area began as relatively small farms, but by the 1940s, much of the land was sold to corporate interests. After World War II, the agricultural uses in portions of the Jamacha Valley were gradually replaced with residential development and golf courses. Van Wormer states, "By the late 1960s, the post-war population boom began to affect the Jamacha Valley."

A map of historic roads and trails in San Diego County between 1769 and 1885 (San Diego County Assessor 1955) indicates that the general alignment of present day State Route 94 through Steele Canyon was the route of one or more stage lines between 1865 and 1885. This may also have been the route of Charles Wesley Grise's "Limited San Diego Imperial Valley Stage" that transported customers from San Diego to the Imperial Valley via a Cadillac touring car from 1911 to 1914 (Reider n.d.).

In 1886, the San Diego Land and Town Company, a subsidiary of the Santa Fe Railroad, began construction of the Sweetwater Dam, which—when completed—would provide water to National City and new subdivisions in Chula Vista. Completed in March of 1888, the 90-foot-high dam was said to be the highest in the United States (Pourade 1964). During the 1890s, visitors from San Diego would board the National City and Otay Railroad traveling to the end of the line near the Sweetwater Dam and then take a burro or horse ride to the top of San Miguel Mountain. In 1890, there were proposals to construct an observatory and grand hotel on San Miguel Mountain, but the proposal never materialized (Brian F. Smith and Associates 1997). Lower Otay Dam was constructed in 1897.

Evidence of historic mining operations is also present on the Refuge, with most of this activity occurring on or in the vicinity of San Miguel and McGinty Mountains. Several shafts cut deep into the bedrock have been found on San Miguel Mountain, but information regarding the specific materials that were mined here is not available. McGinty Mountain is the site of Peg Leg Mine, also referred to on the Assessor Parcel Map as Cosmos Lode Mine. The material mined at this site was silicified alaskite aplite, which was used by the American Encaustic Tiling Company (known as the West Coast Tile Company prior to 1920) to manufacture a hard white tile known as "Kaospar" (County of San Diego 1963). The brand name "Kaospar" porcelain ware was originally used by

California China Products Company of National City, which was known nationally for its design and firing of brilliant, polychromatic Hispano–Mooresque-style faience tile (Bevil 1999). In 1917, the California China Products Company was sold to West Coast Tile Company of Vernon, California, which was sold two years later to the American Encaustic Tiling Company of Zanesville, Ohio.

During the time that California China Products Company was manufacturing porcelain ware and tiles, they found that the primary source of material for producing their porcelain, El Cajon Mountain, was of inferior quality. As a result, they placed advertisements in local newspapers requesting that prospectors send clay samples to the company's laboratory for free testing (Bevil 1999). The silicified alaskite aplite deposit on McGinty Mountain was discovered in 1900 and operated until the early 1930s. This deposit was most actively mined during the 1920s. Based on the size of the excavations, it has been estimated that total production from this mine was approximately 6,500 to 7,000 tons. The rock was hauled by truck to El Cajon and then by train to the Los Angeles area (County of San Diego 1963). It is possible that prospecting for and extraction of manufacturing grade clays occurred elsewhere on the Refuge.

The Del Mar Mesa area was likely used to graze cattle and sheep during the 1800s and early 1900s when Rancho los Peñasquitos, which was located immediately to the south of the present day Del Mar Mesa Preserve, was an active cattle ranch in the 1800s and early 1900s. Public and private actions to ensure the preservation of the vernal pool habitat on Del Mar Mesa began in the early 1980s.

# 3.4.5 Cultural Resources Investigations and Research

As part of the cultural resources review, a record search prepared by the California Historical Resources Information System South Coastal Information Center (SCIC) in 1995 was updated in 2010. The 1995 record search included information about sites and past investigations, while the 2010 update only included site records and digital site boundaries for site located within the Refuge. According to the 1995 results from SCIC, there have been numerous cultural resource investigations within and adjacent to the Refuge. However, this information was not updated as part of the 2010 record search update. It is possible that additional investigations could have been conducted on Refuge parcels acquired after 1995.

The SCIC record search identified 151 prehistoric sites, 28 prehistoric isolates, 26 historic sites, and six multi-component sites within the San Diego NWR. The majority of sites contain lithic (stone) artifacts and/or debitage (stone flakes generated during the crafting of stone tools). Of the 211 sites, only about one-fourth of the sites have been evaluated for California Environmental Quality Act (CEQA) significance, and five have been evaluated for eligibility for listing on the National Register of Historic Places (NRHP). Record searches have not been conducted by the Service for those parcels obtained after 2010, including the Hidden Valley parcels.

# 3.4.5.1 Excavations

Fifty sites identified on the Refuge in the past have been evaluated for cultural significance, with 47 of them evaluated through excavations. One additional site (CA-SDI-14342) may also have been excavated, but there are discrepancies in the information available about this site. Further investigation is therefore required if any future actions could affect this site. Two of the 50 sites are historic sites, which are discussed in detail in this section.

Of the 50 sites that have been evaluated, five have been evaluated for listing on the NRHP and the other 45 have been evaluated for significance under CEQA criteria. Three of the 50 evaluated sites

were not excavated, but a significance determination was made based on surface deposits. Data recovery excavations were completed at three of the 47 excavated and evaluated sites. Twentyseven of the evaluated sites were determined not significant under CEQA, one site has been mitigated through excavation, 15 sites were determined significant under CEQA (one of these [SDI-12085H] was based on surface deposits), three sites were determined not eligible for listing on the NRHP, and four sites have an unknown status based on the current information and may require further investigation in the future.

The three sites (CA-SDI-186, -4757, and -4765) addressed through a data recovery program are located within the Sweetwater River area of the Refuge. These sites were determined to be significant under CEQA during earlier investigations (Berryman 1981, Berryman and Berryman 1987) conducted in association with a development proposal by a prior landowner. Mitigation for potential impacts to these sites, which was conducted in the 1990s, involved data recovery intended to further the understanding of the prehistory of the Jamacha/Sweetwater River Valley (Byrd and Serr 1993).

The data recovery of these three sites, as well as one other site located outside the Refuge boundary, was conducted in two phases. Phase I consisted of plotted surface artifacts, collecting diagnostic surface artifacts, and excavating a series of shovel test pits and units to obtain a representative data sample. During Phase II, additional units and mechanical trenches were excavated to increase data recovery rates and to attempt to find subsurface features. The results of the data recovery effort indicated that these sites were short term or seasonal base camps where tools were manufactured and plants and animals were prepared and consumed utilizing bedrock milling techniques. Temporally diagnostic and radiocarbon dates indicated that the three sites were occupied during the Archaic and Late Prehistoric Periods. Data from the sites indicate that the sites were repeatedly revisited over both time periods with no apparent period of abandonment (Byrd and Serr 1993).

Of the 50 sites evaluated on the Refuge, 31 sites were evaluated in 1991 and 1997 as part of the Rancho San Miguel Subdivision Project Sectional Planning Area Plan. These sites are located within the San Miguel Mountain and Sweetwater River areas of the Refuge. Twenty of the 31 sites were found not significant. The other 11 sites were found significant under the criteria in the California Register of Historical Resources but were not evaluated for eligibility to the NRHP. Test excavations consisted of units and shovel test pits at 28 sites. Excavations were not required to make significance determinations for the other three sites. CA-SDI-12085H, a historic site that was not excavated, was considered significant based on the potential for subsurface historic artifacts and features and its historic context as a dairy farm complex; however, the existing structures at this site were not considered significant (Brian F. Smith and Associates 1997).

In 1999, two of the historic sites in this area (CA-SDI-12056H and CA-SDI-12085H) were evaluated for eligibility for listing on the NRHP by a Service historian (Speulda 1999). A ranch and dairy farm complex, recorded as CA-SDI-12056H, was located on a narrow ridge along the western flank of Mother Miguel Mountain overlooking the Sweetwater Reservoir. The six structures of CA-SDI-12056H were constructed between 1930s and 1950s. This site was found to be ineligible (Speulda 1999), and the structures were subsequently demolished.

Down slope of the San Miguel Ranch complex (CA-SDI-12056H) is an abandoned building and foundations of a farm complex, recorded as CA-SDI-12085H. The one remaining building at this site was evaluated for eligibility to the NRHP in 1999. At that time, the building was considered so deteriorated that it no longer conveyed a link to the historic period in which it was built. Due to the lack of integrity of materials, the building was not considered eligible to the NRHP (Speulda 1999).

Three sites (CA-SDI-12823, -12824, and -12825) were evaluated for eligibility for listing on the NRHP as part of the Rancho San Diego Equestrian Center project (Glenn 1995). None of these sites were determined eligible for listing on the National Register. Other sites within the Refuge boundary have undergone evaluation as part of the CEQA process, but none of these sites have been evaluated for eligibility for listing on the NRHP.

# 3.4.5.2 Historic Sites Investigations

There are no known comprehensive historic site investigations that have been completed within the San Diego NWR. As previously addressed, two historic sites in the San Miguel Mountain area were evaluated for eligibility to the NRHP in 1999. Another historic structure, the Barn at the Oaks (CA-SDI-7928H), was researched as part of Las Montañas Resort and Country Club project. The Barn at the Oaks was determined potentially significant for its architectural style reminiscent of Dutch Revival hay barns of the Midwest and for its association as part of the Oaks School for Boys. As a result of this research, this site was added to the San Diego County Historic Property Listing (Number 021), but it is not listed on the NRHP. The exact date of the barn's construction is not known, but a 1937 lease specifically mentioned the presence of a barn on the property (Chace 1985). The Service implemented actions to stabilize this structure in 2008.

# 3.4.6 Sacred Sites

A record search of the California Native American Heritage Commission Sacred Land Files was conducted in 2010 by the Service in association with the CCP process. The response, dated March 16, 2010, found Native American cultural resources identified in the Jamul Mountains, Alpine, and Otay Mesa quadrangles. Early consultation with Native American tribes was recommended in order to avoid unanticipated discoveries.

# 3.4.7 Information Gaps

The Cultural Resources Review conducted for the Refuge identified several information gaps with respect to cultural resources. These include the lack of surveys boundaries and acreages for investigations completed on the Refuge after 1995; no evaluation of NRHP eligibility status for various sites within the Refuge; and incomplete information regarding the extent of buildings/structures on the Refuge. Because it is unclear how much of the Refuge has been surveyed and what areas still need to be surveyed, it must be assumed that there are numerous unrecorded sites located within the Refuge. (This is particularly true for parcels obtained after 2010.) Additionally, some previously surveyed areas may need an updated survey to assess current conditions and determine if any changes have occurred to the sites since last visited.

# 3.5 Social and Economic Environment

Elements of the social and economic environment include land use, public safety, traffic circulation, public utilities and easements; public access and recreational opportunities, vectors, economics and employment; and environmental justice.

# 3.5.1 Land Use

As discussed previously, the San Diego NWR consists of six distinct areas, five within the Otay-Sweetwater Unit and a small grouping of parcels that represent the Del Mar Mesa Vernal Pool Unit. All of these areas are located within southwestern San Diego County, the most highly populated portion of the county. The Del Mar Mesa Vernal Pool Unit is located within a larger open space preserve managed by various agencies, but primarily by the City of San Diego. This open space preserve is surrounded by urban development located with the City of San Diego. The Del Mar Mesa Vernal Pool Unit is included within boundaries of the Del Mar Mesa Preserve Management Plan, which is expected to be considered for adoption by the San Diego City Council in 2014.

The parcels within the Otay-Sweetwater Unit are located just beyond the edges of urban development that occur to the north and west within the unincorporated areas of San Diego County and to the south and west within the City of Chula Vista. The northern portion of the McGinty Mountain area is included within the county's Crest-Dehesa Community Plan area, while the southern end of the McGinty Mountain area, all of the Las Montañas and current areas within the Otay Mesa and Lakes areas, and a portion of the San Miguel Mountain area are located within the county's Jamul-Dulzura Subregional Plan area. The Sweetwater River area occurs primarily within the county's Valle De Oro Community Plan area, with the Jamacha parcel located within the Spring Valley Community Plan area. The southwestern areas of the San Miguel Mountain area are also located within the county's Sweetwater Community Plan area, while the southernmost parcels in the San Miguel Mountain area are located within the jurisdictional boundaries of the City of Chula Vista.

# 3.5.1.1 Current Uses on the Refuge

The San Diego NWR is managed in accordance with the laws and policies of the NWRS and consistent with applicable guidance provided in the San Diego MSCP (City of San Diego 1998a). Management actions are directed at preserving, managing, and, when necessary, restoring habitat to support a range of listed and sensitive species. In addition, a significant amount of time is spent managing an array of issues related to trail use, illegal encampments, dumping, dogs on the Refuge, encroachment onto Refuge lands by adjacent landowners, land acquisition from willing sellers, and coordination with agencies and organizations, including those managing lands adjacent to the Refuge.

The primary use of the Refuge is as habitat to support native species, particularly listed and sensitive species. Other currently authorized uses and facilities on the Refuge are:

- hiking, mountain biking, and horseback riding on the County of San Diego's Sweetwater Loop and River Trail and Par Four Trail;
- guided hikes to support wildlife observation, interpretation, and environmental education;
- opportunities for wildlife photography;
- scientific research conducted in accordance with Refuge-approved special use permits;
- a trailhead and parking area on Jamul Drive that provides access to McGinty Mountain;
- a large metal storage building referred to as the Rice Barn off of Millar Ranch Road;
- a small metal storage building at the old San Miguel Ranch site;
- utility easements/utility maintenance roads that provide access for Refuge management;
- a portion of Millar Ranch Road that provides access for the Refuge, as well as for a number of private residences located at the base of San Miguel Mountain; and
- an access road in the Otay Lakes and Mesa area that is used by Refuge staff, BLM staff, and the Department of Homeland Security.

Currently, the Refuge offices, maintenance, and primary storage facilities are located off the Refuge on land owned and managed by CDFW. Completion of this CCP is intended, in part, to further refine, identify, and constrain authorized uses. Current uses that are not authorized include hunting, fishing, encampments, dumping, shooting, off-roading, falconry, running, woodcutting, dog training, insect collecting, glass-breaking, smoking, rock-painting, horticulture, paintball shooting, filmmaking, model-aircraft flying, and monument-building.

Opportunities to access the Refuge from adjacent public roads are limited, and only one formal parking area is provided on the Refuge. Other parking opportunities are available at the Steele Canyon Bridge off Highway 94 near Singer Land and at Sweetwater Summit Park. Both of these trail parking areas are maintained by the County of San Diego. The public also parks on public streets, such as Par Four Drive or Sloane Canyon Road, to access trails. Others enter the Refuge via unauthorized routes (e.g., through private property).

In 2010, we estimated that at least 16,000 people visited the Refuge based on a small study conducted near the old steel bridge. We expect that visitation is closer to 22,000 annually. In addition to those who visit the Refuge to use the trail system for wildlife-dependent recreational uses, exercise, and/or an escape from the surrounding urban setting, in fiscal year 2011, 420 volunteers (320 adults and 100 children), participated in 18 community outreach events, including four volunteer work days, five interpretive hikes, three events that combined interpretation and volunteer projects, one children's nature art/Refuge birthday event, and one Refuge volunteer recognition event.

## 3.5.1.2 Surrounding Land Uses

The land uses that surround the properties included within the San Diego NWR are illustrated in Figures 3-21 and 3-22. As indicated in these figures, the majority of the Refuge abuts either preserved lands or residential development. The land uses proposed in the City of San Diego General Plan for areas around the Del Mar Mesa Vernal Pool Unit are consistent with the existing land uses that surround these parcels.

The land uses proposed in the County of San Diego General Plan for the lands surrounding the Otay-Sweetwater Unit are consistent with the existing development that surrounds the Refuge. For those areas located adjacent to the Refuge that are currently undeveloped, the County General Plan Update designates much of the remaining undeveloped private lands as rural residential development with a density of one unit per 20 gross acres. The rural residential designation is intended to reflect and preserve the rural agricultural, environmentally constrained, and natural backcountry areas of the county. A few areas in the vicinity of the Jamul Mountains are designated as specific plan area and some parcels to the southeast of the San Miguel Mountain area are designated semi-rural residential, which would permit residential development at a density of one unit per 10 or 20 gross acres, depending upon the steepness of the slope on a given parcel.

## 3.5.2 Recreational Opportunities

## 3.5.2.1 Trails

Some of the existing trails or pathways and interior roads on the Refuge have been used by the public for horseback riding, hiking, and mountain biking for many years. Many more pathways have been created since the Harris Fire in 2007 facilitated public access to areas of wildlife habitat that had previously been covered with chaparral or coastal sage scrub. Most of these trails, dirt roads, and user-created pathways have not been formally accepted as Refuge trails and many do not meet accepted sustainability standards.

There are a two trails on the Refuge that have been recognized as designated trails within the Refuge, including the Sweetwater Loop and River Trail, a segment of the County of San Diego's Regional Trail System and the Par Four Trail, located in the northern portion of the Sweetwater River management area. The Sweetwater Loop and River Trail, when fully completed, will connect the coast, near the Sweetwater Marsh Unit of the San Diego Bay NWR to the California Riding and Hiking Trail, which provides access to the deserts in eastern San Diego County. The Sweetwater Loop and River Trail currently extends through or adjacent to the Refuge from just north of Sweetwater Summit Park to Highway 94; from that point, the alignment switches to the west side of the Sweetwater River adjacent to existing commercial development and currently ends near the corner of Jamacha Road and Willow Glen Drive. The county's Regional Trails Plan proposes to extend this trail northward along the Sweetwater River to Sloane Canyon, where the trail would then turn to the south and east, ultimately connecting to the California Riding and Hiking Trail. No other regional trails are proposed within the Refuge.



Figure 3-21. Land Uses Surrounding the Otay-Sweetwater Unit



Figure 3-22. Land Uses Surrounding the Del Mar Mesa Vernal Pool Unit

Many of the preserved lands that surround the Refuge also provide trails for public use, although some agencies, such as CDFW, restrict trail use to hiking only. Other opportunities for multiple use trail activities are provided within the various open space parks that extend through the county, including the Tijuana River Valley, Otay Valley Regional Park, San Diego River Park, San Dieguito River Park, Los Peñasquitos Canyon Preserve, and Mission Trails Regional Park. San Diego County identifies on their county trails website (http://www.sdcounty.ca.gov/parks/ hikes.html) the trail system in San Diego County as "one of the most diverse trail systems in the nation." Recreational opportunities are also available on nearby BLM lands, including the Otay Mountain Wilderness (mountain bikes are not permitted in wilderness areas, but hiking and equestrian uses are permitted).

### 3.5.2.2 Hunting and Fishing

The Refuge is not currently open for hunting or fishing, although some illegal fishing activity (for non-native fish species; no native fish are present on the Refuge) is occurring along portions of the Sweetwater River. There are, however, several opportunities for hunting and fishing in the general vicinity of the Refuge, including the Otay Mountain Wilderness, where hunting, fishing, and non-commercial trapping are allowed under State and local laws. Other hunting areas include the Hollenbeck Canyon Wildlife Area, where pheasant and quail hunting is permitted per State regulations; Boden Canyon Ecological Reserve, where upland game hunting is permitted in accordance with the general hunting regulations and at such times and in specific areas as designated by CDFW; and the San Felipe Valley Wildlife Area, where deer and quail hunting area permitted in accordance with State regulations. The Cleveland National Forest is open to hunting of certain bird and game species, including deer, in accordance with the current season schedule and hunting regulations set by CDFW. Deer hunting is also permitted on some BLM lands located in eastern and northeast San Diego County.

Locally, Barrett Reservoir is open by reservation for waterfowl hunting on Wednesdays and Saturdays throughout the season established for the southern California zone, and turkey hunting is offered at Sutherland Reservoir on a Monday, Wednesday, and Saturday schedule for the fall season (November) and the spring season (end of March to beginning of May). Also for the last two years, San Diego County has approved a youth turkey hunt at the Santa Ysabel East Open Space Preserve.

San Diego is considered a world-class spot for bass fishing, with a number of reservoirs available for fishing at various times of the year. Near the Refuge, shoreline fishing is allowed along a 2.5mile stretch on the south side of Sweetwater Reservoir and along a 5-mile portion of the Loveland Reservoir shoreline. At Lower Otay Reservoir, fishing is permitted from boats, float tubes, waders, or the shoreline, while Upper Otay Reservoir permits fishing from float tubes, waders, or the shoreline only on a catch and release (zero kill) basis. Fishing is also permitted at Barrett Reservoir with a reservation from May through September on a catch and release (zero kill) basis.

## 3.5.3 Traffic Circulation and Parking

Traveling to the Refuge can require use of regional transportation corridors (freeways), as well as various surface streets. In addition, activities associated with the Refuge, such as wildlife observation, trail use, and general refuge operations, involve the need for some off- and/or onstreet parking for visitors who opt to use motor vehicles to get to the Refuge. Information regarding current and future traffic volumes and parking availability is provided to facilitate the evaluation of how changes in current uses and activities on the Refuge could affect traffic circulation and parking near the Refuge.

## 3.5.3.1 Traffic Circulation

The current vehicle trips generated as a result of refuge-related management and public use activities are estimated at less than 100 trips per day, with fewer trips generated during the work week. This is based on an estimated 22,000 visitors per year and an estimate of the number of employee and volunteer trips generated on a weekly basis. All of these trips are accommodated by a series of local streets located around the perimeter of the six Refuge areas, as well as Highway 94 to the west of the Otay-Sweetwater Unit and Highway 56 near the Del Mar Mesa Vernal Pool Unit. The number of trips currently generated by the Refuge is considered inconsequential to the overall traffic flow within this portion of the county.

Table 3-10 presents current street classifications, design capacity at Level of Service (LOS) C, and current average daily traffic volumes (ADT) for those streets that provide access to the Refuge. The term Level of Service (LOS) is used to describe the operational conditions of a particular roadway segment or intersection. LOS is a qualitative measure that generally describes these conditions in terms of speed, travel time, freedom to maneuver, comfort and convenience, and safety (Whitson 2000). LOS A is typically described as free flowing; LOS B is free to stable flow with light to moderate volumes; LOS C is moderate volumes, freedom to maneuver noticeably restricted; LOS D approaches unstable flow with heavy volumes and limited freedom to maneuver; LOS E is extremely unstable flow with maneuverability and psychological comfort extremely poor; and LOS F is heavy congestion with stop and go traffic and delays of greater than one minute per vehicle at signalized intersections.

The San Diego region-wide goal for an acceptable LOS on all freeways, roadway segments, and intersections is D; however, local jurisdictions, as well as Caltrans, have slightly different LOS objectives. In the County of San Diego, LOS D is the standard to maintain for Mobility Element roads, unless conditions exist that preclude improving a roadway beyond LOS E or F.

Table 3-10   Existing Traffic Volumes and Street Capacities in the Vicinity of the Refuge						
Street Segment	Classification	Capacity (thousands)	ADT <sup>3</sup> (thousands)			
McGinty Mountain Area						
Willow Glen Drive, between Jamacha Road and Steele Canyon Road	Major Road	30.8 <sup>1</sup>	20.7			
Willow Glen Drive, between Steele Canyon Road and Hillsdale Road	Major Road	30.8 <sup>1</sup>	8.5			
Willow Glen Drive, between Dehesa Road and Hillsdale Road	Community Collector	10.9 <sup>1</sup>	6.4			
Dehesa Road, between Willow Glen Drive and Sloane Canyon Road	Major Road	13.5 <sup>1</sup>	13.2			
Sloane Canyon Road	Local Public Road	1.5 <sup>1</sup>	no data			
Model A Ford Lane	Rural Residential Road	no data	no data			
Jamul Drive, between Steele Canyon Road and Lyons Valley Road	Light Collector (2 lanes)	10.9 <sup>1</sup>	5.9			

Table 3-10 Existing Traffic Volumes and Street Capacities in the Vicinity of the Refuge							
Street Segment	Classification	Capacity (thousands)	ADT <sup>3</sup> (thousands)				
Las Montañas Area							
Highway 94 (Campo Road), between Steele Canyon Road and Vista Sage Lane	Major Road (2 lanes)	13.5 <sup>1</sup>	18.24				
Vista Sage Lane	Local Private Road	no data	no data				
Sweetwater River Area							
Highway 94 (Campo Road), between Jamacha Road and Steele Canyon Road	Major Road (2 lanes)	15	17.5 <sup>4</sup>				
Millar Ranch Road	Local Private Road (2 lanes)	no data	no data				
Singer Lane (cul-de-sac)	Local Public Road	0.21	no data				
San Miguel Mountain Area							
Jamacha Boulevard, between Sweetwater Springs Boulevard to Highway 94(Campo Road)	Major Road (4 lanes)	33.4 <sup>1</sup>	16.9				
San Miguel Road, between Bonita Road and Proctor Valley Road	Local Public Road	8.7 <sup>1</sup>	8.3				
Proctor Valley Road, between Hunte Parkway and Melody Road	Light Collector (2 lanes)	1.5 <sup>1</sup>	0.8				
Otay Mesa and Lakes Area							
Otay Lakes Road, Chula Vista City Limits	Major Road to Village 13,	25 <sup>1</sup>	3.1				
	Community Collector to the east	10.9 <sup>1</sup>	no data				
Otay Lakes Road, east of Chula Vista City Limits	Community Collector (2 lanes)	10.9 <sup>1</sup>	3.1				
Del Mar Mesa Vernal Pool Unit							
State Route 56, between Black Mountain Road and Carmel Valley Road	Freeway (2 lanes)	no data (refer to text)	64-72 <sup>4</sup>				
Camino del Sur, southern terminus	Major Road (4 lanes)	30 <sup>2</sup>	12.3				
Black Mountain Road, between State Route 56 and Park Village Road	Major Road (4 lanes)	35 <sup>2</sup>	34.6				
Park Village Road	Major Road (4 lanes)	35 <sup>2</sup>	8.9				
Mannix Road	Collector (2 lane)	2.2 <sup>2</sup>	no data				

<sup>1</sup>County of San Diego Mobility Element Road Classifications (County of San Diego 2010a)

<sup>2</sup> City of San Diego Roadway Classifications (City of San Diego 1998b)

<sup>3</sup>San Diego Association of Governments (SANDAG) http://www.sandag.org/resources/

demographics\_and\_other\_data/transportation/adtv/index.asp), except as otherwise noted

<sup>4</sup> 2011 Traffic Volumes on the California State Highway System (Caltrans 2011)

For the most part, the roadways located in proximity to the lands within the Otay-Sweetwater Unit operate at LOS D or better. There is one exception: the segment of Highway 94 between Singer Lane and Vista Sage Lane. The Mobility Element of the County General Plan (County of San Diego 2010a) explains that retaining a LOS of E or F on Highway 94 from the Valle de Oro Community Planning Area boundary east to Melody Road represents an instance in which the county has determined that it is more appropriate to retain the existing road condition, in this case a two-lane road, rather than to increase the number of travel lanes. The adverse impacts of adding the additional lanes do not justify the resulting benefit of increased traffic capacity. As a result, this roadway is today and will continue to operate in the future at LOS E or F.

In the area surrounding the Del Mar Mesa Vernal Pool Unit, the surface streets that provide access to these parcels are all operating at LOS D or better. Highway 56 however operates at LOS E or F during weekday morning and evening peak traffic periods. SANDAG (http://www.sandag.org/ resources/demographics\_and\_other\_data/ transportation/adtv/index.asp) describes the segment of Highway 56 in the vicinity of Camino Del Sur as LOS E, with intermittent congestion along the east bound lanes, and a combination of LOS E and LOS F, with 0-2 hours of congested flow, in the west bound lanes.

## 3.5.3.2 Parking

Currently, refuge visitors have limited options for off-street parking of motor vehicles. There is a Refuge-maintained trail staging area off Jamul Drive that provides 17 parking spaces for visitors who wish to access the trails on McGinty Mountain. Off-street parking is available at the Summit Site of Sweetwater County Park, located at 3218 Summit Meadow Road to the west of the San Miguel Mountain area. From this parking area, visitors can access the Sweetwater Loop and River Trail, which extends through the Refuge along the Sweetwater River. Another parking area, maintained by the County Department of Public Works, provides access to the Sweetwater Loop and River Trail from the north. This parking area is located off Highway 94 at Singer Lane, near the site of the old steel bridge.

There are no designated parking areas for the western trail access point for McGinty Mountain, which begins at Farraday Ridge Road, or for the northern portion of the Sweetwater River area, where the trail begins at Par Four Drive. In those locations, current users park along the existing public streets. In the case of the McGinty Mountain trail, trail users are parking on Stonefield Drive, as the entrance to Farraday Ridge Road is gated.

## 3.5.4 Public Utilities and Easements

San Diego Gas & Electric (SDG&E) maintains utility easements and access roads throughout various parts of the Refuge, including on the Del Mar Mesa Vernal Pool Unit and within the Otay-Sweetwater Unit. The majority of the roads located on the Del Mar Mesa Vernal Pool Unit are maintained by SDG&E for access to their transmission line towers, including one tower that is located within the Refuge boundary. Another major northeast to southwest transmission line traverses the lower slopes of San Miguel Mountain, where numerous transmission towers dot the landscape. These transmission corridors were established and developed prior to the establishment of the Refuge.

Also located within the Otay-Sweetwater Unit are several utility easement roads that provide access for the Otay Water District to maintain facilities constructed on inholding parcels, which are parcels surrounded by Refuge land that are owned by another entity. In some cases, communication facilities have been collocated on the existing water facilities. AT&T maintains telephone lines on some of the existing power line routes on San Miguel, as well as separate routes through Las Montañas. In addition, the Sweetwater Authority maintains facilities, including a low flow barrier and a pipeline/electrical alignment, within the Refuge that is part the URDS. The purpose of the URDS is to capture first flush storm flows and low flow runoff before the water enters Sweetwater Reservoir.

#### 3.5.5 Economics and Employment

San Diego has a diverse economic base that includes a strong government sector (due in part to the presence of U.S. Navy and Marine Corps installations throughout the area) and active tourism-related industries. The service industry, which includes both personal and business services, employs the largest percentage of people in the region. According to the 2010 Census, some of the other leading industries in San Diego County include professional, scientific, and technical services; health care and social assistance; and manufacturing.

The estimated population in 2010 for the county was 3,095,313, with an estimated 1,061,789 total households. The largest portion of the Refuge, the Otay-Sweetwater Unit, is situated in southwestern San Diego County near the communities of Bonita, northeast and southeast Chula Vista, Rancho San Diego, Spring Valley, and southeastern El Cajon. The total estimated population for these areas in 2011 was 178,000 (SANDAG Data Warehouse, http://datawarehouse.sandag.org/, data extracted in November 2011).

Although the Refuge will not directly result in the generation of revenues for the region, the personnel employed to manage the Refuge, as well as the activities that occur on the Refuge (e.g., maintenance, limited new construction, recreation), provide positive economic benefits to the region. The Refuge employs three full-time staff members who actively manage, maintain, and protect the resources on the Refuge. There are also additional refuge complex personnel (e.g., firefighters, law enforcement, recreation and environmental education planners) employed in the San Diego Region who participate in the management of this Refuge. All of the employees contribute to the local economy by generating employment and sales taxes and by purchasing goods and services that support other jobs in the region. Goods and services purchased to support management activities on the Refuge also support the local economy.

The economic benefits of recreation (e.g., mountain biking, equestrian activities, hiking, wildlife observation, photography, hunting) are also well documented. The Outdoor Industry Foundation (2006) estimates that active outdoor recreation contributes \$730 billion annually to the U.S. economy. Within California, outdoor recreational activities are estimated to contribute \$46 billion annually to the State's economy, supporting 408,000 jobs and generating \$3.1 billion in annual State tax revenue. There are also demonstrated economic benefits of outdoor recreation related to tourism, property values, and health care savings (Macdonald 2011).

With respect to wildlife observation, the USFWS (2008e) estimates that in 2006, roughly one out of three Americans 16 years or older (71 million people) participated in wildlife watching and that wildlife-related expenditures in 2006 were \$45.7 billion nationwide. Of the 71 million people who participate in wildlife watching, 95 percent of them did so within one mile of their homes. In California, the estimated number of wildlife watchers in 2006 was 6.27 million people, resulting in an economic output of just under \$7.9 million (USFWS 2008e).

The effect of preserving lands within the MSCP study area, including those lands that are currently part of the Otay-Sweetwater Unit of the San Diego NWR, as well as additional lands that could be included in the future per the approved acquisition boundary, on population and housing within the San Diego region were addressed in the Final Joint Environmental Impact Report

(EIR)/EIS for the Issuance of Take Authorizations for Threatened and Endangered Species due to Urban Growth within the MSCP Planning Area (City of San Diego 1997). In this Joint EIR/EIS, three issues were analyzed: 1) the effects of the proposed action on planned/existing housing in the region; 2) effects of the proposed action on the distribution, density, or growth patterns; and 3) a generalized economic analysis of the overall MSCP Plan. The document concluded that implementation of the MSCP would not significantly affect planned or existing housing in the San Diego region. Based on a quantitative analysis of development shifts that were expected to occur with the implementation of the MSCP Plan, as well as analysis of measures incorporated into the MSCP Plan and Subarea Plans to minimize or avoid impacts to land use distribution and growth patterns, the Joint EIR/EIS identified no significant adverse effects on regional growth patterns. With respect to the generalized economic analysis, the Joint EIR/EIS concluded that the implementation of the overall MSCP Plan would result in net positive economic effects for the region (City of San Diego 1997).

## 3.5.6 Environmental Justice

On February 11, 1994, Executive Order 12898 ("Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations") was issued requiring that all Federal agencies achieve environmental justice by "identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." Environmental justice is defined as the "fair treatment for peoples of all races, cultures, and incomes, regarding the development of environmental laws, regulations, and policies.

Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, State, local, and tribal programs and policies. To achieve meaningful involvement requires that all potentially affected individuals have an appropriate opportunity to participate in decisions about proposed activities that could affect their environment and/or health and that the concerns of all participants are considered in the decision making process.

The U.S. Department of Housing and Urban Development (HUD) defines low income as 80 percent of the median family income for the area, subject to adjustment for areas with unusually high or low incomes or housing costs. According to estimates developed by SANDAG, the median household income in 2010 for the areas surrounding the Refuge was:

- \$66,046 for Bonita (zip code 91902);
- \$73,957 for the northeast portion of the City of Chula Vista (zip code 91914);
- \$54,780 for the southeast portion of the City of Chula Vista (zip code 91915);
- \$70,578 for the Jamul area (zip code 91935);
- \$43,243 for the community of Spring Valley (zip code 91977);
- \$51,821 for Rancho San Diego (zip code 91978); and
- \$44,953 for El Cajon (zip code 92019) (SANDAG Data Warehouse, http://datawarehouse.sandag.org/, data extracted in November 2011).

Additional information about the household incomes in these communities is provided in Table 3-11. The estimated countywide median household income for 2010 is \$44,771. An income of \$35,816 would represent 80 percent of the median family income for the region; therefore, based on the figures available, the communities immediately surrounding the Refuge would not meet the definition of low income. San Diego County is about 4,260 square miles in size and in 2010 the estimated population was 3,095,313 (SANDAG, Fast Facts, http://datawarehouse.sandag.org/ data extracted 11/2011). SANDAG estimates that in 2010, approximately 49 percent of the population in San Diego County identified themselves as white, 31 percent as Hispanic, 10 percent as Asian, 5 percent as African-American, 0.5 percent as American Indian, 0.4 percent as native Hawaiian or other Pacific Islander, and 3 percent as two or more races. The ethnic composition of the communities located in proximity to the Otay-Sweetwater Unit, the largest part of the Refuge, is described in Table 3-12.

Table 3-11 Estimated Household Incomes for the Communities <sup>1</sup> around the Refuge in 2010								
	Chula Vista, Bonita (91902)	Chula Vista, NE (91914)	Chula Vista, SE (91915)	Jamul (91935)	Spring Valley (91977)	Rancho San Diego (91978)	El Cajon (92019)	San Diego Region
Occupied Households	5,632	4,173	6,843	2,754	18,625	2,744	14,664	1,068,797
Households with:								
Incomes less than \$15,000 per year	357	108	346	256	2,263	236	1,951	145,352
Incomes from \$15,000 to \$44,999 per year	1,498	708	2,509	566	7,487	925	5,389	391,917
Incomes from \$45,000 to \$74,999 per year	1,306	1,321	2,264	639	5,276	805	3,378	263,494
Incomes from \$75,000 to \$99,999 per year	991	860	946	343	1,805	376	1,802	117,302
Incomes from \$100,000 and above per year	1,480	1,176	778	950	1,794	402	2,144	150,732
Median Income	\$66,046	\$73,957	\$54,780	\$70,578	\$43,243	\$51,821	\$44,953	\$44,771

<sup>1</sup> Community boundaries are defined by zip code, and the data is based on estimates for the year 2010. Source: (SANDAG, Estimates for 2010, http://datawarehouse.sandag.org/, data extracted on 11/2011).

Table 3-12 Ethnic Composite of the Communities <sup>1</sup> in the Vicinity of the Refuge in 2010								
Ethnic Group	Bonita (91902)	Chula Vista, NE (91914)	Chula Vista, SE (91915)	Jamul (91935)	Spring Valley (91977)	Rancho San Diego (91978)	El Cajon (92019)	San Diego Region
American Indian	49	61	22	51	263	38	325	16,878
	(<1%)	(<1%)	(<1%)	(<1%)	(<1%)	(<1%)	(<1%)	(<1%)
Asian	2,658	1,642	5,650	164	5,441	411	1,575	333,673
	(15%)	(12%)	(26%)	(2%)	(9%)	(5%)	(3%)	(10%)
Black	442	408	1,022	276	7,583	551	1,534	167,311
	(2%)	(3%)	(5%)	(3%)	(12%)	(7%)	(3%)	(5%)
Hawaiian and Pacific	58	40	204	15	500	52	151	14,681
Islander	(<1%)	(<1%)	(1%)	(<1%)	(<1%)	(<1%)	(<1%)	(<1%)
Hispanic	6,588	4,971	8,525	2,335	20,620	1,705	7,816	987,278
	(37%)	(36%)	(39%)	(26%)	(33%)	(21%)	(17%)	(31%)
White	7,610	6,348	5,493	5,684	24,776	4,927	31,476	1,586,395
	(42%)	(47%)	(25%)	(64%)	(40%)	(60%)	(70%)	(49%)
Other	36	12	15	10	149	45	158	8,480
	(<1%)	(<1%)	(<1%)	(<1%)	(<1%)	(<1%)	(<1%)	(<1%)
2 or More Races	544	433	796	291	2,958	441	1,987	109,736
	(3%)	(3%)	(4%)	(3%)	(5%)	(5%)	(4%)	(3%)
Total Estimated Population	17,985	13,915	21,727	8,826	62,290	8,170	45,022	3,224,432

<sup>1</sup>Community boundaries are defined by zip code, and the data is based on estimates for the year 2010. Source: (SANDAG, Current Estimates for 2010, http://datawarehouse.sandag.org/, data extracted on 11/2011).

# 4 Alternatives

## 4.1 Introduction

An important step in the CCP process is the development and analysis of alternatives. Alternatives are developed to identify and analyze different ways to achieve Refuge purposes, contribute to the mission of the NWRS, meet Refuge goals, and resolve issues identified during scoping and throughout the planning process. The development of alternatives is also an important component of the NEPA process, and as described in Chapters 1 and 2, compliance with NEPA for this CCP was accomplished through an integrated document, a draft CCP/EA, which addressed both the requirements of NEPA and the CCP process. As such, this chapter describes the process that was followed to develop a range of management alternatives for the San Diego NWR; provides detailed descriptions of the alternatives developed for the Refuge; identifies the preferred alternative; compares the way in which each alternative addresses identified issues; summarizes the similarities among the alternatives; and presents those alternatives that were considered but eliminated from detailed study.

## 4.2 Alternative Development Process

The alternatives development process for the San Diego NWR was an iterative process that required consideration of a number of factors, some of which were known at the beginning of the process and others that became evident during the process as a result of public comments, analysis by the planning team, and information provided by other agencies and interested parties. The issues, constraints, and opportunities affecting management of the Refuge (described in Chapter 2) were all taken into consideration during alternatives development. Also influencing this process were Refuge purposes, the Refuge vision, goals, and objectives (see Chapter 3 of the Final CCP), and public comments provided during the public comment period on the draft CCP/EA (see Appendix F-3 of the EA).

One of the first steps in the alternatives development process was identifying and describing the various programs and management actions currently being implemented on the Refuge, as these practices represent the "no action" alternative. Under the no action alternative, the current management of the Refuge would continue to be implemented for the next 15 years or until management direction is revised through a revision to the CCP. It is important to describe the no action alternative accurately because it serves as the baseline to which all other alternatives are compared.

Next, the planning team considered a wide range of management actions (or strategies) that would address the issues, constraints, and opportunities identified for the Refuge and would assist in achieving Refuge goals and objectives. These actions were refined during several planning team meetings and then clustered into logical groupings to form the action alternatives. Many actions are common to more than one alternative, but the various actions described for each alternative reflect a common management approach for that particular alternative, as presented in detail in this chapter.

## 4.3 Past and Current Refuge Management on the San Diego NWR

## 4.3.1 Background

The San Diego NWR, which is situated on the eastern edge of the San Diego metropolitan area, was established in 1996. The creation of this Refuge coincided with an effort by the Service and the City of San Diego, as well as a variety of other public agencies and interest parties, to develop a Multiple Species Conservation Program (MSCP) for the southwestern San Diego region. The lands acquired for inclusion in the San Diego NWR represent the Service's contribution towards the implementation of the San Diego MSCP (USFSW 1997a). The establishment of the Refuge and the implementation of the MSCP share many of the same purposes, including protecting and managing key habitats for a range of endangered, threatened, and rare species, and maintaining the high biological diversity of southwestern San Diego County.

In April 1997, the Service approved a boundary for the Otay-Sweetwater Unit of the San Diego NWR that encompassed approximately 43,860 acres (refer to Figure 1-3) and a boundary for the Vernal Pools Stewardship Project that encompassed approximately 8,220 acres (refer to Figure 1-5). These boundaries are often referred to as the Refuge acquisition boundary, and it is within these boundaries that the Service is able to negotiate with willing participants to acquire their lands. As indicated in Chapter 1, the boundary of the Otay-Sweetwater Unit was expanded by approximately 327 in 2012 to accommodate the donation of surplus lands from the California Department of Transportation.

Not all lands included within the approved acquisition boundary will become part of the Refuge. Some lands have already been or will be developed, others will continue to be held by the current public or private landowner, and still other parcels will likely be acquired by the Service, other public agencies, or land trusts for the purpose of conserving native habitat and species. The lands acquired by the Service become part of the San Diego NWR. Generally, the lands incorporated into a refuge are acquired as a result of a direct sale from a willing seller at fair-market value; however, there may be occasions in which a parcel is acquired through a donation, partial donation, transfer, or an exchange. Refuge lands are never acquired through condemnation.

The lands included within the Otay-Sweetwater Unit acquisition boundary were selected based on a number of factors. These include a determination that the lands supported "very high" to "moderate" habitat values, high biological diversity and species richness, priority target species, vernal pool habitat, and/or that the lands would provide appropriate habitat connections (wildlife corridors) between larger areas of preserved land (City of San Diego and USFWS 1997). An additional factor that has been considered during the ongoing acquisition process is improving the contiguity (i.e., eliminating inholdings, reducing edge/area ratio) of the lands preserved within and surrounding the Refuge.

Although the boundary for the Vernal Pools Stewardship Project was not approved until 1997, planning for this area was actually initiated in 1989 to ensure the conservation of outstanding vernal pool resources in the San Diego Region. The lands within the boundary of the Vernal Pools Stewardship Project consist of both private and public lands, including lands on MCAS Miramar and the City of San Diego's Montgomery Field. The Land Protection Plan (LPP) for the Vernal Pools Stewardship Project describes a variety of habitat protection methods, including leases and cooperative agreements, conservation easements, and fee-title acquisition. The intent of developing an LPP for the vernal pools of southwestern San Diego County was to coordinate efforts with landowners, local jurisdictions, government agencies, and the Department of Defense to protect native habitats for rare species (USFWS 1997b). The LPP for the Stewardship Project acknowledges that not all of the lands in the proposed acquisition boundary would become part of

the Vernal Pools Unit of the San Diego NWR, and to date the vast majority of the lands included within the Vernal Pools Stewardship Project boundary have not been acquired by the Service.

## 4.3.2 Current Ownership Pattern and Acquisition History

As of August 2013, approximately 26 percent (about 11,470 acres) of the area included within the acquisition boundary for the Otay-Sweetwater Unit has been acquired by the Service for inclusion in the San Diego NWR (refer to Figure 1-3). Other portions of the acquisition boundary (approximately 19,000 acres) have been acquired for habitat and species conservation by other public agencies and land trusts, including the CDFW and The Nature Conservancy (TNC) (refer to Figure 1-4). An additional 6,000 acres are managed by other public agencies to protect the watersheds around two major reservoirs, Sweetwater Reservoir and the Otay Lakes. The Service will likely enter into additional acquisition agreements over the life of the CCP, as various blocks of land within the approved acquisition boundary remain undeveloped and privately held. The lands within the Otay-Sweetwater Unit that have already been acquired by the Service are generally located within several non-contiguous blocks of land, situated to the south of Interstate 8, east of Highway 54, north of Otay Lakes Road, and west of the unincorporated community of Beaver Hollow in the north and to the west of Jamul Creek in the south (refer to Figure 1-6).

Only 77 acres of the 8,220 acres included within the approved boundary of the Vernal Pools Stewardship Project (refer to Figure 1-5) have been acquired by the Service; of this total, 17 acres are located near the Sweetwater Reservoir within the Otay-Sweetwater Unit. The other 60 acres are located within the Del Mar Mesa Vernal Pool Unit. An additional 5,400 acres within the Stewardship Project boundary are owned by other local, State, or Federal agencies or non-profit land trusts.

Land acquisition efforts for the San Diego NWR began in 1992 when approximately 1,840 acres of undeveloped land owned by Home Federal Savings and Loan were placed in Federal receivership under the control of the Resolution Trust Corporation (RTC). Based on the quality of the habitats and populations of listed species supported by these habitats, the Service entered into a purchase agreement with the RTC to acquire approximately 1,826 acres of this land. With this acquisition, the San Diego NWR was established in 1996.

As of August 2013, 75 fee-title acquisitions totaling approximately 11,530 acres had been completed. In addition, four easements have been acquired, <u>although some easements include limitations on use</u>. A complete listing of the Refuge's acquisition history is provided in Appendix <u>I</u>. Some of the most significant acquisitions include the acquisition of about 1,700 acres of the western and northern slopes of Mother Miguel Mountain in August 1997; the Las Montañas area in 1998; several large parcels on the lower northern slopes of McGinty Mountain, as well as some smaller parcels near the top of San Miguel Mountain, in 1999; and a large area along the lower western slopes of McGinty Mountain and over 500 acres near the top of San Miguel Mountain in 2000. Also in 2000, the vernal pool parcels located adjacent to the Sweetwater Reservoir, referred to in this document as the Shinohara parcel, were acquired. In 2012, the 1,905-acre Hidden Valley area was acquired, filling a large gap in Refuge ownership between the San Miguel Mountain and Las Montañas management areas.

Over the next few years, approximately 700 additional acres of land located in various portions of the acquisition boundary are expected to be transferred to the Service from Caltrans (refer to Figure 1-4), including 2.4 acres along Highway 94 near Millar Ranch Road.

## 4.3.3 Existing Management Plans

Prior to the development of this CCP, the Refuge had no comprehensive management plan to direct Refuge management and operations. There was, however, a Conceptual Management Plan for the San Diego National Wildlife Refuge, which was prepared by the Service in 1997. This plan presented a broad overview of the Service's proposed management approaches for wildlife and habitats, public uses and wildlife-dependent recreational activities, wildfire suppression and prescribed burning, rights-of-way and easements, law enforcement, facilities, interagency coordination with the MSCP preserve, and public outreach (USFWS 1997b). The key area of management focus in this initial plan was management of native habitat and plant communities for the recovery of endangered, threatened, and rare species. Active modification and manipulation of intact native plant communities was to be avoided, while enhancement and restoration actions on disturbed or degraded sites was encouraged. Monitoring of distribution and abundance patterns for selected species was also proposed. The plan also encouraged opening the Refuge for compatible recreational uses to ensure opportunities for the public to gain a better appreciation for and understanding of the region's unique wildlife heritage and to enjoy the Refuge's open spaces. In so doing, the plan acknowledged that high-quality wildlife-dependent recreational uses rely on healthy habitats and healthy populations of birds and other wildlife; as a result, the plan acknowledged that some constraints on public use and recreation would be necessary and that certain core areas within the Refuge would not be open to public use (USFSW 1997b).

The other planning process that provides guidance for how the Refuge should be managed is provided within the various components of the San Diego MSCP (City of San Diego 1998a), including the framework management plans and resource management plans associated with each MSCP subarea plan prepared by the participating jurisdictions (i.e., cities of San Diego [City of San Diego 1997] and Chula Vista [City of Chula Vista 2003], County of San Diego [County of San Diego 1997]). The management direction provided in the MSCP focuses primarily on preserve management activities intended to ensure that preserved lands, such as those included in the San Diego NWR, are managed for the long-term conservation of biological resources. In addition, the MSCP envisioned standardized monitoring practices throughout the preserved lands to document ecological trends, evaluate the effectiveness of management activities, provide new data on species population and wildlife movement, and evaluate indirect impacts of adjacent land uses and construction.

## 4.3.4 Management History and Past Refuge Actions

## 4.3.4.1 Refuge Management History

The lands within the San Diego NWR are dominated by coastal sage scrub, chaparral, and grassland habitats. Several parcels contain regionally significant vernal pool habitat, and a variety of other sensitive native upland and wetland habitats occur throughout the Refuge. The Refuge protects habitat that supports or has the potential to support at least 16 federally listed species and at least one candidate species. The majority of the Refuge ownership is included in the Otay-Sweetwater Unit; the remaining acreage, about 60 acres, is included within the Del Mar Mesa Vernal Pool Unit.

Following approval of the Refuge boundary in 1997, two permanent full-time employees—a Refuge Manager and Refuge Wildlife Biologist—were assigned to the San Diego NWR to manage Refuge resources and facilitate daily Refuge operations. A Refuge office was opened on Lyons Valley Road in Jamul. Also in 1997, the Refuge Complex (which oversees the management of several Refuges including the San Diego NWR, San Diego Bay NWR, Tijuana Slough NWR, and Seal Beach NWR) contracted with BLM to provide part-time law enforcement in an effort to reduce the extent of illegal activities (e.g., off-road vehicle use,

dumping, homeless encampments) occurring on Refuge lands. Some of the initial management activities implemented by the new Refuge staff, with assistance from the Refuge Complex, Ecological Services and the Regional Office, included:

- initiation of Quino checkerspot butterfly surveys,
- conducting cultural resource reviews of several existing structures on the Refuge,
- facilitating on-Refuge research by two Dartmouth College students on the sensitivity of the rufous-crowned sparrow (*Aimophila ruficeps*) to residential edge effects, and
- supporting herpetofaunal monitoring by USGS and San Diego State University's Department of Biology.

Today, the Refuge staff includes a Refuge Manager, Refuge Operations Specialist, and a Wildlife Biologist. Refuge offices are located off-Refuge on the Rancho Jamul Ecological Reserve in space shared with CDFW and BLM. The San Diego NWR staff also receives assistance from the Complex staff, including Federal Wildlife Officers, the Environmental Education Specialist, Park Ranger, and Maintenance Mechanic. The Refuge Complex maintains a fire crew, which is stationed at Fire Station Number 36 on Highway 94 and Peaceful Valley Ranch Road in Jamul. The fire crew is responsible for the protection of Refuge resources and adjacent private property. The crew also assists in controlling other wildland fires on public lands when the need for additional crews is identified.

### 4.3.4.2 Past Refuge Actions

A variety of management actions have been implemented on the Refuge since its establishment, with many focused on improving habitat conditions for listed species. Some of the more significant actions are summarized here.

#### Installation of Nest Boxes to Support Burrowing Owls

Artificial nest boxes have been installed on the Refuge in multiple locations to provide nesting habitat for burrowing owls. In 1997, 10 boxes were placed in the disturbed coastal sage scrub and grassland habitats near Par Four Drive. Burrowing owls that were habitually preying on federally endangered California least terns (*Sternula antillarum browni*) at coastal areas were translocated to the Par Four site. Disturbance by coyotes and/or domestic dogs interfered with the introduction, and burrowing owls no longer persist at this site. In October 2007, 10 nest boxes were installed at the Shinohara vernal pool restoration site, and another 10 boxes were added east of that location in 2010. At least 14 owls fledged from these boxes from 2009 through 2011.

#### **Recovery of Otay Tarplant**

This project was initiated as part of a Stipulated Settlement Agreement and Order (Case No 99CV1454 L (LAB) finalized on December 21, 2000, for the purpose of conserving and recovering the federally threatened plant, Otay tarplant. The project was implemented on an area of about 70 acres located just to the west of State Route 125 (SR-125) between San Miguel Ranch Road to the north and Proctor Valley Road to the south. This site has now been incorporated into the Refuge as mitigation for impacts related to an associated housing development with the land transfer of this and three other mitigation parcels finalized in 2013.

Initiated in 2005, work on the site, referred to as the San Miguel Ranch (formerly Trimark) Otay Tarplant Preserve, involved the removal of the dense thatch of dead exotic vegetation that covered the site, followed by a series of herbicide treatments implemented to control nonnative plants. Tarplant seeds and seeds from other native plant species from the surrounding area were collected and distributed over the prepared site. The population of Otay tarplant at this site has benefitted from this restoration work; however, weed control has not been consistently effective throughout the life of the project. Though exotic annual grass species have been drastically reduced, the site continues to support abundant broadleaf annual weeds, most notably short-pod mustard. The distribution of Otay tarplant increased from 1.1 acres in 2005 to 6.25 acres in 2006, despite dramatically lower rainfall in 2006. Work on the project ended in January 2011. In 2011, despite continuing weed problems, the Otay tarplant population remained abundant and productive, occurring over an area of about 13.4 acres; in fact, tarplant on the site in 2011 was more extensive than it has been in the history of tarplant monitoring on this site (since 2001). Individual tarplants have been tall and vigorous, apparently producing large amounts of seed. It is likely that the Otay tarplant seed bank on this site is much larger than it was at the outset of the project.

### Stabilization of the Historic Barn at the Oaks

In 2006, efforts were initiated to stabilize the Barn at the Oaks, a historic structure located in the Las Montañas area of the Otay-Sweetwater Unit. Stabilization was necessary to prevent any further structural deterioration and to reverse the effects of ongoing vandalism. Stabilization of the existing barn structure involved removing the existing roof, which was in danger of caving in and collapsing the entire structure; constructing a new roof; realigning and bracing some of the walls of the structure to prevent collapse from lateral and seismic forces; repairing decayed wood; salvaging historic materials for later reuse; and replacing an existing chain link fence to prevent trespass and vandalism. The project was completed in 2009.

### Translocation of San Diego Ambrosia

In June 2006, San Diego NWR began a project to reduce the likelihood of extinction of San Diego ambrosia. Prior to initiation of this project, there were three occurrences on the Refuge, all of which were subject to deleterious disturbances (e.g., foot, bicycle, horse, and off-road vehicle traffic; weeds; wildfire). Establishment of a new protected population of ambrosia was proposed in an effort to increase the likelihood of persistence of this species on the Refuge and throughout its range.

Prior to planting, three receptor sites, approximately 33 x 66 feet (10 x 20 meters) each and approximately 985 feet (300 meters) apart, were mowed with weed-whackers, raked to reduce the amount of thatch, and then treated with glyphosate herbicide to reduce weeds that may compete with the translocated plants. Cuttings from the wild population on the Refuge were collected to use as donor stock. In November 2006, 600 plants in one-gallon pots were planted at the receptor sites. Plants were placed at 1.6 to 3.3 foot (0.5 to 1.0 meter) intervals and watered as needed to ensure survival during the first four months after planting. In late 2009, two additional receptor sites were prepared. An assessment done in April 2010, showed that the sites were dominated by exotic annual weeds (primarily broadleaf species), though the receptor sites are less weedy than the adjacent untreated non-native grassland. Despite the presence of these weeds, the ambrosia appears to be well established, showing similar stem densities to the donor population at Par Four Drive. Many of the plants have spread via rhizomes at least 17 inches (50 centimeters) from the site of original planting. An additional 400 plants were installed at these sites in late 2010.

### Protection of San Diego Ambrosia

The three native occurrences of San Diego ambrosia on the Refuge were initially threatened by impacts from pedestrians, bicycles, and horses on trails adjacent to or within the ambrosia patches. In three separate projects, Eagle Scout candidates worked with Refuge staff to supervise other scouts and volunteers in erecting post-and-rail fences to redirect traffic in and near the ambrosia patches. The projects have successfully excluded traffic from native

occurrences of San Diego ambrosia, and the plants have responded by spreading via rhizomes into previously trampled areas.

#### **Translocation of Mexican Flannelbush**

In August 2006, San Diego NWR began a project to reduce the likelihood of extinction of Mexican flannelbush. Prior to initiation of this project, the species was known to occur only in two canyons on Otay Mountain in extreme southern San Diego County. Though location information associated with historic collections of Mexican flannelbush is not as precise as that customarily recorded with modern plant collections, the information suggested that the species formerly occurred in Jamul and may have occurred on lands now managed by the Refuge. Seeds were collected from the wild population in August 2006, and a local native plant nursery was contracted to grow container stock from this seed. In November 2010, 141 plants were planted in two canyons on the southwest and northeast sides of Mother Miguel Mountain. As of July 2011, approximately 75 percent of the plants had survived. The mortality rate for these plants is expected to decline after their first dry season in the field.

#### Vernal Pool Restoration on the Shinohara Parcel

The restoration of approximately 30 acres of vernal pool habitat, including a surrounding matrix of coastal sage scrub/foothill needlegrass grassland ecotone, was initiated in spring 2007. The restoration site is located in the southwesternmost corner of the Otay-Sweetwater Unit to the south of Sweetwater Reservoir. The site had been degraded by agriculture, grazing, and exotic plant invasion. Weed control began in April 2007 and continued through the present January 2012. Thirty-three vernal pool basins were re-contoured in 2007, and an additional 30 were created in 2009. Planting of native shrubs and perennial grasses began in January 2011. Soil inoculum from contiguous vernal pool habitat was spread in selected basins in November 2008. Seed of native vernal pool plants was broadcast into selected basins in December 2009 and November 2010. Vegetation change has been monitored annually using permanent transects, and species have been inventoried in vernal pool basins. As of January 2012, the site supported five federally listed plant species, 10 vernal pool obligates, and six additional regionally sensitive species. Qualitative and quantitative monitoring show that native species richness and cover are increasing throughout the site, but the need for weed control to maintain populations of listed and sensitive flora and fauna continues. The site is contiguous with another vernal pool restoration site maintained by the Sweetwater Authority, which enhances the effectiveness of both projects in conserving vernal pool species and ecological function.

#### **Reestablishment and Enhancement of Oak Woodland**

Though oak woodlands currently occur on less than two percent of the Refuge, these woodlands constitute especially valuable wildlife habitat. It is likely that the area historically supported more extensive oak woodlands than it does today. Oaks were probably consumed for fuel and young oaks destroyed by grazing cattle. To address this historic loss, and to mitigate potential future loss of oak woodlands due to depredation by the recently introduced goldspotted oak borer, we began to plant oaks on the Refuge in 2007. Since then, volunteers and Refuge staff have direct-seeded acorns in many locations. As of early 2013, acorns (about three per location) had been planted in approximately 290 locations on the Otay-Sweetwater Unit where conditions are appropriate for supporting oak woodland habitat. As expected, mortality has been high. However, in response to new information on oak woodland restoration, we plan to incorporate weed control into future oak planting efforts, which is expected to increase the rate of successful oak establishment.

#### Construction of a Trail Bridge for the Sweetwater River Trail

To reduce disturbance to sensitive riparian habitat from ongoing trail use and improve conditions for users of the county's Sweetwater River Trail, the Refuge partnered with the County of San Diego in 2005 to construct a 170-foot-long multiple use trail bridge over the Sweetwater River to the south of Highway 94. This bridge, constructed in April 2008 and dedicated in July 2008, provides access for hikers, equestrians, and bicyclists to cross the Sweetwater River with minimal impact to sensitive riparian habitat. With the installation of the bridge, a two-mile trail loop was created that allows users to travel on both sides of the Sweetwater River between the bridge and Singer Lane at Highway 94.

#### Habitat Rehabilitation in Burned Areas

With over \$750,000 in funding from the Burned Area Emergency Response and Emergency Stabilization and Rehabilitation Programs, the Refuge implemented a San Diego NWR Emergency Stabilization Plan for impacts related to the Harris Fire of October 2007. Infrastructure damage to guardrails, signs, and radio equipment were repaired under the plan. In addition, the Refuge has been managing selected habitat polygons within the over 4,000acre burn area to increase the likelihood that high-quality habitat for sensitive species on the Refuge will regenerate and be retained. This habitat rehabilitation focused on two different species and their critical habitats: the Quino checkerspot butterfly and the coastal California gnatcatcher.

The work implemented to support Quino checkerspot involved de-thatching approximately 138 acres in fall 2008. Invasive weedy plants were controlled with selective application of glyphosate in spring 2009 and 2010. In 2010, the initial herbicide application was a non-selective broadcast, using either glyphosate or the grass-specific herbicide fluazifop, depending on the species composition of the weeds and native vegetation in the area. Native seed was collected to reestablish native plants on the sites. The objective was to reestablish an open coastal sage scrub/grassland ecotone, with larval host plants and nectar source plants used by Quino checkerspot.

Site rehabilitation in fall 2009 for the coastal California gnatcatcher involved de-thatching approximately 90 acres of previously occupied gnatcatcher habitat. In 2010, the initial herbicide application within the de-thatched areas was once again a non-selective broadcast of either glyphosate or fluazifop, depending on the species composition of the weeds and native vegetation in the area. Native seed was collected to reestablish native coastal sage scrub vegetation suitable to support gnatcatchers.

In addition to Quino checkerspot and California gnatcatcher, these treatments are expected to benefit a variety of MSCP-covered species including burrowing owl, peregrine falcon (*Falco peregrinus*), rufous-crowned sparrow, coastal cactus wren, ferruginous hawk (*Buteo regalis*), golden eagle, northern harrier, orange-throated whiptail, San Diego horned lizard, Otay tarplant, San Diego barrel cactus, San Diego goldenstar, and variegated dudleya.

#### **Reduction of Hazardous Fuels in the Sweetwater River**

With funding provided by the Service's Fire Management Wildland-Urban Interface Program, a five-year project was initiated in 2008 to remove exotic, invasive plants along portions of the Sweetwater River and Steele Canyon Creek that traverse the San Diego NWR (totaling 4.6 linear miles of riparian habitat). Plants removed from this area included giant reed, salt cedar, and various species of non-native trees and palms.

#### **Restoration of Cactus Wren Habitat**

To facilitate and accelerate recovery of cactus wren nesting habitat damaged by the 2007 Harris Fire, in 2009 with funding from a Transnet Environmental Mitigation Program grant, several hundred pounds of cactus stem sections ("joints"), primarily coastal cholla but including smaller amounts of coastal prickly pear, were salvaged from the construction footprint of the Bayshore Bikeway, located adjacent to the San Diego Bay NWR. From this material and other salvaged cactus, including specimens of foothill prickly pear, over 6,000 cactus plants were grown in a nursery at Rancho Jamul Ecological Reserve. In fall 2010, a contractor was retained to collect and plant an additional 6,000 cactus for this restoration project. In early 2011, these 12,000 cactus plants were planted on three large areas, totaling approximately 123 acres, west of Mother Miguel Mountain. In 2011, mortality of the planted cacti was negligible, and moderate growth was observed during the 2011 growing season.

#### **Restoration on the Jamacha Parcel**

In November 2008, we began a project to enhance habitat quality for Otay tarplant and other grassland and coastal sage scrub species on the Jamacha parcel: a 30-acre parcel adjacent to Jamacha Boulevard in Spring Valley. The site includes several acres dominated by purple needlegrass and supports other clay-soil grassland species. The entire site was de-thatched in late 2008. From 2009 through 2011, weeds were controlled with glyphosate. Herbicides with the active ingredients fluazifop and chlorsulfuron have also been used to a lesser extent to control exotic annual grasses and onionweed (*Asphodelus fistulosus*), respectively. In 2012, efforts continued to remove large amounts of old, dumped concrete from the site to further habitat enhancement.

#### **Refuge Fencing and Boundary Sign Project**

In 2011, a project was initiated to remove and/or repair existing fencing and to install new fencing within the McGinty Mountain and San Miguel Mountain areas of the Otay-Sweetwater Unit. This project was necessary to improve wildlife movement within the Refuge, as well as to secure the boundaries of the Refuge to minimize trespass and habitat damage. At the time that some of the parcels now incorporated within the Refuge were acquired, they included fencing used in the past to delineate property lines, contain livestock, and protect property. As part of this project, fencing located within the interior of the Refuge was removed to improve wildlife movement, and fencing located along the Refuge boundary was either repaired or replaced with new fencing. In total, the project removed approximately 37,400 feet of interior fencing and repaired and replaced approximately 1,800 feet of boundary fencing. Boundary signs were also installed, as necessary, along portions of the Refuge boundary. In addition, this project included the completion of cadastral surveys in two locations, near the confluence of Steele Canyon Creek and the Sweetwater River and the vicinity of a private parcel on the western slopes of Proctor Valley. These surveys were required to determine and define land ownership and boundaries at these locations. This project was completed in 2012.

## Golden Eagle Nest Platforms

In 2007, a rock ledge on San Miguel Mountain that had supported golden eagle nesting collapsed. While eagles continued to be seen in the general area, potential nesting sites suitable for accommodating a golden eagle nest are extremely limited. To address this issue, in 2012 the Refuge working in partnership with BLM advanced a proposal to install artificial eagle nesting platforms in the area. Funding was subsequently secured through the Transnet Environmental Mitigation Program, and in 2013, a contractor fabricated and installed two metal mesh platforms: one on the Refuge on San Miguel Mountain and one on BLM land in the Jamul Mountains. Each platform was bolted into the rockface and braced. Branches and

sticks will be added to encourage nesting. Refuge staff will monitor the sites for use by eagles or other raptors.

### 4.3.5 Current Refuge Management Activities

Current Refuge management involves maintaining, enhancing, and restoring native upland and riparian habitats, monitoring a variety of listed and sensitive species and plant communities, controlling non-native invasive upland and wetland plant species, providing fire protection and law enforcement, and posting Refuge boundaries. The Refuge Manager is also responsible for ensuring the protection of cultural resources; coordinating issues related to contaminants with the Service's Environmental Contaminants Program; and working cooperatively with other agencies, tribes, non-profit organizations, private landowners, and the public on a variety of Refuge-related issues. A detailed description of the range of management activities currently being implemented on the Refuge is provided under Alternative A - No Action.

## 4.4 Proposed Management Alternatives

Four management alternatives, including a no action alternative and three action alternatives, were developed for evaluation in the draft CCP/EA. The four alternatives differ in the extent and focus of wildlife and habitat management actions to be implemented and in the types and levels of public use opportunities to be provided. Management Alternative D represented the Service's preferred alternative; <u>however, after considering the comments received during public review, this alternative was modified, as described below</u>.

## 4.4.1 Alternatives for the San Diego NWR

The four management alternatives evaluated for the San Diego NWR <u>in the draft CCP/EA</u> are summarized here and described in detail in the sections that follow. <u>An additional alternative (a modified Alternative D) was added in response to comments provided during the public comment period on the draft CCP/EA.</u>

#### Alternative A - No Action

Alternative A proposes no changes to the present wildlife and habitat management actions implemented on the Refuge, and no new public use programs would be implemented. This alternative represents the baseline from which other "action" alternatives will be evaluated.

#### Alternative B - Maximize Habitat Values and Species Protection

New and expanded wildlife and habitat management actions would be implemented under Alternative B to protect, restore, and enhance habitat values for listed and sensitive species on Refuge lands. The wildlife-dependent recreational uses currently occurring on the Refuge (i.e., wildlife observation, photography, environmental education, interpretation) would be managed to minimize disturbance to plants and wildlife, while also providing opportunities for the public to observe and appreciate the native species and natural lands protected within the Refuge.

Opportunities for wildlife observation, photography, resource interpretation, and environmental education would be restricted to a designated trail system, and large areas of the Refuge would remain closed to public access, minimizing disturbance to sensitive resources. Within the Otay-Sweetwater Unit, the designated trail system would include some trail with uses limited to hiking and other trails open to non-motorized multiple uses (i.e., hiking, mountain biking, horseback riding). No dogs would be permitted on the Otay-Sweetwater Unit under Alternative B. Public uses on the Del Mar Mesa Vernal Pool Unit would be permitted in accordance with the City of San Diego's Carmel Mountain and Del Mar Mesa Preserves Management Plan, and such uses would be limited to the designated trail system on the Refuge. Access to areas beyond the limits of the designated trails would be prohibited.

#### Alternative C - Expand Opportunities for Wildlife-dependent Recreational Uses

Alternative C proposes to expand the opportunities for wildlife-dependent recreational uses on the Otay-Sweetwater Unit, including providing hunting opportunities in three designated locations within this Unit. The wildlife and habitat management activities proposed for the Refuge under Alternative C would remain consistent with those described under Alternative B. Additionally, public uses and access on the Del Mar Mesa Vernal Pool Unit would be consistent with those proposals presented in Alternative B.

Under Alternative C, the designated trail system within the Otay-Sweetwater Unit would include additional trails not proposed in Alternative B and all trails would be designated for multiple use. In addition, interpretive and environmental education programs would be expanded; dogs would be permitted on the trails, provided they are maintained on a leash; and hunting, conducted in accordance with Refuge-specific regulations, would be permitted on portions of the following management areas: McGinty Mountain (400 acres), Las Montañas (300 acres), and Otay Mesa and Lakes (160 acres).

#### <u>Alternative D (Draft CCP/EA Preferred Alternative) - Optimize Species Protection While Providing</u> <u>Opportunities for Compatible Public Use</u>

Alternative D, the preferred alternative, proposes to optimize species and habitat protection, while expanding opportunities for compatible public use over those currently provided on the Refuge. In addition to the wildlife and habitat management activities proposed under Alternative B, this alternative also proposes to implement a feral pig monitoring and eradication plan on the Refuge. No feral pigs are currently known to occur on the Refuge, but feral pigs and the damage to resources associated with feral pig activity have been identified in the San Diego region. The initial implementation of this plan by the Refuge would therefore involve monitoring for the presence of pigs, with further action on the Refuge becoming necessary only if pigs are identified on Refuge lands.

Existing interpretive and environmental education programs would be expanded on the Otay-Sweetwater Unit under Alternative D, and hunting for big game (i.e., deer, feral pig), resident small game (i.e., rabbits), and resident and migratory upland game birds (e.g., dove, quail, wild turkey) is proposed, subject to refuge-specific conditions, on a portion of the Otay Mesa and Lakes management area. The designated trail system would consist primarily of nonmotorized multiple use trails, with hiking only trails also provided in a few areas; unauthorized trails would be subject to closure. Leashed dogs would only be permitted on those trails designated for multiple use.

Habitat management and public use on the 60-acre Del Mar Mesa Vernal Pool Unit would occur as described under Alternative B.

#### Modified Alternative D (Selected Action)

<u>After considering the range of comments provided during the public comment period, a</u> <u>modified Alternative D was evaluated for implementation. Under this alternative, all of the</u> <u>wildlife and habitat management actions proposed under Alternative D (including the</u> <u>implementation of the IPM Plan and Feral Pig Monitoring and Eradication Plan), along with</u> <u>the proposal for hunting in a portion of the Otay Lakes and Mesa area of the Refuge, would be</u> <u>implemented per available funding and staffing. In addition, the actions to be implemented</u> <u>under Alternative D in the Del Mar Mesa Vernal Pool Unit would also be implemented under the modified Alternative D.</u>

Modified Alterative D differs from Alternative D as follows:

- To minimize the potential for adverse effects to habitat quality, a vernal pool interpretive trail is not proposed.
- A trail will be provided on Lot 707, but it will not be developed as an interpretive trail.
- To avoid adverse effects related to parking, traffic safety, and sensitive species, the parking lot/trail staging area and associated trail access route proposed off Sloane Canyon Road in the vicinity of Model A Ford Lane is not included in selected action.
- A designated trail system, which takes into consideration that comments received during the public comment period, has been included and will not require the completion of a step-down trail plan.
- Some areas of the Refuge will require future trail planning once legal access to the area has been acquired.

Trail proposals addressed in the four action alternatives evaluated in the draft CCP/EA generated significant public comment during the public review period. As a result, additional meetings were held with trail advocates to receive input on specific trail proposals and gather additional input on the desire for a more interconnected trail system. With this information in hand, Refuge staff hiked over much of the Refuge to evaluate site conditions. We examined the various routes indicated on the maps prepared by trail users at public meetings, as well as proposals for specific trail routes that were received in letters or emails during the public comment period. The designated trail plan that has been incorporated into Modified Alternative D takes into consideration the results of this on-site analysis, along with data related to listed and sensitive species occurrences and the locations of sensitive habitat types. We also considered issues related to legal access onto the Refuge and concerns expressed by adjacent property owners, land managers, and utilities. The final trail plan is intended to ensure the protection of listed and sensitive species and habitats, while also meeting the public's desire for an interconnected trail system within the Refuge and to the regional trail network where legal access is available.

## 4.4.1.1 Similarities among the Alternatives for the San Diego NWR

Although there are differences among the range of alternatives presented for managing the San Diego NWR, the alternatives also include various features and management components that would be part of the CCP regardless of the alternative selected for implementation.

#### Features Common to All Alternatives

Features common to all alternatives are summarized here. To reduce repetition in the alternatives descriptions, those features that are common among all of the alternatives are described in detail only under Alternative A – No Action.

- Listed and Sensitive Species Conservation Protect, restore, and enhance habitat to support the Refuge's listed and sensitive wildlife (e.g., birds, insects, reptiles, amphibians, mammals), and protect and reestablish, where appropriate, listed and sensitive plant species throughout the Refuge.
- Listed and MSCP-Covered Species Monitoring Conduct monitoring and targeted studies of listed and MSCP-covered species, as well as the plant communities that support these species.

- *Invasive Species Control* Conduct periodic control of invasive plant species on the Refuge through manual control and the use of Service-approved herbicides. Pesticide approvals would include a detailed evaluation of the proposed pesticide, noting environmental hazards, efficacy, vulnerability of the target pest, and the State-issued Certified Pesticide Applicators' identification number for proposed use of any restricted use pesticides.
- *Environmental Contaminants Coordination* Continue to coordinate with the Service's Environmental Contaminants Program to ensure that trust resources are not being adversely affected by contaminants originating on site, as well as from off-site sources.
- *Protection of Cultural Resources* Manage recorded and future discoveries of cultural resources located within the Refuge in accordance with Federal regulations and Service policy. The Refuge Manager would continue to consider the effects of all proposed actions on cultural resources. Prior to implementing any ground-disturbing projects, the Refuge Manager would consult with Service cultural resources staff, and, when appropriate, the State Historic Preservation Office (SHPO), federally recognized tribes, and interested parties.
- *Wildlife Observation and Photography* Provide opportunities for wildlife observation and photography along public use trails.
- *Interpretation* Maintain the existing interpretive signage on the Refuge.
- *Environmental Education* Support the use of the Refuge as an outdoor classroom.
- Trail Use Allow trail use on the Refuge that is compatible with Refuge purposes.
- *Research* Encourage scientific research activities that are consistent with Refuge purposes and the mission of the NWRS, and that will provide information valuable to the management of the habitats and wildlife present on the Refuge.

#### Features Common to All Action Alternatives

Features common to the three action alternatives are summarized here.

- *Species-Specific Activities* Initiate various actions intended to increase support for listed and sensitive species on the Refuge including improving the efficiency of species and habitat monitoring, adaptively managing Refuge habitats to support listed and sensitive species, and continuing to implement specific habitat restoration and enhance projects to supported listed and MSCP covered species.
- *Habitat Restoration and Enhancement* Expand habitat restoration and enhancement efforts on the Otay-Sweetwater Unit.
- *Management of the Del Mar Mesa Vernal Pool Unit* Manage the Del Mar Mesa vernal pool parcels consistent with the Carmel Mountain and Del Mar Mesa Preserves Management Plan.
- *Integrated Pest Management (IPM)* Implement an integrated approach to pest management throughout the Refuge in accordance with the proposals outlined in the

IPM Plan (Appendix D), which provides a comprehensive, environmentally sensitive approach to managing pests through a combination of strategies that pose the least hazard to people, property, and the environment.

- *Interpretation* Develop a one- to two-mile interpretive trail on the Otay-Sweetwater Unit and install new interpretive elements along the trail.
- *Environmental Education* Expand existing partnerships with nearby schools to create formal and informal environmental education programs using selected areas of the Refuge for outdoor classroom activities.
- *Establish Designated Trail Access Points* Identify and sign designated access points onto the Otay-Sweetwater Unit that will result in minimal impacts to Refuge resources and avoid illegal trespass through private landholdings by trail users attempting to access the Refuge.
- *Designated Trail System* Establish a designated trail system within the Otay-Sweetwater Unit to support trail uses that are compatible with Refuge purpose of conserving listed and sensitive species. Support a designated trail system on the Del Mar Mesa Vernal Pool Unit that is consistent with the City of San Diego's Carmel Mountain and Del Mar Mesa Preserves Management Plan.
- *Visitor Services Facilities* Provide appropriate facilities and programs (e.g., parking areas, visitor contact station, environmental education programs) to support the level of public use anticipated under the action alternatives.

## 4.4.1.2 Detailed Description of the Alternatives for the San Diego NWR

## **ALTERNATIVE A - NO ACTION**

The no action alternative (Figures 4-1 through 4-6) proposes no changes to the present wildlife and habitat management actions implemented on the Refuge and no new public uses. The proliferation of user-created trails on the Refuge, as illustrated in Figures 4-1 through 4-6, are not intended to represent officially recognized Refuge trails. In fact, only the Sweetwater Loop and River Trail and the trail to the west of Par Four Drive have been officially recognized as trails on the Refuge. All other trails and pathways are subject to closure or realignment under this alternative as deemed necessary to achieve Refuge purposes.

## A. Wildlife and Habitat Management

The majority of the wildlife and habitat management and monitoring activities occurring on the Refuge are currently being implemented per the guidance provided in the Conceptual Management Plan for the San Diego NWR (USFWS 1997b) and the various planning documents associated with the San Diego MSCP (City of San Diego 1998a).

## Endangered, Threatened, and Sensitive Species Monitoring and Management

The Refuge supports or has the potential to support at least 16 species listed as endangered or threatened under the Federal Endangered Species Act (ESA), and at least one candidate species, as well as at least 35 narrowly endemic, sensitive, or regionally important species covered under the San Diego MSCP (City of San Diego 1998a). A significant amount of staff time is dedicated to the management and monitoring of these species, with the majority of this effort occurring in the Otay-Sweetwater Unit. Refuge staff coordinates with the City of San Diego and other partners on the management of listed and sensitive species on the Del Mar Mesa Preserve, which includes the 60-acre Del Mar Mesa Vernal Pool Unit of the San Diego NWR.

<u>Monitoring</u>. Monitoring and targeted studies of listed and MSCP-covered species are essential activities conducted on the Refuge. Depending upon the species or habitat, monitoring may be conducted by Refuge staff, Ecological Services staff, other Federal or State agencies (e.g., CDFW, USGS), non-profit organizations, volunteers, and/or private contractors. Species and habitat monitoring, which is conducted in accordance with established monitoring protocols when available, is implemented to assess the status and trends of conserved resources and the effectiveness of ongoing management actions.



Figure 4-1. Alternative A - McGinty Mountain Area, Otay-Sweetwater Unit



Figure 4-2. Alternative A - Las Montañas Area, Otay-Sweetwater Unit



Figure 4-3. Alternative A - Sweetwater River Area, Otay-Sweetwater Unit



Figure 4-4. Alternative A – San Miguel Mountain Area, Otay-Sweetwater Unit



Figure 4-5. Alternative A - Otay Mesa and Lakes Area, Otay-Sweetwater Unit



Figure 4-6. Alternative A - Del Mar Mesa Vernal Pool Unit

The MSCP Biological Monitoring Plan (Ogden 1996) provided initial guidance for monitoring MSCP-covered species, with much of the work focused on presence or absence surveys, particularly with respect to rare plants (McEachern et al. 2007). The intent of the initial monitoring plan was to document the conditions of the habitats and species to be conserved under the MSCP, with recommended locations for monitoring specific habitats and regional wildlife corridor linkages and a list of monitoring priorities for plant and animal species.

The specific biological monitoring objectives of the initial MSCP Biological Monitoring Plan (Ogden 1996) included:

- documenting the protection of habitats and covered species;
- documenting changes in preserved habitats or preserved populations of covered species;
- describing new biological data collected, such as new species sightings and information on wildlife movements and corridors;
- evaluating impacts of human disturbance in and adjacent to preserved lands;
- evaluating management activities and enforcement difficulties; and
- evaluating funding needs and the ability to accomplish resource management goals.

The MSCP anticipated that the monitoring program would evolve over time and provided the authority for the Wildlife Agencies, in collaboration with the Permittees, to make changes in monitoring protocols and priorities. As a result, it was determined that a new monitoring approach involving an adaptive management framework with clearly defined measurable goals and objectives should be developed.

The development and refinement of new approaches to monitoring and adaptive management was done in a stepwise progression that resulted in a series of documents being produced with each document building on the previous ones. These documents are available for review on the San Diego Management and Monitoring Program website (http://www.sdmmp.com/monitoring/ Monitoring\_MainPage.aspx) and/or the CDFW Natural Community Conservation Planning website (http://www.dfg.ca.gov/habcon/nccp/publications.html).

Evaluation of the MSCP monitoring protocols and the overall design of the MSCP monitoring program by the Wildlife Agencies and participating jurisdictions is ongoing. An extensive review and analysis of the San Diego MSCP Biological Monitoring Plan is underway in an effort to improve the scientific robustness of the monitoring program and enhance the ability of the participating jurisdictions and agencies to determine if the biological goals of the MSCP are being met (Hierl et al. 2005). Through this review process, various program topics have been addressed including:

- assessing the original biological monitoring plan for the San Diego MSCP (Hierl et al. 2005);
- developing a revised rare plant monitoring framework (McEachern et al. 2007);
- prioritizing species for monitoring (Regan et al. 2006);
- developing a step-by-step procedure for developing effective monitoring programs in an adaptive management context (Atkinson et al. 2004);
- grouping and prioritizing natural communities for monitoring (Franklin et al. 2006); and

• developing conceptual models to improve the biological monitoring plan (Hierl et al. 2007).

Refuge staff is actively participating in the development and review of updated monitoring programs and protocols, which when completed will likely result in changes to current monitoring procedures conducted on the Refuge.

Researchers at San Diego State University, under the direction of Dr. Douglas Deutschman, have also undertaken a research project to refine the MSCP vegetation community monitoring program. The project uses a variance decomposition approach to examine the effects of number of sites, number and size of plots, sampling frequency, sampling methodology, and observer experience on accuracy, precision, and cost of estimating several variables associated with the structure and floristic composition of the chaparral and coastal sage scrub vegetation communities. The goal is to arrive at a monitoring program that will not only enable biologists to assess whether: 1) the MSCP is conserving the diversity and function of the ecosystem; and 2) the specific species covered by the MSCP are being conserved adequately to meet the take authorization issuance standards of the ESA and the NCCP, but can also achieve these goals at the lowest cost.

This research program is continuing, with the expectation of completion in 2014. San Diego NWR personnel have worked with the research team as they have shared their preliminary results with the community of MSCP biologists. We expect to implement the MSCP-wide monitoring program that results from this research on refuge lands in cooperation with other agencies and land managers in the MSCP preserve system, as Refuge staffing and funding allow.

Current monitoring efforts include for some species adhering to the protocols issued by the Service as part of the ESA Section 10(a)(1)(A) permit that was prepared in association with the approval of the San Diego MSCP, while monitoring other species using updated methods developed cooperatively with the Wildlife Agencies and jurisdictions participating in the MSCP. Still other species on the Refuge are monitored opportunistically, which may be of limited utility in rigorous quantitative estimation of population trends over time. However, such surveys are likely to contribute valuable information on presence or absence, seasonality, distribution, and threats to population persistence.

Monitoring efforts for MSCP covered species have been prioritized according to Regan et al. (2006) who used a step-down approach for prioritizing MSCP covered species, categorizing species based on a number of factors including their at-risk classification (e.g., NatureServe global and state rankings, IUCN ranks, California Native Plant Society rankings). The species were classified as Risk Group 1 (most endangered), Risk Group 2 (moderately endangered), and Risk Group 3 (less endangered). Next, the threats and/or risk factors facing the species were identified. Finally, the habitat associations used by the species and their general spatial distribution in the County (e.g., widespread but sparse) were described. Species in Risk Group 1 are considered the highest priority for monitoring.

Monitoring protocols for rare plant species continue to be refined. In 2011, Tracey et al. prepared a San Diego Rare Plant Monitoring Plan for the monitoring of rare plants in the San Diego region to establish regulatory compliance with the adopted regional habitat conservation plans and to inform land managers on the status of rare plants for potential management efforts. The plan assumes annual modifications as additional species
protocols are added. The results of monitoring efforts assist in refining adaptive management models, monitoring objectives, and management objectives, as well as further define the general distribution of the species. While it is the intent of the plan to apply the protocols toward a regional effort, the protocols are flexible enough to be used by individual land managers who wish to contribute information to the regional effort (Tracey et al. 2011).

Table 4-1 identifies the MSCP covered species that occur on or for which there is suitable habitat included within the San Diego NWR, the risk group for each species, and the monitoring methods, if any, currently (as of 2013) being implemented on the Refuge for each species listed. (Note that the monitoring methods presented here have since been updated, refer to Chapter 3 of the Final CCP for more information.)

On the Otay-Sweetwater Unit, targeted surveys for Quino checkerspot butterfly are conducted in areas of known historical occurrences and other sites with appropriate habitat, along with opportunistic surveys to determine if Hermes copper butterfly is present in appropriate habitat areas on the Refuge. Known occurrences of San Diego thornmint on McGinty Mountain, as well as opportunistic inspections of the Jamacha and Trimark parcels and the Mother Miguel grassland, are also monitored to determine listed and sensitive species presence or absence.

Table 4-1     Current Monitoring Methodology for MSCP-Covered Species on the San Diego NWR			
Species	Risk Group (Regan et al. 2006)	Monitoring Methodology*	
San Diego thornmint (Acanthomintha ilicifolia)	1	Monitored at two permanent plots using method of McEachern et al. (2007)	
San Diego ambrosia <i>(Ambrosia pumila)</i>	1	Known locations are mapped approximately every five years	
California Orcutt grass (Orcuttia californica)	1	Pool-specific presence/absence surveys; annual categorical cover estimate at Shinohara vernal pool restoration site	
Dehesa beargrass (Nolina interrata)	1	Cooperating with CBI in an investigation of this species' abundance, distribution, and ecology	
Del Mar manzanita (Arctostaphylos glandulosa var. crassifolia)	1	Monitoring protocols currently being developed	
Encinitas baccharis <i>(Baccharis vanessae)</i>	1	Not currently known to occur on the Refuge	
Dunn's mariposa lily (Calochortus dunnii)	2	Monitored at one permanent plot using methods of McEachern et al. (2007)	
Gander's butterweed (Senecio gander)	2	Presence/absence noted during habitat-based monitoring; protocols currently under development	
Gander's pitcher-sage (Lepechinia gander)	2	Presence/absence noted during habitat-based monitoring; protocols currently under development	
Otay manzanita (Arctostaphylos otayensis)	2	Presence/absence noted during habitat-based monitoring; protocols currently under development	
Otay mesa mint (Pogogyne nudiuscula)	1	Pool-specific presence/absence surveys; annual categorical cover estimate at Shinohara vernal pool restoration site	

Table 4-1     Current Monitoring Methodology for MSCP-Covered Species on the San Diego NWR			
Species	Risk Group (Regan et al. 2006)	Monitoring Methodology*	
Otay tarplant (Deinandra conjugens)	1	Mapped annually at Rancho San Miguel Otay tarplant preserve, Shinohara vernal pool restoration site, Mother Miguel grassland, Jamacha parcel, and Spring Valley fuel break	
Palmer's goldenbush <i>(Ericameria palmeri)</i>	2	Of limited occurrence; future monitoring per McEachern et al. (2007), as appropriate	
Parry's tetracoccus (Tetracoccus dioicus)	3	Presence/absence noted during habitat-based monitoring; protocols currently under development	
San Diego barrel cactus (Ferocactus viridescens)	3	Monitored at two permanent plots using method of McEachern et al. (2007)	
San Diego goldenstar (Muilla clevelandii)	2	Of limited occurrence; future monitoring per McEachern et al. (2007), as appropriate	
San Diego button celery (Eryngium aristulatum var. parishii)	2	Pool-specific presence/absence surveys; annual categorical cover estimate at Shinohara vernal pool restoration site	
San Diego mesa mint (Pogogyne abramsii)	2	Monitoring to be implemented by Del Mar Mesa Preserve partners	
San Miguel savory <i>(Satureja chandleri)</i>	3	Monitoring protocols currently under development	
Snake cholla (Cylindropuntia californica)	2	Of limited occurrence; future monitoring per McEachern et al. (2007), as appropriate	
Spreading navarretia (Navarretia fossalis)	1	Pool-specific presence/absence surveys; annual categorical cover estimate of Shinohara vernal pools	
Tecate cypress <i>(Cupressus forbesi)</i>	1	Not currently monitored; only small portion of species' distribution is on refuge	
Variegated dudleya (Dudleya variegata)	2	Monitored at one permanent plot using method of McEachern et al. (2007)	
Peregrine falcon (Falco peregrinus)	Excluded, no known threats	Not currently monitored	
Burrowing owl (Athene cunicularia)	1	Artificial nest boxes at Shinohara and Mother Miguel grassland monitored monthly; juveniles banded and color-marked to monitor movements	
California gnatcatcher (Polioptila californica)	2	Refuge is included in MSCP-wide monitoring conducted by USFWS, using methodology developed by Winchell and Doherty (2010)	
Rufous-crowned sparrow (Aimophila ruficeps)	3	Not currently monitored	
Canada goose (Branta canadensis)	Excluded, no known threats	Not currently monitored	
Cactus wren (Campylorhynchus brunneicapillus)	1	Focused surveys of limited suitable habitat conducted opportunistically	
Cooper's hawk (Accipiter cooperii)	3	Not currently monitored	
Ferruginous hawk (Buteo regalis)	3	Not currently monitored	

Table 4-1 Current Monitoring Methodology for MSCP-Covered Species on the San Diego NWR			
Species	Risk Group (Regan et al. 2006)	Monitoring Methodology*	
Golden eagle (Aquila chrysaetos)	2	Focused surveys of limited suitable habitat conducted opportunistically	
Least Bell's vireo (Vireo bellii pusillus)	2	Focused surveys of limited suitable habitat conducted annually	
Northern harrier (Circus cyaneus)	3	Focused surveys of limited suitable habitat conducted opportunistically	
Southwestern willow flycatcher <i>(Empidonax traillii extimus)</i>	1	Focused surveys of limited suitable habitat conducted opportunistically	
Tricolored blackbird (Agelaius tricolor)	1	Focused surveys of limited suitable habitat conducted opportunistically	
Western bluebird (Sialia mexicana)	Excluded, no known threats	Focused surveys of limited artificial nest boxes conducted opportunistically	
Riverside fairy shrimp (Streptocephalus woottoni)	1	Not currently monitored	
San Diego fairy shrimp (Branchinecta sandiegonensis)	1	Annual focused surveys of suitable habitat; Shinohara vernal pools visually inspected annually	
Thorne's hairstreak butterfly ( <i>Mitoura thornei</i> )	1	Not currently monitored	
American badger <i>(Taxidea taxus)</i>	3	Badger surveys were conducted in western San Diego County by Brehme et al. (2012)	
Mountain lion <i>(Felis concolor)</i>	3	Cooperating with UC Davis Wildlife Health Center and Western Tracking Institute to monitor species' occurrence and movements in rural western San Diego County	
Southern mule deer (Odocoileus hemionus fulginosus)	3	Not currently monitored; surveys to estimate relative abundance of deer populations on the Refuge were conducted by Dudek in 2008	
Arroyo toad (Anaxyrus californicus)	2	Focused surveys of limited suitable habitat conducted opportunistically. Protocol surveys of suitable habitat in Sweetwater River conducted from 1997 through 2005 (Madden- Smith, et al.), and in 2010 (RECON)	
Orange-throated whiptail (Cnemidophorus hyperythrus beldingi)	3	Not currently monitored; past monitoring of herpetofauna by USGS for the MSCP (2001 Rochester et al.), and as part of investigations of the effects of wildfire on the herpetofauna community in coastal sage (Rochester et al. 2008)	
San Diego horned lizard (Phrynosoma coronatum blainvillii)	3	Not currently monitored; past monitoring of herpetofauna by USGS for the MSCP (2001 Rochester et al.), and as part of investigations of the effects of wildfire on the herpetofauna community in coastal sage (Rochester et al. 2008)	

Table 4-1 Current Monitoring Methodology for MSCP-Covered Species on the San Diego NWR		
Species	Risk Group (Regan et al. 2006)	Monitoring Methodology*
Southwestern pond turtle (Clemmys marmorata pallida)	3	Focused surveys of suitable habitat conducted opportunistically. In 2002 and 2003, USGS conducted surveys MSCP-wide, including sites along the Sweetwater River (Madden-Smith et al. 2005); after a sighting in April 2010, USGS surveyed Steele Canyon Creek but had no sightings

Other monitoring-related activities currently occurring on the Refuge include:

- conducting qualitative assessments of the status and threats to the naturally occurring and restored populations of San Diego ambrosia on the Refuge;
- supporting the Center for Natural Lands Management in their research of effects on San Diego ambrosia of physical and chemical weed control techniques, as the results of this research can benefit future management practices for this species;
- surveying for the presence of Quino checkerspot butterfly in areas where protocol surveys are not currently being conducted, particularly in areas of known historical occurrences, as well as where appropriate habitat has been identified;
- monitoring San Diego barrel cactus at established plots (Otay-Sweetwater Unit);
- conducting annual inventories of the plant and animal species present in the Refuge's Otay-Sweetwater vernal pools;
- inventorying and repairing or replacing physical structures such as burrowing owl boxes and bluebird nesting boxes installed on the Otay-Sweetwater Unit in previous years; and
- monitoring the cactus wren habitat restoration sites on the Otay-Sweetwater Unit.

The MSCP also addresses the need for wildlife corridor monitoring. The plan identified four regional habitat linkages on the Refuge: the portion of the Sweetwater River that extends from the McGinty Mountain area to the Sweetwater River area (Rancho San Diego); habitat connections between San Miguel Mountain, Proctor Valley, and the Jamul Mountains; the lands connecting the Jamul Mountains and the southeast side of Lower Otay Lake; and Little Cedar Canyon, which provides a linkage between the Jamul Mountains and the San Ysidro Mountains. The MSCP proposed that the presence of focal species within these linkage areas be determined through the detection of animal sign (tracks and scat) and visual sightings.

In 2011, the San Diego Tracking Team established tracking transects in the Las Montañas management area of the Refuge to obtain data that will improve our understanding of how and to what extent this area functions as a wildlife corridor. Also in 2011, the San Diego Management and Monitoring Group issued a Connectivity Monitoring Strategic Plan for the San Diego Preserve System (the plan and additional details are available at http://www.sdmmp.com/monitoring/ connectivity\_monitoring.aspx). This strategic plan provides direction for connectivity monitoring that will facilitate an assessment of how the goals of ensuring the persistence of species across the MSCP preserve system and preserving ecosystem functions across the landscape are being achieved.

Herpetofaunal (i.e., reptiles, amphibians) monitoring on the Refuge began in 1995 as part of a larger USGS and San Diego State University project (Rochester et al. 2001) involving the autecological study of the herpetofauna of San Diego County. The goal of the study was to identify the reptile and amphibian species present, when they are active, and in which habitats they occur. The Refuge study site, where 10 pit-trap arrays were constructed, is located along both sides of the Sweetwater River just to the south of Highway 94. The monitoring effort as of 2001 involved 295 sampling days in which 30 species were identified.

<u>Management</u>. Since the Refuge was established in 1996, more than 15 projects, many of which are described here under Past Management Actions, have been initiated on the Otay-Sweetwater Unit to restore and/or enhance habitat for the primary purpose of supporting listed and MSCP-covered species. Other ongoing projects that support listed and sensitive species in the Otay-Sweetwater Unit include:

- Control of invasive plant species in recent burn areas and in restored/enhanced areas (e.g., cactus wren habitat restoration areas, vernal pool restoration on the Shinohara site, and Otay tarplant habitat enhancement on the Jamacha parcel);
- Installing fencing and/or signage to reduce disturbance and minimize direct impacts related to unauthorized off-trail activities;
- Documenting reintroduction, enhancement, and restoration project results to determine how best to design and implement future projects to maximize benefits to listed species;
- Coordinating with other agencies and organizations to investigate the potential effects to native species, particularly listed plant species, of various types of herbicides used to control non-native grasses and other invasive plants in natural areas; and
- Repairing or replacing physical structures such as burrowing owl boxes and bluebird nesting boxes.

No specific projects related to listed or sensitive species are currently being implemented by San Diego NWR on the Del Mar Mesa Vernal Pool Unit. While some trash removal and fencing to limit illegal trail use has been conducted, the primary Refuge activities for this area include general oversight, periodic monitoring of habitat and species, and coordination with other agencies that manage wildlife habitat on Del Mar Mesa to develop and implement a Del Mar Mesa Preserve Management Plan.

# Habitat Restoration and Enhancement Activities

In addition to habitat restoration and enhancement projects implemented for the primary purpose of supporting listed species, several other restoration and enhancement projects have also been implemented on the Refuge to restore or improve habitat quality for a range of plant and wildlife species. These activities include controlling invasive non-native plants in recent burn areas; controlling invasive non-native grasses and forbs in other disturbed areas; removing non-native shrubs and trees from riparian areas; planting and maintaining oak seedlings in appropriate habitat throughout the San Diego NWR; and maintaining and monitoring restored cactus patches in recent burn areas.

### Habitat and Wildlife Protection

Various management actions are currently implemented on the Refuge to minimize the potential for disturbance to plants and wildlife and to reduce adverse effects to habitat and water quality from erosion, illegal encampments, and dumping. These management

actions include the installation and maintenance of fencing and/or signage intended to discourage visitors from off-trail activity, as well as general site surveillance, and, when necessary, the issuance of citations by Federal Wildlife Officers. Gates, fencing, and/or signage are also used to delineate those areas of the Refuge that are closed to public use. Control of illegal motorized vehicle activity on the Refuge involves the use of gates, other types of barriers, and/or signs, as well as interagency patrol of vulnerable areas. The Refuge is also partnering with adjacent landowners to find mutually agreeable ways of preventing motorized access onto the Refuge through these adjacent parcels. Abandoned mine shafts are closed to human access using wildlife-friendly gates that allow bats and smaller wildlife to continue to use the shafts as habitat. The San Diego NWR fire crew assists in minimizing adverse effects to Refuge resources through the control of wildland fires both on and off the Refuge.

#### **General Site Management**

General site management includes activities such as invasive species control; fence and sign maintenance around trails and trail parking areas; working with partners to remove homeless encampments; and working with volunteers to implement small habitat restoration projects. Refuge staff will also continue to work with the appropriate agencies and Service personnel to secure existing mine shafts discovered on the Refuge.

Refuge staff will also continue to cooperate with and support partner agencies, organizations, and/or contractors in the implementation of region-wide projects that not only benefit the overall goals of multiple species conservation, but also the long-term management of the plant and wildlife resources on the Refuge. One such project involved the creation of a fine-scale vegetation map for approximately 450,000 acres of conserved lands in western San Diego County, including conserved lands within the boundaries of the San Diego NWR. This project, which began in 2009, was conducted in accordance with CDFW and national standards for field data collection, vegetation mapping will assist the Refuge in the planning and implementation of various projects, including habitat monitoring and restoration or enhancement. The Refuge will also continue to provide logistical and permitting support for research projects that have the potential to benefit Refuge resources. Such projects include the San Diego Natural History Museum's Plant Atlas project and several research projects being conducted by graduate student researchers from local and out-of-state universities.

The invasive species control currently implemented on the Refuge employs both chemical and physical/mechanical control methods. Some control is implemented by Refuge staff, while other control may be performed by contractors. Herbicides, which are chemicals that kill or injure plants, are widely used for controlling weeds and are generally considered an effective eradication tool, particularly when the size of the invasive plant infestation and/or the characteristics of the invasive plant species cannot be controlled solely by physical or mechanical methods. Herbicides are generally classified by their mode of action. Some include growth regulators, amino acid inhibitors, grass meristem destroyers, cell membrane destroyers, root and shoot inhibitors, and amino acid derivatives, all of which interfere with plant metabolism in a variety of ways (Bussan and Dyer 1999).

Herbicides can be categorized as selective or non-selective. Selective herbicides kill only a specific type of plant. Some herbicides used for noxious weed control are selective for broad-leaved plants, leaving grasses unaffected. Other herbicides, such as glyphosate, are

non-selective, affecting much of the vegetation; therefore, care is required when using this product around desirable, non-target plants (Rees et al. 1996).

All herbicides used on the Refuge must be reviewed and approved as part of the Service's Pesticide Use Proposal System (PUPS). The PUPS identifies specific pesticides approved for use on each Refuge and includes details on target pests, products applied, application dates and rates, method of use, number of applications, site description, sensitive habitats, and best management practices (BMPs) to avoid impacts to sensitive resources. The herbicides currently used on the Refuge are presented in Table 4-2. This table also provides information regarding target pests and application methods. When controlling invasive plants using chemical methods, Refuge staff applies herbicides to target plants or cut stumps by using spray bottles, backpack sprayers, or a tank and hose mounted on a gator or other type of all-terrain vehicle (ATV).

A variety of mechanical methods are used to remove invasive plants including pulling or digging the invasive plants out by hand, using a nylon filament trimmer (weed "whacker") or chain saw, and uprooting the plant with a "weed wrench." As part of controlling invasive weedy species, some areas on the Refuge have been mechanically de-thatched and the dead herbaceous material removed to facilitate subsequent herbicide treatment.

## Managing Habitat and Species Conservation Banks on the Refuge

During the initial years of Refuge establishment, the formation of conservation or mitigation banks was one tool used to acquire lands for incorporation into the Refuge. Three areas of the Refuge were acquired in association with the establishment of conservation banks (i.e., Rancho San Diego, San Miguel, and Singing Hills); in all three cases, the Refuge was identified as the party responsible for management and monitoring of sensitive habitats and covered species on the bank properties. The agreements for establishing the banks also required the development of management plans for those areas incorporated into the banks. The final CCP serves as the management plan for these conservation banks, and the Carlsbad Fish and Wildlife Office is responsible for maintaining the accounting records for each bank. The three banks included within the Refuge are described here.

<u>Rancho San Diego Mitigation Bank</u>. This mitigation bank was established in 1996 to offset impacts to sensitive habitats and species from transportation and other government sponsored projects, as well as development projects by others, occurring in western San Diego County below the 2000-foot elevation. Under this agreement, the 1,832 acres of land included within the bank were acquired by the Service to be managed as part of the National Wildlife Refuge System.

Table 4-2   Pesticides Currently Used on the San Diego NWR					
Active Ingredient	Common Product Names	Target Pests	Treatment Area Location/Size	Application Method Application Rate Application Equipment	Applications per year
<b>Glyphosate</b> (formulated as a water-soluble liquid containing surfactant)	RoundUp Pro Prosecutor	Non-native, invasive weeds/grasses (post-emergent)	Shinohara parcel (30 acres), Jamacha parcel (30 acres)	Ground spot treatment 0.87 ounces/acre Hand- held equipment	1 application per year at each site
<b>Glyphosate</b> (formulated as a water-soluble liquid for mixing with water or nonionic surfactant)	Rodeo Aquamaster	Non-native, invasive broadleaf weeds and shrubs in wetland areas (post-emergent)	Shinohara parcel (30 acres)	Ground spot treatment 0.65 ounces/acre Hand- held equipment	1 application per year
Fluazifop-P-butyl	Fusilade DX Fusilade II	Non-native annual grasses, filaree, tocolote (post- emergent)	Jamacha parcel (30 acres) and Par Four parcel (0.57 acre)	Broadcast 0.188 gallons/acre Boom	1 application per season
Chlorsulfuron	Telar XP	Onion weed (pre-emergent or early post-emergent)	Jamacha parcel (5 acres)	Ground spot treatment 0.80 ounces/acre Hand- held equipment	1 application per year

The owners of the bank include the San Diego Association of Governments (SANDAG), Caltrans, and the County of San Diego. Percentage of credit available to each owner is allocated as follows: SANDAG 53 percent, Caltrans 23 percent, and the County of San Diego 24 percent. The bank permits the use of existing vegetation communities as mitigation for habitat impacts and includes a wetland mitigation component that permits the creation of wetland habitat, provided the habitat to be impacted approximates the existing wetland communities on the Bank.

Under the authorizing agreement, the Service was given the responsibility for preparing a management plan for the lands within the bank that addresses species monitoring in accordance with the requirements of the MSCP, habitat restoration, fire management, control of invasive plant species, and provisions for compatible public use. No endowment was provided to assist in the management of the lands within this conservation bank. As of 2013, the majority of the credits available from this bank had been expended.

San Miguel Conservation Bank. Established in 1997, the San Miguel Conservation Bank includes 1,186 acres on the western slopes of San Miguel and Mother Miguel Mountains. The lands within the bank support a variety of native plant communities, including "Very High Quality" (as defined by the MSCP) coastal sage scrub habitat, as well as lesser acreages of other habitats, such as chamise and mixed chaparral, perennial grasslands, riparian scrub, and other wetlands, all of which promote the multi-species values of the property. The desire to preserve these high habitat quality lands coupled with the landowner's need to mitigate for impacts to sensitive species on adjacent lands led to the formation of the conservation bank. The size of the bank was large enough to offset impacts associated with the development of the lands to the south of the bank and to provide additional credits that could be sold to third party purchasers in need of off-site mitigation. The original conservation bank owner, Emerald Properties Corporation, sold the remaining credits in the bank to the San Diego County Water Authority in 2003. The Water Authority plans to use the remaining credits to mitigate for impacts to species covered by the San Diego County Water Authority Subregional Natural Community Conservation Plan/Habitat Conservation Plan (October 2010).

An endowment was established for San Miguel Conservation Bank that required an initial payment of \$100,000 and \$500 for each additional credit sold after the first 140 credits are sold. As of 2012, the endowment totaled \$623,000.

Singing Hills Conservation Bank. Established in 1998, the Singing Hills Conservation Bank is located on a 79-acre property located on the north side of Dehesa Road, just to the east of the intersection of Dehesa Road and Willow Glen Drive. The County of San Diego is the owner of this bank, which included 69.7 credits when established. As of 2013, only 0.69 credits have been used. The primary intent of this conservation bank was to provide mitigation for County of San Diego Department of Public Works projects; however, the county does have the ability to permit the use of the existing credits for other projects. The credits serve as mitigation on a one-acre for one-acre credit basis for adverse impacts to like habitat within the western portion of San Diego County below the 2,000-foot elevation. As with the other two banks, the Service, as the owner of the property, is responsible for managing and maintaining the property within the bank in perpetuity. Management requirements include the development of a habitat management plan and consideration of monitoring, habitat and species recovery, fire management, and appropriate public use activities. An endowment fund of \$20,910 was created to assist with conservation and restoration of these lands.

#### B. Public Use

### Public Access

When the Refuge was established, public access on the Refuge was officially only open for use of the county's Sweetwater Loop and River Trail and a trail within the northern portion of the Sweetwater River area that was proposed to accommodate equestrians from Bright Valley Farms. Today, numerous other trails are present most of which have been created by users or follow old access roads and existing utility easements. Users have also created pathways onto the Refuge through adjacent private properties. These unofficial trails and access paths represent more than 210 miles of disturbance within the Otay-Sweetwater Unit.

Under Alternative A, official access to the trails present on the Refuge would continue to be limited to a few designated entry points. For instance, in the McGinty Mountain area, trail access is available from a parking area located along the north side of Jamul Drive, approximately one-half mile west of Lyons Valley Road. There are also existing easements to the north of Jamul Drive. Another less frequently used access point is an area located immediately to the south of Model A Ford Lane along Sloane Canyon Road near the northeastern portion of the Refuge.

No authorized access points are currently available within the Las Montañas area; however, the public appears to be entering this part of the Refuge from several locations, including from points off Highway 94, locations south of Jamul Drive, Vista Sage Lane, and through privately held parcels in the Vista Sage and Echo Valley areas.

The Sweetwater River area is currently being accessed from a variety of locations, such as public trails, public roads, and privately owned lands. Appropriate access to this area can be gained by using the county's Sweetwater Loop and River Trail, which extends north along the Sweetwater River from the Refuge's San Miguel Mountain area and from a small county-maintained parking area located to the south of Highway 94 at Singer Lane.

Although no parking area has been established at Par Four Drive, a kiosk is maintained here on Refuge property that establishes an official entry point onto the Refuge from this public street. Equestrians from Bright Valley Farms, located along Highway 94 just to the west of Steele Canyon High School, also gain access to the Refuge along a trail that connects the horse stable to Refuge property near the Sweetwater River. Unauthorized access to this portion of the Refuge occurs along Jamul Drive and Steele Canyon Road in the northeast; along Jamacha Boulevard, Trace Road, Doubletree Road, and Millar Ranch Road near the center of this area; and through Sweetwater Authority property and a usercreated extension of a trail system established for the Pointe development in the south.

Access onto the San Miguel Mountain area appears to be taken from a variety of locations, including via the official Sweetwater Loop and River Trail. Parking and staging areas are available for this trail at the nearby County of San Diego Sweetwater Summit

Campground site. There also appears to be unauthorized access occurring off Millar Ranch Road, Proctor Valley Road, and through San Diego Gas & Electric (SDG&E) property, a private golf course, the Rolling Hills Ranch housing development, and other privately-held parcels to the south.

All areas of Refuge land included within the Otay Mesa and Lakes area are posted as closed to public access. Some trespass by off-road vehicles is occurring in the easternmost parcel, where an access road accommodates Refuge and Department of Homeland Security management and monitoring responsibilities.

#### Wildlife-dependent Recreational Use

Hunting and Fishing. The Refuge is not currently open to hunting or fishing.

<u>Wildlife Observation, Photography, and Interpretation</u>. Opportunities for wildlife observation and photography are available along existing trails, particularly along the Sweetwater Loop and River Trail. Interpretive signs describing the endangered and threatened plants and animals occurring in and around the Sweetwater River are provided along a segment of the Sweetwater Loop and River Trail near the old steel bridge, and additional interpretation of Refuge resources occurs as part of various Refuge events and during monthly "Hike with a Ranger" outings.

<u>Environmental Education</u>. Activities related to environmental education are currently limited to occasional visits overseen by the San Diego Refuge Complex's education program and conducted in partnership with Earth Discovery Institute. Elementary school students visit the Refuge and walk on the trails with teachers to fulfill a nature-based curriculum. The Refuge has also partnered with San Diego Audubon Society to identify and establish relationships with local elementary and high schools that may be incorporated into existing Refuge-based nature programs. The San Diego Audubon offers an experiential OutdoorExplore! nature program and a curriculum-based "Nearby Nature School Field Trips" program that could eventually be offered at the Refuge.

#### **Other Public Uses**

<u>Trails</u>. Trail use conducted solely for recreation, fitness, and commuting purposes is not considered a wildlife-dependent recreational use. However, trails do play an important role in accommodating wildlife-dependent recreational uses such as wildlife observation, photography, and resource interpretation. As described previously, a few trails were opened for public use when the Refuge was established, and an interim Compatibility Determination was prepared to address trail use at that time. There are, however, a significant number of user-created trails, maintained utility roads, and other unmaintained dirt roads that have not been officially opened or incorporated into a designated trail system (refer to Figures 4-1 through 4-6). These unofficial trails are currently used by hikers, joggers, dog-walkers, bicyclists, and equestrians. We have attempted to identify the majority of these unofficial trails, accessways, and easements in order to access the potential effects of their use on sensitive Refuge resources. There are clearly additional rogue trails and pathways being used on the Refuge that will require future analysis.

Only the county's Sweetwater Loop and River Trail, which extends along the Sweetwater River, and a trail located in the area west of Par Four Drive were considered for use when the Refuge was established. Under the no action alternative, trail use would continue more or less as it is occurring today. Trail users would be required to stay on designated trails, and entry onto the Refuge through unauthorized locations and creation of unauthorized trails would be addressed through signage, barriers, and/or law enforcement activity. With the exception of the two trails described, trails could be closed as necessary to address habitat and wildlife disturbance issues, as well as to eliminate safety or water quality issues related to severe erosion or steepness of slope. Dogs on leashes have been permitted to use the trails, but the lack of adherence to leash requirements, off-trail activity, and/or accumulation of dog waste along the trails and at trailheads could result in the prohibition of dogs from the Refuge at any time and without prior notice.

Geocaching. According to Geocaching.com, traditional geocaching is a "real-world outdoor treasure hunting game" in which players using GPS-enabled devices try to locate geocaches (containers that include a logbook and possibly a trinket, coin, or other object) that are hidden, often in outdoor locations, by other players. The GPS coordinates for a cache are provided on a website such as Geocaching.com, and players using their GPS devices seek out the hidden geocache. When a geocache is located, the player signs the logbook, when applicable, removes and replaces the object in the cache box, and returns the geocache to its original location. In general, the placement of geocaches on national wildlife refuges is prohibited. This is due in part to Federal regulations that prohibit the abandonment of property (50 CFR 27.93) on any national wildlife refuge, but also because such activity can result in disturbance to or destruction of refuge resources. As a result, all caches found on the Refuge are removed. Other forms of geocaching, such as virtual geocaching, which do not involve the placement of a physical object on the Refuge, or placement of caches by Refuge staff in association with wildlife-dependent recreational uses (e.g., environmental education, interpretation) may be permitted but must first be found appropriate and compatible with the purposes of Refuge establishment.

<u>Research</u>. The Refuge supports a variety of research and resource survey work conducted in association with graduate work at various universities and/or implemented by other public (e.g., USGS, CDFW), private, and non-profit researchers (e.g., California Native Plant Society, Center for Natural Lands Management, San Diego Natural History Museum, Conservation Biology Institute). All research conducted on the Refuge is evaluated to ensure that the work being conducted is compatible with Refuge purposes and is likely to result in benefits to Refuge management and/or Refuge resources. Work conducted on the Refuge by outside individuals, organizations, or agencies may only be conducted after a Special Use Permit (SUP) has been issued by the Refuge Manager that documents the purpose(s) of the work to be conducted and includes specific conditions intended to protect trust resources and ensure adherence to applicable Refuge regulations and policies.

#### C. Refuge Operations

#### **Staffing and Facilities**

The staff at the San Diego NWR currently includes a Refuge Manager, Refuge Operations Specialist, and Wildlife Biologist. Refuge staff shares office space with CDFW and BLM at the Rancho Jamul Ecological Reserve management offices. These offices, which are located on the old Daley Ranch off Highway 94, are approximately five miles driving distance from the nearest Refuge land.

The Refuge maintains a storage facility along the upper portion of Millar Ranch Road, a 17-stall parking area at Jamul Drive, a 170-foot-long trail bridge across the Sweetwater River, and several kiosks at entry points onto the Refuge.

## **Operational Access**

To accommodate Refuge operations, maintenance, fire management, law enforcement, and other Refuge-related purposes, a system of access routes are maintained throughout the Refuge. These access routes are gated and, depending upon where these access routes are located, are either posted as closed to all unauthorized motorized vehicles or closed to all public access.

## **Maintenance**

The primary maintenance activities on the Refuge include maintaining gates, fencing, and boundary signs; removing illegally discarded materials ranging from trash to tires to large household items; working with the county sheriff's office to remove and clean up homeless campsites; maintaining the parking area off of Jamul Drive; keeping kiosks, interpretive and informational signage, and the trail bridge at the Sweetwater River in good repair; and addressing serious trail tread issues as funding allows. The Refuge also assists in maintaining the lower portion of Millar Ranch Road and a portion of upper San Miguel Road.

## D. Fire Management

In accordance with the Fire Management Plan for the San Diego NWR (USFWS 2004a), the primary strategy for fire management on the San Diego NWR is full fire suppression. Successful fire management under this strategy involves hazardous fuels reduction, interagency fire response, and community fire preparedness. Under any of the alternatives, fire management on the Refuge would be implemented consistent with the most current Fire Management Plan for the Refuge Complex.

To assist in the protection of Refuge lands and resources, the San Diego NWR Complex (NWRC) includes a Service-funded fire crew that operates as part of the Southern California Fire Management Zone. In addition to providing fire management services to the Refuges on the San Diego NWRC (i.e., Seal Beach NWR, San Diego Bay NWR, Tijuana Slough NWR, and San Diego NWR), the Zone also provides fire management services to the Blue Ridge, Bitter Creek, Guadalupe-Nipomo Dunes, Hopper Mountain, Coachella Valley, and Sonny Bono Salton Sea NWRs. The Zone also supports interagency fire suppression and fuels management efforts in southern California. Interagency partners include San Diego Rural Fire Protection District, California Department of Forestry and Fire Protection (Cal Fire), San Miguel Consolidated Fire Protection District, the Fire Safe Council of San Diego County, the San Diego Forest Area Safety Taskforce, and the Border Agency Fire Council.

The Southern California Fire Management Zone maintains two fire crews (Engines 56 and 58) consisting of one engine captain and two crew members at Fire Station 36 in Jamul; two additional firefighters for each engine are typically hired during fire season. The Service's fire staff is collocated with the San Diego Rural Fire Protection District at Fire Station 36, which is located at 14024 Peaceful Valley Ranch Road just off Highway 94 in Jamul. The crews assist in fire protection activities on and off the Refuge, including providing interagency fire response for wildfires in the San Diego community and throughout the Southern California Fire Management Zone, as well as participating in out-of-area wildland fire assignments.

Another component of the Service's wildland fire protection strategy has been the Wildland-Urban Interface Program. The wildland-urban interface (WUI) is defined as the line, area, or zone where structures and other human developments meet or intermingle with undeveloped wildland or vegetative fuels. Most Refuge lands in San Diego County are surrounded by developed areas that meet this definition. The Refuge fire staff work closely with neighboring communities to reduce future wildfire risks to homes, businesses, and critical infrastructure. This is accomplished primarily by reducing fuels in the wildland-urban interface and collaborating with local, State, and Federal partners.

Fuels reduction in the WUI has focused on high-risk communities and adjacent natural resources that are inherently important to social and/or economic stability. These projects increase public and firefighter safety, reduce risk of unwanted fire, protect recreational opportunities on Service lands, strengthen rural economies, and increase public understanding of fire management. Fuel reduction projects funded and implemented by the Refuge have included construction and maintenance of fuel breaks, invasive species removal, and a residential chipping program. In most cases, projects are accomplished through contracts with local businesses or cooperative agreements with local fire agencies.

Through the Fire Safe Council of San Diego County and several local fire safe councils, the Service emphasizes the importance of homeowner responsibility for maintaining property according to local fire safety standards. The Refuge also assists local communities with the development of Community Wildfire Protection Plans, which prioritize local fuel reduction treatments and address ways in which a community can work to reduce structural ignitibility and keep homes safe from wildfires.

As described earlier, the WUI Program has provided funding to support a partnership with San Diego Rural Fire Protection District in which local landowners have received assistance with chipping vegetation and removing debris piles around their homes and structures. This community chipper program has treated up to 2,000 acres annually around homes in the wildland-urban interface (USFWS website, http://www.fws.gov/cno/fire/socal/, accessed on 6/13/11). Unfortunately, reduced fire program budgets in fiscal years 2012 and 2013 resulted in insufficient funds to support the community chipper program. Unfortunately, reduced fire program budgets in fiscal years 2012 and 2013 resulted in insufficient funds to support the community chipper program.

Through existing Federal, State, and local fire management partnerships in San Diego County, between 1,600 and 2,500 acres per year of San Diego NWR lands and adjacent public and private lands have been treated over the past few years to provide community protection, reduce hazardous fuels, and enhance native habitat. The activities implemented to accomplish these objectives have emphasized mechanical, chemical, and biological treatment. Mechanical treatment involves the physical removal of flammable materials such as invasive woody species growing in natural riparian zones, the thinning of native shrub vegetation in fire management zones, and chipping vegetation that has been removed from fire management zones. Chemical treatment is used to control non-native invasive plants which when present in natural areas have the potential to increase fire frequency and intensity, as well as extend the traditional fire season (Zouhar et al. 2008). Biological treatment would include seeding recent burn areas with a site-appropriate native seed mix and/or actively planting native container stock in burn areas in an effort to reduce the potential for invasion by non-native weedy species. The Service's contribution to these efforts would continue to occur per available funding under any of the management alternatives described in this document.

The actions described are implemented to reduce long-term fire suppression costs. Other actions taken by the Refuge in an attempt to reduce these costs include control of illegal motorized off-road vehicle activity, timely response to illegal dumping, and continuous surveillance for and rapid closure and cleanup of illegal encampments. All of these activities would continue under all of the alternatives addressed in this document.

Unfortunately, the potential for wildland fire increases when native vegetation is replaced with non-native woody and annual species. Excessively frequent wildland fire tends to shift vegetation communities from native shrub-dominated to non-native annual-dominated. With respect to the San Diego NWR, this is occurring in areas within and adjacent to the Refuge that are subject to repeated fires over relatively short time intervals. Approximately 4,200 acres of the Refuge's coastal sage scrub and chaparral habitats have burned in past fires, including the Harris Fire of 2007, the Millar Fire of 2007, and the Otay Fire of 2003. The Harris and Otay Fires also impacted significant areas of native vegetation outside the boundaries of the Refuge. The disturbance to habitat and soil as a result of these fires has favored the proliferation of non-native weedy species in various locations and as such has altered the natural fire regimes in these areas. A major effort has been untaken on the Refuge to reduce the extent of non-native vegetation present, but additional work remains unfunded.

Even with the steps being taken by the Refuge to reduce the effects of wildland fire on sensitive resources (e.g., removal of highly flammable invasive weeds, active community involvement in the WUI program), factors such as climatic trends and residential and commercial development within the WUI continue to have a direct effect on fire suppression costs (Strategic Issues Panel on Fire Suppression Costs 2004). Costs associated with fire suppression activities on the Refuge, as well as rehabilitation costs following recent fires, have increased in recent years on the Refuge. This is particularly true of the costs associated with the Harris Fire of 2007, which burned almost 50 percent of the Otay-Sweetwater Unit, as well as significant areas of other Federal, State, and local agency-owned lands and private properties.

Under Alternative A, fire management would be implemented consistent with the direction and procedures outlined in the currently approved Fire Management Plan for the San Diego National Wildlife Refuge Complex (USFWS 2004a). If the Fire Management Plan for the Refuge Complex is updated, any new procedures would be implemented following approval of the updated Fire Management Plan.

### E. Law Enforcement

Law enforcement on the Refuge is the primary responsibility of the Service's Federal Wildlife Officers. Currently, the Refuge Complex has one supervisory Officer and two Refuge Officers assigned to the San Diego NWR Complex. A zone Federal Wildlife Officer who serves other southern California Refuges is also stationed at the Complex. These officers enforce Federal wildlife laws on Service-owned lands within the National Wildlife Refuge System. They are charged with protecting wildlife and wildlife habitat, protecting Service facilities, and ensuring employee and visitor safety. Duties may include patrols, surveillance, investigations, apprehensions, seizures and arrests, and interaction with the judicial system. Refuge officers often work with other Federal, tribal, State and local law enforcement agencies that have overlapping jurisdiction within and adjacent to the San Diego NWR. Law enforcement activities currently occurring on the Refuge would continue under all alternatives.

## F. Land Acquisition

As described in earlier in this chapter, land acquisition efforts for this Refuge are still ongoing. Under all of the alternatives, the Service will continue to work with willing sellers to acquire additional lands within the acquisition boundary per available funding.

## G. Cultural Resources

It is the policy of the NWRS to identify, protect, and manage cultural resources located on Service lands and affected by Service undertakings for the benefit of present and future generations and in accordance with applicable laws and regulations. Cultural resources, including both archaeological and historic sites, are known to be present within the Refuge boundaries. Some of these sites have been previously evaluated to determine if they are eligible for inclusion on the National Register of Historic Places (NRHP), while others have not yet been evaluated. It is highly likely that additional sites occur on the Refuge that have not yet been detected and/or recorded. Because cultural resources are known to be present on the Refuge, any Refuge project that would result in subsurface ground disturbance or would affect a structure that is considered more than 50 years old must be reviewed by the Service's Cultural Resources Program for compliance with Section 106 of the Historic Preservation Act.

The Cultural Resources Review process involves the preparation of a Request for Cultural Resources Compliance (Appendix J), which is submitted to the Regional Cultural Resources Office for review. With information about the project location and extent of the proposed ground-disturbing activity, the Cultural Resources Office will determine the potential effect of the proposal on cultural resources. Those projects that would are not likely to affect subsurface materials could fall under the Service's programmatic agreement with the SHPO, while other projects requiring greater ground disturbance could require SHPO review and concurrence. When there is a potential for disturbance to cultural resources, consultation with federally recognized tribes, interested parties, and the SHPO is required. Review and consultation requirements are applicable to all alternatives evaluated in the CCP.

# H. Environmental Contaminants Coordination

The Service's Contaminants Program is available to assist the Refuge Manager in issues related to contaminants, as well as to conduct studies related to the effects of contamination on Refuge trust resources. The Contaminants Program at the Carlsbad Fish and Wildlife Office has assisted in addressing potential contaminants issues on the San Diego NWR on several occasions. Under all alternatives, the Refuge Manager would continue to consult with the Contaminants Program on potential contaminants issues.

# I. Volunteers and Partners

The Refuge's volunteer program has grown due to involvement by Conservation Biology Institute (CBI) in supporting a Community Outreach Coordinator for south San Diego County with funding by a grant from San Diego Foundation, TNC, and the Transnet Environmental Mitigation Program. As of 2013, the current coordinator position, fulfilled by the Earth Discovery Institute with funding from Transnet, works with the Refuge and partner agencies CDFW and BLM, and others to involve the public in stewardship projects and interpretive events. Over 200 volunteers participated in stewardship projects, such as weeding endangered plant habitat, and provided over 800 hours in labor. Over 500 people attended interpretive events, including the Refuge's 15<sup>th</sup> anniversary celebration and Hike with a Ranger events, for over 1,000 hours of participation. The South County Land Managers group is a partnership forged by the Refuge with CDFW, BLM, CBI, TNC, and other State and local conservation landowners. The group meets quarterly to discuss management and monitoring actions, share successes, and coordinate on mutual challenges. The partnership has resulted in coordinated efforts to control illegal off-road activity in Proctor Valley, development of a matrix of sensitive species distribution and threats to those populations, and a study on behalf of the managers by CBI, funded by the Environmental Mitigation Program under Transnet, to understand methods to restore habitat to benefit Quino checkerspot butterfly, Otay tarplant, and burrowing owl.

# ALTERNATIVE B – MAXIMIZE HABITAT VALUES AND SPECIES PROTECTION

Under Alternative B (Figures 4-7 through 4-12), the wildlife and habitat management activities described in Alternative A would be implemented along with additional actions intended to further restore and enhance habitat values and support listed and sensitive species.

Opportunities of wildlife-dependent recreational uses including wildlife observation, photography, environmental education, and interpretation would be provided under Alternative B. Public access on the Refuge for these and other uses would be restricted to a designated (e.g., officially recognized, signed) system of trails. All other trails, which for the most part are user- created trails, would be subject to closure and rehabilitated to support habitat and species conservation. Specific trail alignments will be defined in a step-down trail plan to be prepared upon approval of the Final CCP. No dogs would be permitted on the Otay-Sweetwater Unit under this alternative.



Figure 4-7. Alternative B - McGinty Mountain Area, Otay Sweetwater Unit



Figure 4-8. Alternative B - Las Montañas Area, Otay Sweetwater Unit



Figure 4-9. Alternative B - Sweetwater River Area, Otay Sweetwater Unit



Figure 4-10. Alternative B - San Miguel Mountain Area, Otay Sweetwater Unit



Figure 4-11. Alternative B – Otay Mesa and Lakes Area, Otay Sweetwater Unit



Figure 4-12. Alternatives B, C, and D - Del Mar Mesa Vernal Pool Unit

Public uses on the Del Mar Mesa Vernal Pool Unit would be permitted in accordance with the City of San Diego's Carmel Mountain and Del Mar Mesa Preserves Management Plan, and such uses would be limited to the designated trail system on the Refuge. Access to areas beyond the limits of the designated trails would be prohibited.

## A. Wildlife and Habitat Management

In addition to continuing to implement the wildlife and habitat management actions described under Alternative A, Alternative B proposes to expand wildlife and habitat management activities to maximize habitat values and species protection on the Refuge to the extent feasible based on available funding. The majority of the actions proposed under this alternative would be implemented on the Otay-Sweetwater Unit. The design and implementation of management actions on the Refuge will incorporate regional management strategies and adapt management practices as appropriate in response to new information and site-specific conditions.

Management of listed and MSCP-covered species will continue to evolve based on the outcomes of research efforts related to species and habitat management that are ongoing in western San Diego County. A Management Strategic Plan (MSP) (San Diego Management and Monitoring Program 2013) was recently prepared for the San Diego Association of Governments (SANDAG) that addresses a comprehensive approach for managing multiple plant and animal species within western San Diego County.

The MSP presents biological goals and measureable objectives that are intended to facilitate a coordinated effort in implementing management actions. The MSP categorizes and prioritizes species and vegetation communities, identifies geographic locations for management actions, provides specific timelines for implementation, and establishes a process for coordination and implementation. As a living document, the MSP will be revised over time to incorporate new information or to address changes in current conditions (e.g., wildfire). Refuge staff have and will continue to actively participate in the development of this effort, as well as the other regional efforts related to the adaptive management and monitoring of species and habitats within the MSCP preserve areas.

The Del Mar Mesa Vernal Pool Unit requires less active management than does the Otay-Sweetwater Unit due in part to the smaller size of the area, the nature of the habitats present in the area, and the potential for cooperative management opportunities among various agencies. The Service, City of San Diego, County of San Diego, and CDFW all own and manage property on Del Mar Mesa.

In 2001, the City of San Diego, recognizing the need to coordinate the resource management efforts and public uses occurring in this area, initiated the development of a management plan for approximately 980 acres on Del Mar Mesa. This management area is referred to as the Del Mar Mesa Preserve. The City of San Diego, through a cooperative effort with the other agency landowners in the preserve, has produced the draft Carmel Mountain and Del Mar Mesa Preserves Management Plan (City of San Diego 2011), that when approved by the San Diego City Council will provide coordinated management direction for the entire Del Mar Mesa Preserve. Upon approval of the plan, the City of San Diego, County of San Diego, CDFW, and the Service are expected to enter into a Memorandum of Agreement (MOA) that will define by what mechanism the Del Mar Mesa Preserve will be managed. Although the logistics of day-to-day management responsibility for the lands within the preserve are still being considered, the draft management plan suggests several options for preserve management. These options, outlined in the draft plan, include hiring an individual with biological resource management experience to oversee management activities; hiring a private or non-profit resource management organization to oversee management activities; deferring to the City of San Diego to act as the land manager; or having each landowner agency responsible for implementing the management strategies on their own properties. Under any option, a management committee comprised of representatives from each of the agency landowners would be formed to oversee preserve management.

All of the action alternatives, including Alternative B, propose to implement habitat and species management activities on the Del Mar Mesa Vernal Pool Unit in accordance with an approved Carmel Mountain and Del Mar Mesa Preserves Management Plan. The habitat and wildlife management activities addressed in the draft management plan (City of San Diego 2011) are summarized in Table 4-3. Additional information is presented in the draft management plan, which is incorporated by reference into this document and available for review at http://www.fws.gov/sandiegorefuges/new/ccp2/ccp2.htm.

#### Endangered, Threatened, and Sensitive Species Monitoring and Management

Just as described under Alternative A, monitoring and management of listed and sensitive species under Alternative B would require a significant time commitment from Refuge staff. Currently, MSCP covered species are monitored on the Otay-Sweetwater Unit by Refuge staff, other Federal, State, and local agency staff, and/or public and private researchers.

Under this alternative, monitoring efforts would be increased for Risk Group 1 MSCP covered species (Regan et al. 2006). In addition, current survey efforts for San Diego thornmint on the Otay-Sweetwater Unit would be expanded to include any areas that appear to support suitable habitat for this species. Quino checkerspot butterfly surveys would also be expanded to include all habitat with the potential to support this butterfly in order to increase our understanding of the status and distribution of the Quino checkerspot butterfly within the Refuge.

Another action proposed for implementation under this alternative when funding is identified is a comprehensive Refuge-wide (Otay-Sweetwater and Del Mar Mesa Vernal Pool Units) survey to identify, map, and assess existing populations of sensitive plant species and establish baseline species data for the vernal pools present on each Unit.

Under Alternative B, the following species-specific activities would be implemented per available funding on the Otay-Sweetwater Unit:

• Least Bell's Vireo – Evaluate data from ongoing monitoring efforts to identify any adverse population trends. If populations appear to be declining, investigate potential causes and implement those management actions that, if taken, could reverse these trends. Such management actions could include mosquito control to address West Nile virus (which would first require the preparation of a Mosquito Management Plan and accompanying Compatibility Determination), Argentine ant control, nest predator control, cowbird control to reduce nest parasitism, habitat manipulation, and/or permanent or seasonal trail closures or trail relocations to reduce disturbance during the nesting season.

Table 4-3
Species and Habitat Management Actions <del>Proposed f</del> or the Del Mar Mesa Vernal Pool Unit
per the <del>draft</del> Carmel Mountain and Del Mar Mesa Preserves Resource Management Plan (City of San Diego 201 <u>5</u> 1) <sup>‡</sup>

Management Topic	Management Activities
MSCP Species Monitoring and Me	anagement
Monitoring Protocols for Rare Plants	Monitor rare plants in accordance with the most current rare plant monitoring protocols adopted for the region.
Del Mar Manzanita	Survey for and map any newly discovered locations of this species; control invasive weeds as necessary to reduce fuel sources near the ground, thereby reducing the effects of fire on seeds and plant crowns; control invasive weeds to improve the potential for expansion of the population beyond the limits of the current population; and implement measures to reduce the potential for trampling.
Orcutt's Brodiaea	Reduce edge effects along trails and roads through fencing and/or signage, monitor the effectiveness of these measures, and implement additional measures such as enforcement if necessary to protect the species; and implement weed control where necessary to restore habitat quality.
San Diego Button Celery	Reduce edge effects along trails and roads through fencing and/or signage or realign the trail or roads to avoid impacts; monitor the effectiveness of these measures and implement additional measures such as enforcement, if necessary, to protect the species; control invasive species as necessary; and restore and/or enhance vernal pool habitat (e.g., restore the natural hydrology to disturbed pools, remove exotic plants, and reintroduce plant propagules) to support this species as funding becomes available.
Coast Barrel Cactus	Reduce edge effects along trails and roads through fencing and/or signage or realign the trail or roads to avoid impacts; monitor the effectiveness of these measures and implement additional measures such as enforcement, if necessary, to protect the species; and implement aggressive weed control to reduce the effects fire could have on these plants.
San Diego Goldenstar	Reduce edge effects along trails and roads through fencing and/or signage or realign the trail or roads to avoid impacts; monitor the effectiveness of these measures and implement additional measures such as enforcement, if necessary, to protect the species; and implement weed control as necessary.

Table 4-3
Species and Habitat Management Actions <del>Proposed f</del> or the Del Mar Mesa Vernal Pool Unit
per the <del>draft</del> Carmel Mountain and Del Mar Mesa Preserves Resource Management Plan (City of San Diego 201 <u>5</u> 1) <sup>‡</sup>

Management Topic	Management Activities
San Diego Mesa Mint	Reduce edge effects along trails and roads through fencing and/or signage or realign the trail or roads to avoid impacts; monitor the effectiveness of these measures and implement additional measures such as enforcement, if necessary, to protect the species; implement measures to maintain surrounding habitat for native pollinators, and protect and maintain vernal pool watersheds. Restore vernal pool habitat per available funding by restoring the correct hydrology, removing exotic plants, and repopulating the pools with appropriate vernal pool species.
San Diego Fairy Shrimp	Conduct surveys to determine the distribution of this species within the existing vernal pools; restore disturbed vernal pools; close or reroute roads and trails that are directly impacting vernal pool habitat; install fencing and signage around sensitive areas, and routinely patrol these areas to ensure their long-term protection.
Belding's Orange-throated Whiptail	Manage suitable habitat areas and linkages to off-site habitat area in a manner that will ensure good habitat quality (e.g., maintain woodpiles and natural leaf litter to attract native prey species, minimize the potential for edge effects, address issues related to domestic pets and invasive ants).
San Diego Horned Lizard	Maintain suitable habitat areas and linkages to off-site habitat area in a manner that will ensure good habitat quality; maintain native ant species and control Argentine ant populations; protect the species against detrimental edge effects; restore appropriate native habitat to support this species; and avoid the construction of new trails or roads in areas where this species is present.
California Gnatcatcher	Maintain or restore, per available funding, appropriate habitat to support this species; monitor nesting habitat for the presence of brown-headed cowbirds; and protect nesting areas from human and domestic animal disturbance.
Northern Harrier	Maintain appropriate foraging habitat for this species.
Southern California Rufous-crowned Sparrow	Maintain the native herbaceous component within the sparrow's habitat through prescribed burns or manual methods.
Western Bluebird	Protect occupied habitat and nesting areas from human and domestic animal disturbance.
Burrowing Owl	Monitor the preserve to identify occupied habitat areas and determine owl use and nesting success; implement predator control measures as necessary; and establish a 300-foot impact avoidance area around occupied burrows.

# Table 4-3 Species and Habitat Management Actions <del>Proposed</del> for the Del Mar Mesa Vernal Pool Unit per the <del>draft</del> Carmel Mountain and Del Mar Mesa Preserves Resource Management Plan (City of San Diego 201<u>5</u>4)<sup>‡</sup>

Management Topic	Management Activities	
Mountain Lion	Monitoring to detect presence.	
Southern Mule Deer	Monitoring to detect presence.	
Management of Sensitive Species	Not Covered by the MSCP	
Plants	For sensitive plant species not covered by the MSCP, minimize the potential for trampling by redirecting activities to less sensitive areas; and reduce impacts related to competition with exotic weeds by implementing a weed management program per available funding.	
Reptiles and Amphibians	Encourage herpetofaunal monitoring in conjunction with partners to better understand existing species diversity; and redirect recreational activity that could impact sensitive herptiles to less sensitive areas.	
Birds	Enhance open foraging areas by implementing a weed control program; confine recreational activity to the designated trail system; and restore coastal sage scrub habitat where appropriate to support Bell's sage sparrow ( <i>Amphispiza belli</i> ) and other coastal sage scrub-dependent species.	
Mammals	Maintain the integrity of natural open space areas to support the San Diego black-tailed jackrabbit.	
Other Management Actions		
Native Species Introduction	Reintroduce native species whose historic range included the project site, provided there is prior consensus among the preserve owners and the agency(ies) with jurisdiction over that species.	
Habitat Protection	Restrict activities in native habitat to: natural resource surveys and monitoring; emergency response; and hiking, biking, and equestrian activities on designated trails; and all such activities shall be conducted in a manner that avoids or minimizes impacts to native habitat and species.	
Exotic Plant Control and Reestablishment of Native Species	Implement site-specific non-native plant removal strategies, as funding is available. Focus initial efforts on habitat patches that support sensitive species. Following removal of non-native species, reestablish native species by hand seeding or propagation off-site and outplanting.	

# Table 4-3 Species and Habitat Management Actions <del>Proposed f</del>or the Del Mar Mesa Vernal Pool Unit per the <del>draft</del> Carmel Mountain and Del Mar Mesa Preserves Resource Management Plan (City of San Diego 201<u>5</u>4)<sup>‡</sup>

Management Topic	Management Activities
Native Pollinator Population Enhancement	Provide adequate habitat for pollinator assemblages (e.g., restore and maintain areas of open ground within associated native vegetation to support ground nesting bees and other invertebrates, reintroduce nectar-producing plant species with overlapping flowering periods that extend throughout the Southern California growing season).
Exotic Animal Control	Monitor for impacts related to Argentine ants and non-native mammalian predators, including uncontrolled pets, and implement appropriate controls necessary to protect sensitive species.
Cryptogamic/Microbiotic Crust Enhancement and Restoration	Promote conditions that are appropriate for the growth of cryptogamic/microbiotic crusts in part by eliminating human-related disturbance and increasing soil stability.

Source: City of San Diego (2015)

<sup>1</sup> As of December 2013, the Carmel Mountain and Del Mar Mesa Preserves Management Plan had not yet been approved by the San Diego City Council and is therefore subject to some revision. The Del Mar Mesa Vernal Pool Unit will be managed in accordance with a final preserve management plan that has been agreed upon by all partner agencies identified in the plan.

- Burrowing Owl Install additional nesting boxes in appropriate locations within the San Miguel Mountain area, and conduct annual burrowing owl breeding surveys in appropriate locations to determine where and how many owls are present on the unit during the breeding season. Release rehabilitated or relocated burrowing owls in appropriate habitat on the Refuge as opportunities occur.
- Mexican Flannelbush Establish additional populations of this species on alluvial benches of low-gradient canyons within the McGinty Mountain area of the Otay-Sweetwater Unit. Implementation of this proposal, which is consistent with the recommendations of the *Fremontodendron mexicanum* (Mexican flannelbush) 5-Year Review: Summary and Evaluation (USFWS 2009c), will be coordinate with Ecological Services and other interested Federal, State, and local agencies.
- San Diego Ambrosia Continue to support research into herbicides that can effectively control non-native grasses without adversely affecting existing populations of San Diego ambrosia. If such an herbicide is identified, use this product to control non-native grasses in areas that currently support or have the appropriate site and soil characteristics to support San Diego ambrosia and other sensitive plant species. Also, evaluate the effects of human disturbance (i.e., trampling) on this species, and implement management actions (e.g., trail fencing, trail realignments, signage) to avoid and minimize adverse effects from both on-and off-trail activity.
- Quino Checkerspot Butterfly Seek funding to implement Quino habitat restoration and/or enhancement projects that will result in improved connectivity within and between known species occurrences. Such enhancement projects could include the control of non-native invasive weeds in those areas that support potential Quino habitat. As part of the annual monitoring efforts for this species, identify and assess potential sites for population augmentation using captive bred Quino checkerspot butterflies.
- Arroyo Toad Enhance riparian areas along the Sweetwater River by removing exotic plant species and mimicking the natural disturbance regime in an effort to create shallow, sand- or gravel-bottomed sunny pools, suitable for supporting breeding arroyo toads. Concurrently, work with other property owners along the Sweetwater River to improve habitat linkages between appropriate arroyo toad habitat on the Refuge and existing populations of arroyo toads upstream of the Refuge to facilitate the natural recolonization of arroyo toads on the Refuge.
- Townsend's Big-eared Bat, Western Red Bat, and Other Bat Species Seek funding to create and install artificial bat roosting habitats that provide conditions suitable for obligate cave-roosting species, and install bat boxes in suitable locations on the Otay-Sweetwater Unit to support other bat species. When closing abandoned mine shafts, include provisions for continued bat access where appropriate.
- Golden Eagle Protect the areas surrounding the recently installed golden eagle breeding platforms from human disturbance during the nesting season.

- Southwestern Pond Turtle Work with USGS and other partners to determine if suitable habitat is present on the Refuge in the vicinity of the Sweetwater River and Steele Canyon Creek to establish populations of this species on the Refuge.
- California Red-legged Frog Working with USGS and/or other partners, initiate • actions to re-establish the California red-legged frog on the Refuge, as the Sweetwater River watershed is identified in the Recovery Plan for the California Red-legged Frog as a priority watershed for focused recovery efforts (USFWS 2002c). Re-establishment would involve a multiple step process that begins with the selection of donor populations for translocation and habitat assessment of potential translocation sites. Donor populations would be identified using DNA fingerprinting techniques for up to 30 individuals from each of 16 different populations in the Sierra San Pedro Mártir Mountains of Baja California, where frogs have been tentatively identified as appropriate genetic sources. This strategy is critical to the success of re-establishment efforts, as frogs with similar genetic backgrounds have the highest probability for survival under a given set of environmental conditions. Site assessments would also be performed to identify appropriate translocation sites. One potential site identified on the Refuge is the Mother Miguel pond located in the San Miguel Mountain area of the Otay-Sweetwater Unit.
- Coast Live Oak Periodically monitor oak stands for signs of goldspotted oak borer infestation and/or the presence of *Phytopthora ramorum*, an introduced plant pathogen responsible for sudden oak death.

Activities related to the protection and recovery of vernal pool species on the Otay-Sweetwater Unit are addressed in subsequent text under Habitat Restoration and Enhancement Activities.

Under Alternative B, the species-specific activities to be implemented per available funding on the Del Mar Mesa Vernal Pool Unit are described in Table 4-3. A proposal to seek funding to survey and map sensitive species on the Del Mar Mesa Vernal Pool Unit in an effort to establish a baseline for future monitoring and management efforts is also included in Alternative B.

# Avian Monitoring on the Otay-Sweetwater Unit

The establishment of Monitoring Avian Productivity and Survivorship (MAPS) stations on the Otay-Sweetwater Unit would provide monitoring data for listed and sensitive species, as well as other bird species present within this area. Under Alternative B, the Refuge would seek partners to develop two MAPS stations in this area—one located in oak woodland and the other within chaparral or coastal sage scrub habitat. MAPS stations are designated bird banding stations operated by Federal and State agencies, private organizations, and individual bird banders. The MAPS program, which is coordinated through the Institute for Bird Populations (IBP), uses a standardized protocol of constanteffort mist netting at over 500 stations. MAPS has proven to be a valuable tool for providing critical information relating to the ecology, conservation, and management of North American landbird populations and the factors responsible for changes in their populations.

The establishment of MAPS stations on the San Diego NWR was recommended by the Institute of Bird Populations (DeSante et al. 2004) in a study that looked at the current

status and future direction of MAPS Stations on national wildlife refuges in Washington, Oregon, California, Nevada, and Idaho. This study was conducted to enhance the usefulness of MAPS data through thoughtful selection of target species and the siting of stations on refuges that include habitats of special concern, are located in an area that would fill a gap in the existing MAPS data, and support substantial numbers of individuals of the selected target species. The study concluded that new MAPS stations in several locations throughout the region would benefit the program, including stations on the San Diego NWR, particularly in oak woodland and chaparral habitats (DeSante et al. 2004).

#### Habitat Restoration/Enhancement Activities

In addition to the habitat restoration and enhancement projects described in Alternative A, Alternative B proposes the following additional projects that would be implemented on the Otay-Sweetwater Unit over the life of the CCP per available funding:

- Vernal Pool Habitat Design and seek funding to implement proposals for restoring or enhancing vernal pools habitat where appropriate site conditions (e.g., soils, topography) are present. Also seek funding to restore native upland habitat, including coast barrel cactus and native bulb plants, around restored vernal pools on the Shinohara site, including controlling non-native weed species.
- Coastal Sage Scrub Habitat Improve habitat quality in coastal sage scrub habitat through a variety of efforts, including controlling non-native weed species and revegetating weeded areas with a combination of appropriate native shrub species, sensitive native geophytes, and herbaceous flowering plants. In addition, per available funding, restore coastal sage scrub habitat on sites where conditions indicate this habitat type occurred in the past. Working with other partners, support the region-wide effort to develop and implement methods to reduce the percent coverage of exotic invasive species in coastal sage scrub habitat, and continue to support MSCP preserve-wide monitoring of coastal sage scrub habitat quality.
- In coastal sage scrub habitat where cactus species are present, manage these areas to maintain healthy stands of cactus to support cactus wrens. Reduce the effects of fire on these habitat areas by removing non-native vegetation such as annual grasses and mustard. Control tree tobacco (*Nicotiana glauca*) and other shrubs to reduce "predator ladders" in cactus wren nesting habitat.
- Riparian Habitat As part of a step-down habitat management plan, identify locations within the Sweetwater River corridor where riparian habitat has been lost or degraded, and restore or enhance those areas to support a range native plant and wildlife species. As part of this step-down planning effort, identify portions of the riparian habitat within the McGinty Mountain and Sweetwater River management areas where habitat could be managed to mimic the natural disturbance regime observed in unaltered riparian corridors. These actions would be taken to support listed and sensitive species such as the least Bell's vireo, southwestern pond turtle, and arroyo toad.
- Isolated Wetlands Maintain and enhance native habitat around the Refuge's various impoundments, particularly in the San Miguel Mountain management area, to improve habitat quality for a range of wildlife, including the tricolored blackbird (*Agelaius tricolor*), which does not regularly breed on the Refuge.

- Native Grasslands Reestablish native grassland habitat, including a suite of appropriate annual and perennial forbs, in areas with suitable clay soils such as on the Jamacha parcel and on the gentle lower western slopes in the San Miguel Mountain area.
- Cryptobiotic Crust Encourage research related to the restoration of crytobiotic crust, and seek funding to implement restoration in select areas of the Refuge.
- Tree Planting Expand the Refuge's current oak planting project to other areas of the Refuge and include the planting of a variety of appropriate tree species, including coast live and Engelmann oak, California sycamore, and Southern California black walnut.
- Invasive Species Rapid Response Program Develop a program to assist in the identification of new invasive plant species on the Refuge in an effort to ensure quick control of these new species before they become a significant problem. This program could involve a collaborative effort with other landowners to implement a regional invasive species strategic plan and/or a combination of research, interagency coordination, public outreach, citizen science, and rapid response in the form of mechanical and/or chemical control. Under the latter program, Refuge staff would keep apprised of those plant species that have been identified as having significant potential for invading Refuge habitats, such as perennial pepperweed and Wards weed (Carrichtera annua). Pictures of problem plant species could be posted on the Refuge webpage and/or at trail kiosks with information provided for how to contact and provide information to Refuge staff about an observation of one of these species on the Refuge. Potential partnerships with Calflora and the Southern California Weeds Observation Hotline could benefit this program. Researchers and monitors would also be encouraged to record the location of any problem species. Potential infestation sites would be investigated, and new invasive plants would be promptly controlled to avoid further distribution on the Refuge. As a start to such an invasive plant detection and treatment program, the Refuge is establishing a partnership with Friends of San Diego Wildlife Refuges and Earth Discovery Institute to develop a volunteer "weed team" to map and treat weeds, and evaluate treatment effectiveness in the Par Four Trail area.
- Nest Boxes Install nest boxes in appropriate locations on the Otay-Sweetwater Unit to provide additional nesting opportunities for secondary cavity-nesting birds such as western screech owl (*Otus kennicottii*), American kestrel (*Falco sparverius*), and western bluebird.
- Invertebrates Obtain needed data regarding the diversity and abundance of terrestrial invertebrates present on the Refuge, including both native species and invasive species by designing and implementing an inventory and sampling plan for terrestrial invertebrates present in chaparral vegetation on the Otay-Sweetwater Unit, when adequate funding is identified.

Within the Del Mar Mesa Vernal Pool Unit, proposed actions related to restoration and enhancement include restoration of habitats to support sensitive bird species; control of invasive, non-native plant species; enhancement of habitat to support native pollinators; and restoration and enhancement of cryptobiotic crust (refer to Table 4-3). Another habitat restoration effort that would be implemented on both units of the Refuge, per available funding, is the conversion of unnecessary roads and trails to appropriate habitat by restoring the natural contours of the site and establishing a mix of appropriate native species. The habitats to be restored will be determined based on such factors as adjacent native vegetation, soil type, slope aspect, and site hydrology.

## Habitat and Wildlife Protection

The management actions described in Alternative A to protect habitat and wildlife would also be implemented under Alternative B. In addition, this alternative includes a number of new actions that would be implemented to protect Refuge resources. Actions proposed for implementation on the Otay-Sweetwater Unit include:

- Evaluating the existing network of trails and pathways to determine how best to accommodate opportunities for public access while protecting the range of listed and sensitive species and habitats supported on this Unit (discussed in greater detail under Public Use);
- Prohibiting dogs on the Otay-Sweetwater Unit;
- Installing fencing and gates behind the commercial development at Jamacha Road and Willow Glen Drive to reduce disturbance to riparian habitat from homeless activity and other unauthorized access;
- Working with adjacent landowners to keep goats and cattle from entering Refuge lands;
- Impounding domestic animals, such as goats and cattle, that are found on Refuge land and disposing of them in accordance with 50 CFR 28.42, which addresses notification procedures, public sale of unclaimed animals, expenses to owners for capture, impoundment, advertising, care, forage, and potential damage claims, when redeeming an animal;
- Coordinating with other agencies to determine the status of wild turkey and feral pig populations in the vicinity and, when necessary, conducting annual surveys of the Otay-Sweetwater Unit to identify signs of the presence of these species on the Refuge;
- Initiating actions necessary to permit the control of feral pigs and wild turkeys on the Refuge if and when their presence is confirmed on the Refuge;
- Implementing a program to control non-native predators, including dogs and cats, when site monitoring indicates that such action is necessary to protect ground and shrub nesting birds, lizards, and other sensitive species from excessive predation;
- Installing signs and/or fencing around intact areas of cryptobiotic crust to minimize the potential for damage due to trampling;
- Completing the mapping of vegetation types on recently-acquired lands on the Otay-Sweetwater Unit and documenting the current status of non-native and pest plant species on these parcels;
- Reducing the potential effects of wildland fire on highly sensitive habitat areas, such as large concentrations of mature cactus and areas known to support host plants for the Quino checkerspot butterfly, by focusing invasive plant species control in these areas, as well as providing fuel breaks and thinning existing vegetation in strategic locations; and,
- Expanding invasive plant control to include mechanical and chemical control of invasive plants along trails, roads, and within other disturbed areas.

The control of non-native predators such as dogs and cats would be implemented on a caseby-case basis per available funding. The following guidelines would be followed in controlling non-native predators:

- Trapping of non-native predators would be limited to strategic locations where determined feasible to protect ground and shrub-nesting birds, lizards, and other sensitive species from excessive predation;
- Actions to control non-native predators would be implemented on a temporary, short-term basis and would only be implemented when potential for take or harm to listed or sensitive species has been identified;
- All control methods would be humane, providing adequate shade and water for any trapped animal;
- Traps set out overnight would be checked within two hours of sunrise, and traps left out during daylight hours would be monitored regularly and checked a minimum of four times per day;
- Prior to implementing trapping in a particular area, signs at trail access points would be posted to notify adjacent residents of the proposed activity and to provide information on where trapped animals can be retrieved;
- Domestic animals inadvertently trapped would be taken to an approved shelter facility operated by a cooperating local unit of government, humane society, or veterinary care facility;
- A public outreach campaign would be initiated to inform the public of the importance of controlling pets and the need for predator control on the Refuge to protect sensitive species; and
- In accordance with 50 CFR 28.43, dogs and cats running at large on the Refuge and observed by an authorized official in the act of killing, injuring, harassing, or molesting humans or wildlife may be disposed of in the interest of public safety and protection of wildlife.

Habitat and wildlife protection on the Del Mar Mesa Vernal Pool Unit would be implemented consistent with the approved Carmel Mountain and Del Mar Mesa Preserves Management Plan.

# **Integrated Pest Management**

Under Alternative B, an integrated pest management (IPM) approach would be utilized to eradicate, control, or contain a variety of plant, animal, and insect pests on the Refuge. To the extent practicable, pest management on the Refuge would be coordinated with adjacent landowners, as well as upstream and downstream landowners, to ensure effective control of invasive wetland plants and aquatic animal species, particularly those that occur within the Sweetwater watershed.

In accordance with 517 DM 1 and 569 FW 1, the IPM approach would use control methods based upon effectiveness, cost, and minimal ecological disruption, which considers minimum potential effects to non-target species and the Refuge environment. Control of pest species is necessary when these pests are resulting in environmental harm. Environmental harm by pest species refers to a biologically substantial decrease in environmental quality as indicated by a variety of potential factors, including declines in native species populations or communities, degraded habitat quality or long-term habitat loss, and/or altered ecological processes. Environmental harm may be a result of direct effects of pests on native species, including preying and feeding on them; causing or vectoring diseases; preventing them from reproducing or killing their young; outcompeting

them for food, nutrients, light, water, nest sites, or other vital resources; or hybridizing with them so frequently that within a few generations, few if any truly native individuals remain. Environmental harm also can be the result of an indirect effect of pest species. For example, decreases in native pollinator diversity and abundance may result from invasive plant infestations that reduce the availability and/or abundance of native upland plants that support native pollinator species.

Environmental harm may also involve detrimental changes in ecological processes. For example, invasive non-native plant species can outcompete and ultimately replace native species of forbs and shrubs, altering the function of the historic plant community. Environmental harm may also cause or be associated with economic losses and damage to human, plant, and animal health; such as invasions by fire-promoting non-native grasses that alter entire plant communities, increasing fire frequency and intensity, which in turn increases firefighting costs and threats to adjacent development.

The details of the IPM Plan proposed for implementation on the San Diego NWR are provided in Appendix D. One or more methods may be employed to meet the objectives of the IPM Plan, including cultural, physical/mechanical, biological, and/or chemical control. These methods are summarized here and presented in detail in Appendix D.

Cultural control can involve the management and manipulation of competitive interactions so that weeds are placed at a disadvantage. This type of cultural control includes a broad range of normal management practices that can be modified or manipulated to manage one or more pest problems, either by minimizing the conditions those pests need to live (e.g., water, shelter, food), or minimizing opportunities for introduction. Cultural control can also mean modifying human behavior or activities in an effort to avoid invasive seed transport and the improper disposal of non-native and pest plant debris. To this end, cultural control, as discussed here, consists of awareness of the ways seeds are transported, disposal of non-native and pest plant debris, and public and staff education.

Physical control involves the removal; destruction; disruption of growth; interference with pest reproduction using treatments that can be accomplished by hand, hand tools (manual), or power tools (mechanical); and the physical removal of plants by pulling, grubbing, digging out root systems, cutting plants at the ground level, and removing individual competing plants around desired species. Other methods may include "topping" annual weeds prior to seed set, placing mulch around desired vegetation to limit competitive growth, tilling/disking, cutting, swathing, grinding, sheering, girdling, mowing, or mulching of the pest plants. Other types of physical control could include solarization, prescribed fire, and the use of flamers, where permitted.

Classical biological control involves the deliberate introduction and management of natural enemies (e.g., parasites, predators, or pathogens) to reduce pest populations. The Service strongly supports the development of and the legal and responsible use of appropriate, safe, and effective biological control agents for nuisance and non-indigenous or pest species. To date, the intentional use of biological control agents has not been implemented on the San Diego NWR.

Under the IPM, pesticides may be used where physical, cultural, and biological methods or combinations thereof are impractical or incapable of providing adequate control, eradication, or containment. If a determination is made that the most appropriate control for a particular pest or group of pests on the Refuge is the use of a pesticide, the most
specific (selective) chemical available for the target species (or multiple species) would be used unless considerations of persistence or other environmental and/or biotic hazards would preclude it.

In accordance with 517 DM 1, pesticide usage would be further restricted because only pesticides registered with the U.S. Environmental Protection Agency (USEPA) in full compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and as provided in regulations, orders, or permits issued by USEPA may be applied on lands and waters under Refuge jurisdiction.

Throughout the life of the CCP, pesticides proposed for use on the Refuge would be evaluated by the IPM Regional Coordinator for potential effects to Refuge biological resources and environmental quality; the results of this evaluation, including the potential effects of each product, would be documented in "Chemical Profiles." The product would also require approval through the PUPS process, which is described under Alternative A.

When a proposal is submitted requesting approval for the use of any new products on the Refuge, chemical profiles will be prepared for those products; it is based on the information provided by those chemical profiles that a decision to approve or disapprove a product will be made. Only those pesticides that are likely to result in only minor, temporary, and/or localized effects to species and environmental quality based upon non-exceedance of threshold values in Chemical Profiles would be approved for use on the Refuge. In all cases, best management practices would be implemented during the handling and application of pesticides, and, in some cases, non-exceedance of threshold values the implementation of additional BMPs that further define how, when, where, and to what extent a specific pesticide may be applied.

Chemical profiles, provided in Attachment B of Appendix D, have already been completed for those pesticides currently being used or being considered for use on the Refuge. These pesticides are presented in Table 4-4, along with information regarding the pests to be targeted and the areas in which they may be applied.

When addressing the use of herbicide, it is also important to consider the method of application to be used. The application method chosen depends upon:

- treatment objective (removal or reduction);
- accessibility, topography, and size of the treatment area; characteristics of the target species and the desired vegetation;
- location of sensitive areas and potential environmental impacts in the immediate vicinity; anticipated costs and equipment limitations; and
- meteorological and vegetative conditions of the treatment area at the time of treatment.

Herbicides can be applied with manual application devices or from vehicles such as allterrain vehicles with a boom sprayer attachment. Manual applications of herbicides are used only in small areas, in areas inaccessible by vehicle, and/or to minimize potential impacts to non-target plants. Herbicides may be applied to green leaves with a backpack applicator or spray bottle, wick or gloves (wiped on), or wand (sprayed on). Herbicides can be applied to trees around the circumference of the trunk on the intact bark (basal bark), to cuts in the trunk or stem (frill, or "hack and squirt"), to cut stems and stumps (cut stump), injected into the inner bark, or to the soil before the target species' seeds germinate and emerge (Tu et al. 2001).

There are several drawbacks and limitations to herbicide use. Herbicides have the potential to injure or kill non-target plants even when the herbicide is not applied directly to the plant, through drift, runoff, and possibly through root leakage. The herbicides considered for use on the San Diego NWR are regarded as posing relatively low risk for use in natural areas because they are not likely to contaminate groundwater if used properly and are of low toxicity to animals (Tu et al. 2001).

Table 4-4   Pesticides Proposed for Use on the San Diego NWR under Alternative B								
Active Ingredient	Common Product Names	Selective/Non-Selective	General Mode of Action	Target Pests	Potential Treatment Areas			
<b>Glyphosate</b> (formulated as a water-soluble liquid containing surfactant)	Prosecutor RoundUp Pro	Broad-spectrum, non- selective, systemic herbicide (post emergent)	Prevents the production of several essential amino acids essential to growth	Non-native, invasive weeds/grasses	Upland habitats where invasive grasses and forbs are affecting listed and sensitive plants			
<b>Glyphosate</b> (formulated as a water-soluble liquid for mixing with water or nonionic surfactant)	Rodeo, Aquamaster	Non-selective aquatic herbicide (post-emergent)	Prevents the production of several essential amino acids essential to growth	Emerged, non-native aquatic weeds and shrubs in aquatic areas	Sweetwater River floodplain, around man- made ponds			
Fluazifop-P-butyl	Fusilade DX Fusilade II	Selective, systemic herbicide that targets grasses (post- emergent)	Stops meristematic activity by inhibiting the synthesis of lipids, which are essential to the new cell production	Non-native annual and perennial grasses	Upland habitats where invasive grasses are affecting listed and sensitive plants			
Oryzalin	Surflan AS	Selective, annual grasses, broadleaf weeds, woody shrubs and vines (pre-emergent surface- applied herbicide)	Inhibits the growth of germinating weed seeds	Non-native, invasive broadleaf weeds and grasses (control or suppression depending upon the species)	Upland burn areas and other areas impacted by invasive grasses and annual weeds			
Clethodim	Envoy Plus	Selective cyclohexenone herbicide used to control annual and perennial grasses (post emergent)	Lipid inhibitor damages the integrity of cell membranes and inhibits new plant growth	Annual Fescue (Vulpia myuros)	Upland burn areas and other areas impacted by invasive grasses and annual weeds			
Chlorsulfuron	Telar XP	Selective, systemic herbicide that targets broadleaf weeds and undesirable grasses (pre-emergent or early post- emergent)	Acetolactate synthesis inhibitor that stops cell division in plant roots and shoots, causing plants to stop growing	Non-native, invasive onion weed	Upland habitats where onion weed is affecting listed and sensitive plants			

Table 4-4     Pesticides Proposed for Use on the San Diego NWR under Alternative B								
Active Ingredient	Common Product Names	Selective/Non-Selective	General Mode of Action	Target Pests	Potential Treatment Areas			
Triclopyr, butoxyethyl ester with surfactants	Garlon 4 Ultra	Selective, systemic herbicide that targets woody and herbaceous broadleaf plants (little or no impact to grasses)	Mimics the plant growth hormone auxin, causing uncontrolled and disorganized plant growth and ultimately plant death	Invasive, woody vegetation (salt cedar, eucalyptus, ailanthus); primarily for cut-stump or drill applications	Upland areas infested with non-native woody species			
Triclopyr, butoxyethyl ester	Pathfinder II	Selective, systemic herbicide that targets woody and herbaceous broadleaf plants (little or no impact to grasses)	Mimics the plant growth hormone auxin, causing uncontrolled and disorganized plant growth and ultimately plant death	Invasive, woody vegetation (salt cedar, eucalyptus, fennel)	Upland and wetland areas infested with non-native woody species			

Restricted use herbicides must be applied by someone with a California Restricted Use License or by a person under their direct supervision. Federal law states all herbicides must be applied according to the label. Herbicide treatments on the Refuge would be combined with other control methods and could use any of the application methods listed here, depending on the situation. All applications would be conducted in accordance with the specifications described in the chemical profile and/or PUPS approval and would adhere to any special BMPs listed in the chemical profile.

Due to differences in species tolerance and the variety of habitats within the Refuge, the ability to use a number of different herbicides is necessary in order to choose the one that is most effective for a particular species in a particular environment. The potential for weeds to develop a resistance to a particular herbicide over time is another reason for developing a variety of herbicide options, as rotating herbicides with different biochemical pathways (from different herbicide groups) can help delay herbicide resistance.

Compounds referred to as adjuvants are often added to an herbicide formulation or tank mix to facilitate the mixing, application, or effectiveness of that herbicide. Spray adjuvants often improve spray retention and absorption by reducing the surface tension of the spray solution, allowing the spray droplet to spread more evenly over the leaf surface. Herbicide absorption may be further enhanced by interacting with the waxy cuticle on the leaf surface. They are sometimes included in the formulations of herbicides (e.g., RoundUp<sup>®</sup>), or they may be purchased separately and added into a tank mix prior to use (Tu et al. 2001).

Adjuvants are chemically and biologically active (not chemically inert) compounds. Some adjuvants have the potential to be mobile and pollute water. The Material Safety Data Sheet (MSDS) for an adjuvant and the herbicide label (if the adjuvant is included in the formulation) should be checked for conditions in which the adjuvant should not be used.

The extent of invasive plants known to occur on the Refuge necessarily requires some prioritization both with respect to control, but also with respect to monitoring. In 2012, management priorities for invasive, non-native plants were outlined in a strategic plan for San Diego County prepared for SANDAG by the Conservation Biology Institute (CBI), Dendra, Inc., and Cal IPC (CBI et al. 2012). This strategic plan for managing invasive plants prioritizes on-the-ground projects based on invasive plant impacts along with considerations for regional management goals, feasibility of successful implementation, and the needs of narrow endemic species covered by NCCP programs. A total of 29 species were identified as priorities for near-term management and monitoring in this regional strategic plan (CBI et al. 2012). The strategic plan's recommendations, along with data gathered on the Refuge as part of the implementation of a national strategy for management of invasive species in 2011, will be used to identify priority species in need of control, as well as to develop monitoring and inventory priorities for various areas on the Refuge.

In addition to invasive, non-native plant control, the IPM Plan for the San Diego NWR also addresses the control of non-native aquatic pests. A variety of non-native aquatic and semi-aquatic organisms present on the Refuge have the potential to impact future proposals to reintroduce listed species that historically occurred along portions of the Sweetwater River and Steele Canyon Creek. These non-native species include largemouth bass, green sunfish, carp, bullfrogs, African clawed frogs, red swamp crayfish, North American crayfish, and red-eared sliders. Although a variety of control methods are described in the IPM Plan (Appendix D) for controlling non-native aquatic species, the most common method is trapping using nets, traps, and spears. In the case of non-native fish, frogs, and crayfish, once these organisms are trapped, they would be euthanized and disposed of in an appropriate manner. Nonnative turtles that are trapped would, if deemed in good health, be placed with the San Diego Turtle and Tortoise Society or comparable organization that has an established adoption program that adopts turtles to people who have demonstrated a commitment to their long-term care. Regular monitoring on Refuge lands is essential to detecting new non-native species and preventing their spread.

Another important aspect of managing aquatic invasive species is education and public outreach. The hazards (e.g., serious illness, starvation, death by predation) to an unwanted pet and the impacts to the native wildlife of releasing a pet "back into the wild" could be described in a brochure or on an information bulletin at a trailhead kiosk. Explaining to the public that their pet does not naturally occur in the habitats found on the Refuge is particularly important because all of the exotic animals that currently or potentially present problems for Refuge wildlife have been introduced intentionally.

It is unlikely that adequate funding and staff would be available to control the numbers of exotic aquatic animal species on the Refuge; therefore, the IPM Plan proposes to rank target species by the extent of the species ecological impact, current distribution and abundance, trend in distribution and abundance (e.g., rapidly increasing numbers), and difficultly of management. Impacts that are considered in this ranking include the threat to endemic and listed species, the threat to ecosystems that support listed species (e.g., reduced aquatic productivity), the threat to previous habitat restoration projects (i.e., the continued success of previous projects), and the level of effort needed to eradicate or contain the invasive species. The species that rank highest should receive the highest management priority; however, new infestations of non-native, invasive species should take precedence, as early action provides the greatest opportunity to contain and, ideally, eradiate the new species.

An essential element of the IPM Plan is monitoring the results of all activities implemented under the IPM Plan. Ongoing monitoring of invasive species' response to IPM treatment is critical in order to evaluate the effectiveness of different treatment methods and to apply adaptive management practices when deemed necessary.

#### **General Site Management**

General site management would include the actions described in Alternative A, as well as the following:

Water Monitoring – Seek funding to conduct periodic monitoring of surface and groundwater quality on the Otay-Sweetwater Unit and annual monitoring of groundwater levels within riparian and oak woodland areas of the unit.

# B. Public Use

## Public Access

Under Alternative B, specific areas of the Refuge, primarily the designated trail system, would be officially opened to public use. Any off-trail use would be limited to supervised environmental education and interpretive programs and research projects conducted in accordance with a Refuge Special Use Permit. Large areas of the Refuge would remain closed to the public to protect listed and sensitive species and other natural resources.

No dogs or other pets would be permitted within the Otay-Sweetwater Unit under Alternative B. The regulations regarding dogs and other pets on the Del Mar Mesa Vernal Pool Unit will be consistent with the regulations included in the approved management plan for the larger Del Mar Mesa Preserve.

On the Otay-Sweetwater Unit, official access points onto the Refuge would be established as trailheads and would be indicated on future trail maps. All public use activities would be limited to the officially designated trail system, which would include some multiple trail use and some pedestrian-only trail use. To prevent impacts to adjacent private lands, as well as to sensitive resources, no access onto Refuge lands would be permitted from any areas other than officially designated access points. Unauthorized access points would be officially closed, posted, and, if necessary, fenced with those trails leading onto the Refuge from unauthorized access points restored to native habitat.

Because the majority of lands included within the Refuge boundary are landlocked with no direct access to the public right-of-way or other public lands, the number of access points onto the Refuge is limited. Official access points onto the Refuge under Alternative B are described here (note that some of these are existing, as described under Alternative A and shown in blue on Figures 4-7 and 4-9).

• McGinty Mountain Area – An existing 17-space parking lot and trail staging area, maintained by the Refuge, is located off Jamul Drive approximately one-half mile west of Lyons Valley Road. This parking area provides access to a trail that extends through a portion of the Refuge, then onto other properties with trail easements, and finally back onto the Refuge (refer to Figure 4-7). Under this alternative, the Refuge would establish a designated trail through the McGinty Mountain area that could be accessed from this existing parking lot.

Public access to the McGinty Mountain area is also available south of Model A Ford Lane at Sloane Canyon Road near the northeastern portion of the Refuge. There is currently no established parking area at this location, and parking sites along the side of the roadway are extremely limited. Alternative B includes a proposal to seek funding to construct a four- to six-car parking area and trailhead on the Refuge at this location. The design and layout of this parking area would be determined as part of future step-down planning.

Access onto this portion of the Refuge from any other location is prohibited because such access would require traveling through privately owned property and/or tribal, State, or locally owned property that is not currently open to public use. The portion of this management area located to the north of Dehesa Road would remain closed to all public access. Las Montañas Area – No facilities to support parking or trail staging are currently available for the Las Montañas area. Under Alternative B, funding would be sought to create an authorized access point onto the southern portion of the Las Montañas area. The proposal includes the design and construction of a small parking lot and trail staging area, which will likely be sited along the south side of Highway 94, although a location off Vista Sage Lane onto Refuge land might also be explored. The specific details related to the location, size, site layout and design, and ingress and egress requirements as they relate to Highway 94 would be determined as part of a step-down trail plan. Public comment would be sought, and compliance under NEPA would be required as part of the step-down planning process. Additionally, any requirements for site-specific studies (e.g., County of San Diego traffic study) or necessary permits (e.g., Caltrans encroachment permit) would be complied with before construction of a parking and trail staging area could be implemented. All existing trails in the south portion of this management area that can only be accessed via private property would be closed and revegetated.

No public access is permitted in the northern portion of the Las Montañas area; this area would remain officially closed to public access under this alternative.

- Sweetwater River Area Under Alternative B, official access to this area would be provided via:
  - the county-maintained parking area at the old steel bridge off Highway 94;
  - Bright Valley Farms (per agreements made with the County of San Diego when the Refuge was established);
  - $\circ~$  a trail along the north side of Highway 94, although no public parking is available at this location;
  - o Par Four Drive, where only on-street parking is available; and
  - the County's Sweetwater Loop and River Trail, which is served by a parking and trail staging area within the Sweetwater Regional Park Summit Site.

In addition, funds would be sought to design and construct visitor services facilities along the south side of Highway 94 near Millar Ranch Road to improve public access onto the Refuge. These facilities, including a parking lot with some pullthrough parking spaces to accommodate equestrian trailers, a temporary visitor contact station, restrooms, shade structure, and information kiosk. It is anticipated that these facilities would be constructed on a 2.4-acre parcel to be donated to the Refuge by Caltrans in the near future. These facilities would support the interpretive and environmental education programs proposed under this alternative, as well as existing and future trail users. Specific details related to the location, size, site layout and design, and ingress and egress requirements as they relate to Highway 94 would be determined as part of a step-down trail plan. Public comment would be sought, and compliance under NEPA would be required as part of the step-down planning process. Additionally, requirements for sitespecific studies (e.g., traffic study) and/or necessary permits (e.g., Caltrans encroachment permit) would be complied with before construction of a parking/trail staging area could be implemented.

The Jamacha parcel, located to the east of Jamacha Boulevard, would remain closed to public access to protect sensitive species and support ongoing restoration efforts. No access onto the Refuge from Jamacha Boulevard, Trace Road, and Doubletree Road would be permitted under this alternative.

San Miguel Mountain Area – As of 2013, the only official access point to this area is via the Sweetwater Loop and River Trail. Alternative B includes a proposal to seek funding to establish an access point and trail staging area (e.g., parking area, trailhead) on Refuge land in the Hidden Valley area off Proctor Valley Road. Specific details related to the location, size, and layout and design of the parking lot would be determined as part of a step-down trail plan. Public comment would be sought, and compliance under NEPA would be required.

Also, as part of the development of the step-down trail plan, the unofficial access points coming from the south and east of the San Miguel Mountain area would be evaluated to determine if these access points can be retained or should be closed. The decision of whether one or more of these routes should be closed or officially opened would be based on current property ownership in the area, as well as the potential effects of current and future public use on Refuge resources in the area. If these routes require access through private property, they can only be authorized if trail easements can be obtained from the underlying landowner.

• Otay Mesa and Lakes Area – The Refuge lands in this area would remain closed to all public access.

#### Wildlife-dependent Recreational Uses

Hunting. The Refuge would remain closed to hunting under this alternative.

<u>Fishing</u>. Although the Refuge includes approximately 5.7 miles of the Sweetwater River, opportunities for fishing are limited by both minimal water depths along much of the River and the lack of the presence of native fish populations within this watershed. There are some deeper pools located along the river course that support non-native fish; however, this alternative also proposes to eradicate non-native fish from the Refuge in an effort to support the reestablishment of populations of southwestern pond turtle and the federally endangered arroyo toad along suitable segments of the Sweetwater River.

The general guidelines for wildlife-dependent recreation, as presented in 605 FW 1.6 of the Service Manual, provide a range of criteria to be considered when opening a refuge to a particular recreational experience. Some of these criteria include consideration of applicable laws and regulations, minimizing conflicts with fish and wildlife population and habitat goals, promoting accessibility and availability to a broad spectrum of the American people, promoting resource stewardship and conservation, providing reliable and reasonable opportunities to experience wildlife, and using visitor satisfaction to help define and evaluate programs. We develop and evaluate quality wildlife-dependent recreation programs based on these criteria, which necessarily involves considering the existing and projected future conditions on a refuge. Such conditions include the lack of native fish within the watershed and the projected future lack of non-native fish in accordance with the Integrated Pest Management Plan that accompanies the CCP.

The guidance also addresses the need to consider applicable laws and regulation, including the ESA, and minimizing conflicts with fish and wildlife population and habitat goals. The portion of the Sweetwater River that extends through the Refuge is designated as critical habitat for the least Bell's vireo and southwestern willow flycatcher, and allowing public uses along the banks of the river could result in disturbance to nesting vireos.

The opportunities to harvest fish from the Sweetwater River at present are low and will be essentially nonexistent in the future. Based primarily on the limited fishing opportunities available along the Sweetwater River, but also considering the potential for increased disturbance within habitat designated as critical for the recovery of the least Bell's vireo and southwestern willow flycatcher, we have determined that the Refuge would remain closed to fishing under Alternative B. There are however opportunities for fishing in the immediate vicinity of the Refuge, including at Sweetwater Reservoir and Lower Otay Reservoir.

<u>Wildlife Observation/Photography</u>. Opportunities for wildlife observation and photography would be available from points along the designated trail system on both units of the Refuge. Within the San Miguel Mountain area, there is an opportunity to install a photo blind adjacent to the trail near one of the old cattle ponds on the site.

<u>Interpretation</u>. This alternative proposes to expand the interpretive program on the Otay-Sweetwater Unit and work with partners to implement interpretive programs on the Del Mar Mesa Vernal Pool Unit in an effort to increase the public's understanding of the Refuge's contribution to the conservation of the sensitive resources that occur in southwestern San Diego County. Interpreting the Refuge's resources and educating users about the need to protect these resources is an important management tool that has been shown to reduce inappropriate behavior in park and open space users. The following interpretive projects would be implemented on the Otay-Sweetwater Unit as funding sources are identified:

- Design and construct a two-paneled kiosk for the southern trailhead and parking area on McGinty Mountain that interprets McGinty Mountain's rare gabbro soil-dependent southern mixed chaparral habitat with its associated endemic plant species, and also provides trail and regulatory information;
- Design and construct a two-panel visitor contact kiosk at the Barn at the Oaks that interprets the history of the barn and surrounding lands, as well as the native habitats supported in the area;
- Design and construct a two-panel visitor contact kiosk at the Par Four Drive trailhead to inform users that they are entering Refuge land and to introduce users to the listed species in the area including San Diego ambrosia, Hermes copper butterfly, and California gnatcatcher;
- Design and construct a visitor contact kiosk with shade structure that can accommodate three to six interpretive/information panels to be installed near the convergence of the Sweetwater River and Steele Canyon Road to the south of Highway 94, with interpretive topics covering riparian, coastal sage scrub and chaparral ecology and the Refuge's role in conserving the rich diversity of native wildlife within western San Diego County;
- Develop a one- to two-mile interpretive trail near the old steel bridge within the Sweetwater River area that would incorporate the existing interpretive elements already present in this area, and include five additional interpretive elements to interpret the species and native habitats in the immediate area; and

• Design, construct, and install a two-panel visitor contact kiosk at the trailhead for the Sweetwater River and Loop Trail located in the county's Sweetwater Regional Park Summit site to introduce and interpret the habitats found on the Refuge to visitors embarking on hikes through the Refuge from this off-site public park and campground, and provide information about the existing partnership among Federal and State agencies and public utilities to manage and restore the habitats for threatened and endangered species.

Interpretation on the Del Mar Mesa Vernal Pool Unit would be provided as part of the implementation of the Carmel Mountain and Del Mar Mesa Preserves Management Plan. As currently drafted, this plan provides recommendations for interpretation but does not provide any specific proposals. Specific interpretive projects would be developed following approval of the plan, but, in general, the plan recommends that interpretive signage be installed in proximity to particularly sensitive habitat areas, such as vernal pools, at trailheads, and at other opportune locations. The plan also recommends that one trail within the Del Mar Mesa Preserve be designated for interpretation, with signs to be placed at appropriate locations along the trail. An interpretive trail brochure is also recommended to provide more extensive interpretation of the area and the resources supported within the preserve. Finally, the plan recommends that a docent program be established to lead guided field trips, participate in presentations at the preserve, assist with public outreach, monitor trail conditions and use, and generally watch over the preserve.

<u>Environmental Education</u>. Under this alternative, the Refuge would expand existing partnerships with nearby schools, as well as seek additional new partners, to create formal and informal environmental education programs that utilize the Refuge, including both the Otay-Sweetwater Unit and potentially the Del Mar Mesa Vernal Pool Unit, as an outdoor classroom. The proposed locations for conducting future outdoor classroom activities on the Otay-Sweetwater Unit include the area near Par Four Drive and the area to the east of the old steel bridge. The Refuge would also assist participating schools in developing a "master teacher" program, which will reduce the administrative costs of the program. One recommendation for the Del Mar Mesa Preserve is to have the preserve adopt a local school and develop programs for that school that teaches the students about the area's natural resources through presentations and walks, and possibly through hands-on experience in small habitat restoration projects, exotic species control, and habitat maintenance projects.

# **Other Public Uses**

<u>Trails</u>. Under Alternative B, the existing network of user-created trails and pathways was evaluated to consider existing and potential future impacts to important Refuge resources, including sensitive habitat, listed and sensitive plant and animal species, cultural resources, and water quality. In addition, trail sustainability, public safety, erosion, compatibility with Refuge purposes, and potential effects to adjacent private properties were considered. Based on this analysis, general corridors for where trails should be located within a designated trail system for the Otay-Sweetwater Unit and recommended uses have been identified. Specific trail alignments for the routes included with the proposed designated trail system will be developed in a step-down trail plan to be prepared adoption of the Final CCP. This detailed trail planning would be conducted in partnership with a variety of interested parties, including trail user groups, San Diego County Parks and Recreation, adjacent property owners, and other members of the public. NEPA compliance will be

required as part of the planning process and the draft trail plan would be made available for public review and comment in association with draft NEPA document.

The step-down trail plan process would include determining specific trail layouts, recommending trail tread improvements for any segments of existing trails that are retained, and identifying those trails to be closed and decommissioned. The plan would also provide descriptions of proposed trail features, identify approved uses on the various trail segments, and develop a trail sign and wayfinding program. The trail sign program would focus on providing the public with a clear understanding of which trails are part of the designated trail system. Existing trails proposed for retention in whole or in part as segments of the designated trail system would be evaluated to determine if they are sustainable, are aligned in a manner that will minimize impacts to the Refuge resources, and do not require or encourage access onto the Refuge through private property. Where realignment is necessary, the new alignment would be sited in a manner that would avoid impacts to sensitive Refuge resources, respect the existing topography, take into account surrounding drainage patterns and soil type, promote user safety, and address user desires for viewpoints, overlooks, and linkages to other authorized trails on adjacent properties.

Under this alternative, multiple use trails designated in the step-down trail plan would generally be limited to those trail segments that serve as segments of the county's regional trail system, including the Sweetwater Loop and River Trail. Generalized trail corridors for the designated trail system within the Otay-Sweetwater Unit are presented in Figures 4-7 through 4-10.

Alternative B also includes a proposal to explore potential options for connecting the County of San Diego's Sweetwater River Trail on the south of Highway 94 to the Par Four Trail on the north of Highway 94 in a manner that would ensure safe passage from one side of Highway 94 to the other. Under this proposal, the Refuge would partner with other agencies to explore various connection options including a fair weather undercrossing along the east side of the Sweetwater River below the Highway 94 bridge or the construction of an overcrossing or at-grade crossing in an appropriate location on the east side of the Sweetwater River near the Highway 94 bridge. There is currently some trail use occurring under the bridge to gain access to the northern portion of the trail, but there is no formal trail segment. As a result, impacts to vegetation and water quality are occurring within the Sweetwater River. This segment of the trail would not be located on the Refuge; therefore, it is likely the County of San Diego would have to take the lead on such a project. Construction of a trail connection in this area would require coordination with a variety of agencies, including but not limited to the County of San Diego, Caltrans, the Service, and CDFW.

Due to the extent of listed species supported on the Refuge and the importance of protecting the habitat that supports these species, some trails could be subject to seasonal closure to protect these species during nesting or other vulnerable stages of their life cycles. For instance, if golden eagles are observed making preparation for or tending a nest, a disturbance avoidance area would be established around the nest site with a radius of approximately 4,000 feet (1,220 meters). If a trail is located within the disturbance avoidance area, the trail would be closed until the eagle chicks have fledged or the nest is no longer occupied. Trails located within habitat that could support Quino checkerspot butterfly larvae would also be subject to seasonal closure to protect the larvae while they are vulnerable to trampling.

Another component of this designated trail system proposal is the development and implementation of a trail wayfinding program. This program would include:

- Design, printing, and distribution of a Refuge trail map;
- Placement of trail signs at trailheads and major trail intersections to provide directions and to inform users of the trail's permitted uses (i.e., multiple use, pedestrian only, no dogs);
- Installation of kiosks at trailheads; and
- Installation of fencing or other barriers where necessary to better direct users down the appropriate pathway and away from sensitive resources.

Alternative B also proposes the development of a partnership with equestrian groups, including Bright Valley Farms, mountain biking groups, and hikers to form a volunteer trail maintenance group to help maintain the multiple use trails on the Refuge. Additionally, the Refuge would establish a volunteer trail patrol with similar partners to assist the Refuge staff in monitoring trail users and updating the staff on potential hazards, maintenance issues, and inappropriate trail activities. The volunteer patrol would be developed consistent with similar programs being implemented by the San Diego County Parks Department and City of San Diego Regional Open Space Division.

Several actions are proposed under this alternative to improve accessibility within the proposed trail system. These actions include:

- Retrofit the approach ramps of the Sweetwater River Trail Bridge to comply with the draft Final Accessibility Guidelines for Outdoor Developed Areas;
- Ensure that accessibility is maximized to the extent possible when implementing trail improvements, rerouting a trail segment, and choosing which existing trail segments to include in the designated trail system; and
- Repair or eliminate degraded segments of the Sweetwater Loop and River Trail, particularly on the south side of the Sweetwater River; highly degraded sections may require a replacement route to circumvent problem areas.

The trail proposals for the Del Mar Mesa Vernal Pool Unit are illustrated in Figure 4-12. These trails would be part of the larger trail system proposed for the Del Mar Mesa Preserve, as presented in the draft Carmel Mountain and Del Mar Mesa Preserves Management Plan (City of San Diego 2011). Under the proposed plan, the northwestern Refuge parcel would include a segment of a hike/bike trail that travels through coastal sage scrub habitat and two segments of a multiple use trail that follows the alignment of existing San Diego Gas & Electric utility easements. The southwestern parcel would be bisected by a segment of a hike/bike trail that extends through coastal sage scrub habitat. No trails are proposed for eastern parcel; therefore, no public access onto this parcel would be permitted.

<u>Geocaching</u>. No form of geocaching would be permitted on the Refuge under Alternative B.

Groundspeak, which owns Geocaching.com, has prepared a guide for park and law enforcement agencies that assist agencies in determining if geocaches have been improperly or illegally placed on agency land. The guide also outlines the procedures for physically removing the cache and deleting its listing on Geocaching.com. This guide is available at *http://www.geocaching.com/articles/parksandpolice/* 

*GuideForParksandLawEnforcement.pdf.* Under Alternative B, any traditional geocaches encountered on the Refuge would be removed. To ensure that geocachers do not continue to seek the cache, the following procedures, developed by Groundspeak, will be implemented for any cache found on the Refuge that is listed on Geocaching.com:

- The cache owner will be informed that the cache has been removed,
- The cache name, GC code for the cache, and any additional information available to assist Groundspeak in identifying the specific cache will be provided to Groundspeak; and,
- A note will be posted on the geocaching listing indicating that the cache has been physically removed.

<u>Research</u>. Under Alternative B, the Refuge would continue to develop research partnerships with academic institutions and other public (e.g., USGS), private, and nonprofit researchers (e.g., California Native Plant Society, Center for Natural Lands Management, San Diego Natural History Museum, Conservation Biology Institute) to conduct research on the Refuge that would benefit Refuge management and/or Refuge resources. Potential research projects include but are not limited to:

- studying the mechanisms of type conversion in coastal sage scrub habitat;
- developing appropriate methods for the successful reversal of type conversion;
- conducting studies related to the life history of the Quino checkerspot butterfly;
- identifying the factors that may be contributing to Quino population declines;
- using genetic data to determine patterns of demography and gene flow within and among populations of coastal California gnatcatcher; and
- developing a strategy to address productivity and survivorship for species populations determined to be declining.

Other potential cooperative research projects may include working with researchers at USGS to facilitate genetic, demographic, and movement studies of southwestern pond turtles; partnering with researchers to study eagle activity on the Refuge, information that will contribute to the conservation of eagles on a larger geographic scale; and encouraging research related to the restoration of cryptobiotic crust.

The Refuge would also continue to support research related to the control of invasive nonnative grasses and annual forbs in an effort to identify controls methods that are both effective and avoid any adverse effects to native plant and animal species. Such research would include field studies to identify appropriate herbicides for controlling non-native grasses in areas supporting San Diego ambrosia and studies to evaluate the merits of using grazing as a tool for controlling invasive plants in some portions of the Refuge.

Research suggests that a well-regulated program of rotational grazing may have the potential to reduce cover of exotic annual grasses, thus reducing competition for native annual forbs, and improving habitat conditions for Quino checkerspot butterfly and other sensitive species found in grasslands, coastal sage scrub, and the grassland/coastal sage scrub ecotone (Weiss 1999, Hayes and Holl 2003, Vulliamy et al. 2006). Another study conducted by Kimball and Schiffman (2003) concluded that grazing harmed native species and promoted alien plant growth.

While grazing is not currently a habitat management tool used on the Refuge, an experimental grazing program that evaluates the beneficial and potentially harmful effects

of grazing as a management tool may be warranted in areas of the Refuge where exotic annual grasses are problematic. If this research demonstrates that grazing is effective in controlling invasive grasses and improving habitat quality for sensitive species in coastal southern California, a carefully regulated and monitored grazing program could be implemented on portions of the Refuge in the future.

# C. Refuge Operations

# **Staffing**

Alternative B proposes to increase the number of staff supporting the San Diego NWR by five full time equivalent positions and two other positions shared with the Complex. These positions include, in order of priority:

- 1. Fish and Wildlife Biological Technician (GS 5/7/9);
- 2. Community Outreach (GS 11); this position would be shared within the Refuge Complex, with half of the time devoted to the San Diego NWR;
- 3. Fish and Wildlife Biologist (GS 11);
- 4. Park Ranger (GS 5/7/9);
- 5. Maintenance Worker (WG 8);
- 6. Environmental Education Specialist (GS 11); and
- 7. GIS Technician (GS 7/9/11); this position would be shared within the Refuge Complex, with a quarter of the time devoted to the San Diego NWR.

## **Facilities**

Alternative B proposes that the Refuge office continue to be collocated with CDFW in Jamul. This alternative does however include proposals to construct several visitorserving facilities on land currently owned by Caltrans but proposed for conveyance to the Refuge. The site is located west of Millar Ranch Road and south of Highway 94. Proposed facilities include a temporary visitor contact station where Refuge staff can be available to provide information and answer questions about the Refuge, its management, and approved public uses. This facility will also provide Refuge staff with the opportunity to monitor more closely public use activities occurring on the Refuge. Other facilities include a restroom, visitor parking, trailhead kiosk, and interpretive elements.

A site plan would be developed for the site once it is acquired by the Refuge. The parking area would accommodate several horse trailer pull-through spaces and a new access point onto the Sweetwater Loop and River Trail, including a potential new trail bridge across Steele Canyon Creek, would be constructed. The site plan would also address vehicular and pedestrian ingress and egress to the site from Highway 94. The details of the site plan would be developed with various Refuge partners and would be subject to NEPA.

Other facilities proposed for construction on the Refuge under Alternative B include:

• Construct a Native Plant Nursery – This facility, which would be constructed at the Refuge office at Rancho Jamul Ecological Reserve, would enable the Refuge to propagate native plants for use in Refuge restoration and enhancement projects. The facility would include a greenhouse, potting shed, outdoor growing areas, seed cleaning area, and seed, plant, tool and supply storage. To the maximum extent practicable, the nursery would utilize low energy use technology, such as solar

panels, to minimize energy consumption. The siting and design of this facility would be coordinated with CDFW.

- Relocate an Existing Storage Building The storage facility (Rice Barn) located on San Miguel Mountain would be relocated to the Refuge headquarters in Jamul.
- Construct Firefighter and Volunteer Staff Barracks Temporary housing for seasonal firefighters and incidental and transient staff would be constructed at the Refuge headquarters site in Rancho Jamul. This facility would consist of a modular, four-bedroom, two-bath, "green" residence powered by photovoltaic panels.

## **Operational Access**

Alternative B includes a proposal to assess the existing road network within the Otay-Sweetwater Unit. As part of this assessment, a road plan will be developed for maintaining those roads necessary to accommodate Refuge operations, fire management, law enforcement, Department of Homeland Security, and/or utility companies. It will also identify areas where new gates or other barricades are required to limit or prohibit access onto Refuge property; identify and post Refuge boundaries that are not adequately marked; and identify those roads and access points that are not needed to support Refuge or other authorized entities operations. Several dirt roads within the Otay-Sweetwater Unit, which have already been deemed necessary for fire and maintenance vehicle access, are highly deteriorated and require repair and rehabilitation. These access routes, which include the McGinty/Immenschuh access road, portions of existing access roads in the Las Montañas area, the Hidden Valley access road, and the access road to the old San Miguel Ranch property, are proposed for rehabilitation under Alternative B. Alternative B also proposes to seek funding to close, recontour, and restore to appropriate native habitat all existing roads and access points that are not considered necessary for Refuge management.

#### **Maintenance**

The maintenance activities described under Alternative A would also be implemented under Alternative B. Some additional maintenance activities proposed under Alternative B include:

- Repair Saddle Road Dam The erosion and an existing seepage problem on the outside of the dam face would be repaired. Repair work, which would affect an area of approximately 6,500 square feet, would require the removal of some native vegetation.
- Remove Water Tanks Several water tanks are present on an old dairy site near Mother Miguel Mountain. These tanks, which were present on the land when it was acquired, have become traps for small wildlife and need to be removed. The project would involve removal of the tanks, footings, and piping.
- Remove Pumphouse, Well, and Tanker Trailer This non-operational facility, located to the south of Jamacha Road, was present on the property at the time of donation to the Refuge. The required action will involve removing the pumphouse and tanker trailer and plugging the existing well.

- Demolish Sweetwater River Pumphouse Ruins Due to public safety issues, the ruins of this old pumphouse are proposed for demolition following a cultural resource evaluation of the structure and the implementation of any required mitigation should the facility be deemed eligible for listing on the NRHP.
- Remove Internal Fencing and Rehabilitate Boundary Fencing in Hidden Valley The Hidden Valley property acquired in 2012 requires the removal of hundreds of feet of internal t-post and wire fencing to benefit wildlife movement, as well as the repair of boundary fencing to minimize the potential for trespass onto sensitive Refuge lands.

Alternative B also addresses the need to close known mine shafts, wells, and any previously unknown wells or mineshafts discovered on the Refuge. For example, after the wildfire in 2007, evidence of mining in the form of several scrapes and four openings were discovered in the vicinity of Mother Miguel Mountain. The openings are not protected, representing a safety hazard to the public and wildlife. In addition, the previous closure at Peg Leg Mine is in need of repair. Remedies proposed for open shafts include the installation of bat-compatible steel gates into horizontal openings and the insertion of polyurethane foam into vertical shafts and smaller openings to fill and seal these safety hazards. Three wells have been located on the Hidden Valley property and one well is known to be present in the Las Montañas area that require closing in a manner consistent with State guidelines.

# **Utility Easements**

Refuge staff will continue to work with the various utilities that maintain utility easements and other facilities on the Refuge or on inholdings surrounded by Refuge land to ensure the protection of Refuge resources and the safety of Refuge visitors. To facilitate better coordination, the Refuge will work with the utility companies to develop maps for the Refuge that clearly delineate all recorded easements located on the Refuge.

## D. Fire Management

The fire management strategies proposed under Alternative B would differ from Alternative A in that Alternative B supports the use of prescribed burning as a fire and habitat management tool. This change would only go into effect if the existing Fire Management Plan for the San Diego National Wildlife Refuge Complex (USFWS 2004a) were amended to permit this activity. Revisions to the approved Fire Management Plan for the Refuge Complex were initiated in 2011.

The use of prescribed burning to control invasive plant species would reduce the fuel load on the Refuge, which could reduce the intensity of wildland fire in some locations on the Refuge. This could in turn reduce fire suppression costs, but the reduction in costs would likely be minimal due to the size of the Refuge and the areas within the Refuge that would be appropriate for prescribed burning.

The draft Carmel Mountain and Del Mar Mesa Preserves Management Plan, which addresses fire management on the Del Mar Mesa Preserve, proposes full fire suppression in this area. This is consistent with the existing Fire Management Plan for the Refuge Complex.

## E. Law Enforcement

No changes to the existing law enforcement activities occurring on the Refuge are proposed under Alternative B.

#### F. Land Acquisition

Future land acquisition efforts will focus on acquiring parcels that support the creation or expansion of large contiguous blocks of undisturbed habitat within MSCP-designated core areas, as well as on parcels that if acquired would provide a functional link between habitat areas to improve connectivity between core areas, minimize problems associated with habitat fragmentation, provide pathways for genetic and demographic interchange, and accommodate species movement in response to wildland fire, climate change, and other stressors.

#### G. Cultural Resource Management

Cultural resource management under Alternative B would include all of the actions described under Alternative A. In addition, known cultural resources would be evaluated to determine if additional measures, such as rerouting a trail to avoid or minimize the potential for adverse effects to a site, capping a site to protect its integrity, and/or installing fencing or signage intended to keep the public out of sensitive areas while not drawing attention to the presence of any cultural resources, should be implemented to ensure the long-term site protection.

Prior to implementing any project on the Refuge that would involve ground disturbance, Refuge staff would coordinate with the Service's Regional Cultural Resources team and the appropriate tribal governments when deemed necessary in accordance with Service policy and other Federal regulations and policies. The San Diego NWR Complex is also pursuing with the Kumeyaay Cultural Repatriation Committee the development of procedures, to be formalized through a Memorandum of Understanding, which would be implemented in the event of a NAGPRA-related discovery on the Refuge.

#### H. Environmental Contaminants Coordination

Environmental contaminants coordination would be as described under Alternative A.

## I. Volunteers and Partners

As described in Alternative A, the Refuge would continue to develop partners and work with volunteers to benefit Refuge management and Refuge resources. Under Alternative B, these partnerships would be expanded to include volunteer trail maintenance activities and the formation of a volunteer trail patrol. This alternative also proposes hiring a Community Outreach Coordinator for the Refuge Complex; this position would be responsible for the development and implementation of volunteer programs and activities for the San Diego NWR, as well as the other Refuges in the San Diego NWR Complex.

# ALTERNATIVE C – EXPAND OPPORTUNITIES FOR WILDLIFE-DEPENDENT RECREATIONAL USES

Alternative C (Figures 4-13 through 4-17) proposes to expand the opportunities for wildlifedependent recreational uses on the Otay-Sweetwater Unit, while wildlife and habitat management activities would remain essentially the same as those described under Alternative B. The wildlife and habitat management actions, as well as the public use proposals, described for the Del Mar Mesa Vernal Pool Unit under Alternative B (refer to Figure 4-12) are also proposed under Alternative C.

# A. Wildlife and Habitat Management

The same wildlife and habitat management actions described in Alternative B for the Otay-Sweetwater Unit and Del Mar Mesa Vernal Pool Unit, including the implementation of an IPM Plan, would be implemented under Alternative C. Also under Alternative C, annual surveys to determine relative densities and population trends for southern mule deer would be conducted on the Otay-Sweetwater Unit.

## B. Public Use Program

# Public Access

Similar to the discussion provided in Alternative B, various areas of the Refuge would be officially opened to public use under Alternative C, while other areas would remain closed to protect sensitive resources.

On the Otay-Sweetwater Unit, official access points onto the Refuge under Alternative C would include those described under Alternative B. In addition, access onto the Refuge from Jamacha Boulevard, Trace Road, and Doubletree Road would be permitted in the future when a proposed multiple use trail is constructed and officially opened on the southwest side of the Sweetwater River management area.

# Wildlife-dependent Recreational Uses

<u>Hunting</u>. Under Alternative C, portions of the McGinty Mountain, Las Montañas, and Otay Mesa and Lakes management areas, as shown in Figures 4-13, 4-14, and 4-17, would be opened to hunting following the completion of a step-down hunt plan. Hunting would be conducted subject to refuge-specific conditions, which would vary depending upon the hunting location within the Refuge.

The areas considered for inclusion in a hunt program under Alternative C were selected after consideration of various factors, including those outlined here.

- Size and Configuration Areas of the Refuge considered for hunting represent large blocks of Refuge land separated from nearby residences or other development by changes in elevation and/or dense vegetation and a minimum distance of 150 yards.
- Ease of Access –The majority of lands included within the Refuge boundary are landlocked, having no direct access via a public right-of-way or other public lands. Because access is not permitted onto the Refuge through adjoining private property, those areas of the Refuge that will be open for hunting under Alternative C will be accessible from a public road or through other public lands where hunting is currently permitted. Future parking areas are proposed to provide access onto the McGinty Mountain and Las Montañas areas, and hunting access within the Otay Lakes and Mesa area would be provided through adjacent public lands.



Figure 4-13. Alternative C – McGinty Mountain Area, Otay-Sweetwater Unit



Figure 4-14. Alternative C - Las Montañas Area, Otay-Sweetwater Unit



Figure 4-15. Alternative C – Sweetwater River Area, Otay-Sweetwater Unit



Figure 4-16. Alternative C -San Miguel Mountain Area, Otay-Sweetwater Unit



Figure 4-17. Alternatives C & D – Otay Mesa and Lakes Area, Otay-Sweetwater Unit

- Habitat and Species Sensitivity Areas supporting federally listed plant and invertebrate species that could be adversely affected by trampling were excluded from designated hunting areas.
- Visitor Experience In addition to our responsibilities for protecting sensitive habitats and species and our desire to promote resource stewardship and conservation, 605 FW 1.6 of the Service Manual also addresses the need to consider visitor satisfaction when developing visitor services for a Refuge. Per this guidance, the public use program under Alternative C was developed after considering how best to provide reliable and reasonable opportunities to experience wildlife and ensure a satisfying visitor experience for all users. To achieve these objectives, we looked at current and future use patterns on the Refuge, along with habitat and species sensitivity, in developing a hunting program under Alternative C. Those areas of the Refuge that currently experience lower levels of public use (e.g., wildlife observation, photography, environmental education, interpretation, non-motorized trail use) have been proposed as future hunting areas under this alternative. This proposal is intended to minimize conflicts between users and promote a satisfying experience for the range of users expected to be present on the Refuge at any one time.

The proposed hunting program in Alternative C would provide opportunities for hunting brush rabbit, desert cottontail, dove, and California quail (subject to refuge-specific conditions) in the southern portion of the Las Montañas area on about 300 acres and about 400 acres within the McGinty Mountain area (refer to Figures 4-13 and 4-14). Bow hunting of southern mule deer would also be permitted within the 400 acres on McGinty Mountain. Refuge-specific conditions, which would be developed during the preparation of a step-down hunt plan, may address a variety of topics including hunt seasons, methods of hunting, descriptions of areas open to hunting, methods of access, and other provisions as appropriate.

Approximately 160 acres in the southeastern portion of the Otay Mesa and Lakes area (refer to Figure 4-17) would also be opened to hunting per refuge-specific conditions for big game (i.e., deer, wild pig), resident small game (i.e., rabbits), and resident and migratory upland game bird (e.g., dove, quail, wild turkey) hunting. Due to the lack of frontage along Otay Lakes Road, access into this area of the Refuge would be via foot from adjacent State and BLM lands that are also open to hunting. No public access of any kind would be permitted outside of the designated hunt area.

Specific details of the proposed hunting program for the Otay-Sweetwater Unit would be further defined in a step-down hunt plan, to be developed following the approval of the CCP. The step-down plan would evaluate the need, if any, for the development and implementation of a reservation and check-in process for the McGinty Mountain and Las Montañas areas, and would address any facility needs (e.g., parking, staging, check-in and check-out station), as appropriate.

The details of the step-down hunt plan would be addressed at one or more public meetings; and once drafted the hunt plan would be made available for public review and comment. The official opening of the Refuge to hunting requires that a notice be published in the Federal Register, which would be done as part of the Service's annual final rule on Refuge-Specific Hunting and Sport Fishing Regulations.

<u>Fishing</u>. Alternative C includes no proposal to open the Refuge for sport fishing for the reasons described under Alternative B.

<u>Wildlife Observation/Photography</u>. Opportunities for wildlife observation and photography would be similar to those described under Alternative B, although the additional trail segments proposed under this alternative would provide some additional opportunities.

<u>Interpretation</u>. All of the proposals related to interpretation on the Otay-Sweetwater Unit that are described under Alternative B would also be implemented under Alternative C. In addition, the following proposals would be included as part of Alternative C:

- Design and construct a two-paneled kiosk for the northern trailhead and parking area on McGinty Mountain that interprets the sensitive resources and wildlife on McGinty Mountain, and also provides information regarding trail use and hunting;
- Geocaching Program Develop a geocaching program as a component of the • Refuge's interpretive program. Geocaching is a high-tech treasure hunt involving the use of a Global Positioning System (GPS) unit. The goal is to find the location of the geocache. There are different types of geocaches; the traditional geocache includes a logbook and frequently a trinket, coin, or other object. Another form of geocache is an EarthCache, which is also listed on Geocaching.com. According to the EarthCache website (http://www.earthcache.org), "EarthCache sites do not use stored containers; their treasure is the lessons people learn about our planet when they visit the site." Earthcaches would provide a unique interpretive tool for the Refuge. Traditional geocaching by individuals would not be permitted on the Refuge, as the hiding of private caches on Refuges is prohibited by Federal regulation. Such a program could, however, be implemented by the Refuge staff, which would ensure that caches are placed in locations that would avoid off-trail activity and associated impacts to the Refuge's sensitive resources. EarthCaches could also be developed for the Refuge by the staff as part of the interpretive program.
- Vernal Pool Interpretive Trail Develop a 500-foot-long boardwalk trail, with interpretive panels and species identification signs, around a portion of the Shinohara vernal pool site with panels that interpret the unique species and habitat requirements of this specialized wetland habitat.
- Lot 707 Interpretive Trail Develop a children's interpretive trail on Lot 707. This parcel is located in proximity to an elementary school, as well as Cuyamaca College, providing some interesting partnership opportunities. Interpretation along a trail on this site could be focused on introducing elementary students to the natural environment. A trail that extends to the top of the site would provide users with distant views of the Refuge; representing an opportunity to interpret the Refuge purposes and the importance of preserving natural habitat areas. Parking to access this site would be limited to on-street parking. Access to the site is also available via an existing county trail.

<u>Environmental Education</u>. All of the proposals related to the implementation of environmental education programs on the Refuge, as described under Alternative B, would also be implemented under Alternative C. In addition, the environmental education

program would be expanded to address Quino checkerspot butterfly recovery and/or vernal pool restoration and enhancement.

## Other Public Uses

<u>Trails</u>. As described under Alternative B, Alternative C would result in the closure of many user-created trails and old roads and accessways in an effort to protect sensitive Refuge resources and ensure public safety. The generalized trail corridors for the designated trail system proposed for the Otay-Sweetwater Unit under Alternative C are illustrated in Figures 4-13 through 4-17. Specific trail alignments would be determined based on factors such as the potential effects to sensitive Refuge resources and the ability to build a sustainable trail that respects the existing topography and takes into account surrounding drainage patterns and soil type. Access within the Refuge would generally be limited to the designated trail system. All other areas of the Refuge, with the exception of the south end of the Las Montañas area, a portion of the McGinty Mountain area, and the southwestern portion of the Otay Mesa and Lakes area where off-trail activity would be permitted in accordance with authorized hunting activity, would be closed to public access.

Under this alternative, all trail corridors are proposed to accommodate non-motorized multiple use trails. As discussed in Alternative B, specific trail alignments would be determined during the preparation of a step-down trail plan for the Otay-Sweetwater Unit. The step-down trail process and anticipated products of the process are the same as those presented under Alternative B. During the step-down trail planning process, the potential for developing a trail to the top of Mother Miguel Mountain would also be explored.

The other proposals related to trails, as described under Alternative B, including assessment and repair or realignment of the county's Sweetwater Loop and River Trail to protect sensitive resources and improve public safety, establishment of volunteer trail maintenance groups and volunteer trail patrols, and exploring trail connection options across Highway 94 in the vicinity of the Sweetwater River, would also be implemented under Alternative C.

Unlike Alternative B, dogs would be permitted on Refuge trails, provided they are kept on a six-foot or shorter leash at all times and all waste is picked up and carried off site to an appropriate disposal can. The ability to bring dogs onto the Refuge would be conditional and subject to change without notice should leash and cleanup requirements be ignored.

The trail system described in Alternative B for the Del Mar Mesa Vernal Pool Unit would be the same under Alternative C.

<u>Geocaching</u>. Although geocaching would not be permitted on the Refuge, EarthCache sites, as described under Interpretation, may be established as part of an expanded interpretive program on the Otay-Sweetwater Unit. All illegal caches located on the Refuge would be removed as described under Alternative B.

<u>Research</u>. The proposals related to research under Alternative B would also be implemented under Alternative C.

## C. Refuge Operations

# **Staffing**

The staffing proposals described under Alternative B are also proposed for Alternative C.

# **Facilities**

Until funding is identified to move the Refuge office onto Refuge land, it will continue to be collocated with CDFW in Jamul. Assuming such funding is identified, this alternative envisions the future establishment of a Refuge office and permanent visitor contact station on about 2.4 acres of the land currently owned by Caltrans and located to the west of Millar Ranch Road and south of Highway 94. When funding is identified, a site plan, including engineering and design plans, and required traffic studies would be prepared for the proposed facility. Site features would include an approximately 2,500-square-foot, permanent Refuge office and visitor contact station, as well as parking for Refuge staff and Refuge vehicles. This proposal would also include the facilities proposed for this site under Alternative B (i.e., parking lot with some pull-through parking spaces to accommodate equestrian trailers, restrooms, shade structure, and information kiosk).

The construction of this facility would enable Refuge staff to have a permanent presence on the Refuge; provide Refuge visitors with the opportunity to interact with Refuge staff, ask questions, and learn more about the Refuge; and allow Refuge staff to monitor more closely public use activities occurring on the Refuge. Relocation of the Refuge office onto Refuge land would also reduce miles traveled to manage wildlife, habitat, and public use on the Refuge. The implementation of this proposal would be subject to NEPA compliance, and would be presented to the public for review and comment prior to project approval.

## D. Fire Management

The fire management strategies proposed under Alternative B would also be implemented under Alternative C.

# E. Law Enforcement

Under Alternative C, law enforcement activities would be expanded beyond those described under Alternative A to include the management and regulation of the proposed hunting program. Hunting on the Otay Mesa and Lakes area could be managed by CDFW, as it is located adjacent to State lands open to hunting. These details would be addressed in a step-down hunt plan.

## F. Land Acquisition

Land acquisition efforts would continue as described under Alternative A.

# G. Cultural Resource Management

Cultural resource management under Alternative C would include all of the actions described under Alternatives A and B.

# H. Environmental Contaminants Coordination

Coordination related to environmental contaminants would be the same as that described under Alternative A.

## I. Volunteers and Partners

Proposals related to volunteers and partnerships would be the same as those described under Alternatives A and B.

# Alternative D (Preferred Alternative <u>in the draft CCP/EA</u>) – Optimize Species Protection while Providing Opportunities for Compatible Public Use

Alternative D includes all of the wildlife and habitat management proposals included in Alternative B, as well as a proposal to implement a feral pig monitoring and eradication plan. The public uses proposed under this alternative represent a mix of proposals from both Alternatives B and C. The actions proposed under this alternative for the Otay-Sweetwater Unit are illustrated in Figures 4-18 through 4-21 (refer to Figure 4-17 for actions proposed under Alternative D for the Otay Mesa and Lakes area). Under Alternative D, management of the Del Mar Mesa Vernal Pool Unit would be consistent with the proposals described under Alternative B (refer to Figure 4-12).



Figure 4-18. Alternative D – McGinty Mountain Area, Otay-Sweetwater Unit



Figure 4-19. Alternative D - Las Montañas Area, Otay-Sweetwater Unit



Figure 4-20. Alternative D – Sweetwater River Area, Otay-Sweetwater Unit



Figure 4-21. Alternative D -San Miguel Mountain Area, Otay-Sweetwater Unit

## A. Wildlife and Habitat Management

The wildlife and habitat management actions described in Alternative B for the Otay-Sweetwater and Del Mar Mesa Vernal Pool Units, including the implementation of an IPM Plan, would be implemented under Alternative D. In addition, Alternative D includes a proposal to implement a Feral Pig Monitoring and Eradication Plan on the Refuge. Currently, there is no documentation of feral pig populations on the Refuge, but feral pigs have been identified on Forest Service lands to the east and are expected to continue to expand their range, making it likely that they will ultimately spread onto Refuge lands.

The Carlsbad Fish and Wildlife Office is already a participant in an inter-governmental group established by the Forest Service and BLM to address feral pig impacts, and the Refuge proposes to join this group. A number of State and local agencies are also participants in the Inter-Governmental Group on Feral Pig Impacts. This group has developed Principles of Understanding to work together to address feral pig impacts in San Diego County and to develop an "all-lands" approach to dealing with the feral pig population. A "Working Group" has also been established for key participants from multiple agencies in the area to come together to share knowledge and develop strategies for dealing with the feral pig population in the County across jurisdictional boundaries.

The Feral Pig Monitoring and Eradication Plan, which is provided as Appendix E, includes proposals to 1) monitor Refuge lands for evidence of feral pig activity; and 2) once pigs are confirmed to be present on the Refuge, to have the pigs lethally removed from the Refuge by contracted sharpshooters, such as USDA Animal and Plant Health Inspection Service [APHIS], before they are able to establish a permanent population on Refuge lands.

Authority to control wildlife populations for management is governed by several sections of the Code of Federal Regulations. Title 50 CFR, Part 31, Section 14 states: (a) Animal species, which are surplus or detrimental to the management program of a wildlife area, may be taken in accordance with Federal and State laws and regulations by Federal or State personnel or by permit issued to private individuals, and (b) Animal species, which damage or destroy federal property within a wildlife refuge area, may be taken or destroyed by Federal personnel. Title 50 CFR, Part 30, Section 11(a) states that feral animals, including horses, burros, cattle, swine, sheep, goats, reindeer, dogs, and cats, without ownership that have reverted to the wild from a domestic state may be taken by authorized Federal or State personnel or by private persons operating under permit in accordance with applicable provisions of Federal or State law or regulation.

To avoid or minimize impacts to Refuge resources from feral pigs, the implementation of this step-down plan would include the following steps:

- Keep apprised of current trends in feral pigs dispersal and colonization within the region;
- Establish agreements for controlling feral pigs on the Refuge well in advance of determining that their presence on the Refuge is imminent;
- Periodically inspect Refuge lands for evidence of feral pig activity, adjusting the frequency of these inspections based on current sighting information in the area and regional survey results;
- Should pigs be identified on Refuge lands, rapidly identify the location(s) and extent of infestation and document the extent of resource (e.g., biological, cultural, watershed) damage;

- Implement feral pig removal by employing the following methods: 1) removal by trapping, which is expected to result in the removal of the majority of the pigs; 2) professional (e.g., USDA APHIS) ground-based sharpshooters to pursue "trapaverse" animals after trapping efforts have been implemented; and 3) aerial dispatch (shooting), which would only be implemented in remote locations that are difficult to access on foot;
- When deemed necessary to enhance the effectiveness of control, construct short spans of temporary fencing to restrict or funnel movement of feral pig populations during trapping and hunting activities;
- Implement an adaptive management process to ensure project objectives are practical and attainable; and
- Implement short and long-term monitoring to evaluate project success.

This proposal, which is consistent with the plan developed by the participants of the Inter-Governmental Group on Feral Pig Impacts, draws upon a large body of experience from many successful feral pig elimination and control efforts across the United States (USDA Forest Service 2013). On the Refuge, the implementation of feral pig monitoring and eradication is intended to avoid or minimize damage caused by feral pigs to listed and sensitive species, as well as other biological, cultural, and watershed resources.

# B. Public Use Program

# Public Access

As described in Alternative C, specific areas of the Refuge would be officially opened to public use, while other areas would remain closed to protect sensitive resources. On the Otay-Sweetwater Unit, official access points onto the Refuge under Alternative D would be established consistent with the description provided under Alternative C. However, under Alternative D, hunting is only proposed on the Otay Mesa and Lakes area of the Refuge, therefore, public use activities elsewhere on the Otay-Sweetwater Unit would be limited to the officially designated trail system, except for limited environmental education and interpretive activities and approved research projects.

## Wildlife-dependent Recreational Uses

<u>Hunting</u>. In Alternative D, hunting would be permitted on about 160 acres in the southeastern portion of the Otay Mesa and Lakes area (refer to Figure 4-17). Hunting in this area would occur per refuge-specific conditions and would allow the take of big game (i.e., deer, wild pig), resident small game (i.e., rabbits), and resident and migratory upland game birds (e.g., dove, quail, wild turkey). Due to the lack of frontage along Otay Lakes Road on which to access the Refuge, along with the potential for the presence of Quino checkerspot butterfly larvae and associated host plants on the ridge within the northern portion of the site, no access through the Refuge from Otay Lakes Road would be permitted. Access into the Refuge's hunting area would be permitted only through adjacent State and BLM lands, where hunting is also permitted. No public access of any kind would be permitted within the Otay Lakes and Mesa area outside of the designated hunt area, and only hunters with valid hunting licenses would be permitted within the designated hunt area.

As addressed under Alternative C, the details of this hunting program would be provided in a step-down hunt plan, which will be developed upon completion of the Final CCP. <u>Fishing</u>. The Refuge would remain closed to fishing for the reasons described under Alternative B.

<u>Wildlife Observation/Photography</u>. Opportunities for wildlife observation and photography would be similar to those discussed under Alternative C.

<u>Interpretation</u>. All of the proposals related to interpretation on the Otay-Sweetwater Unit that are described under Alternative C would also be implemented under Alternative D.

<u>Environmental Education</u>. All of the proposals related to the implementation of environmental education programs on the Refuge, as described under Alternative C, would also be implemented under Alternative D.

#### **Other Public Uses**

<u>Trails</u>. As described under Alternative C, many user-created trails and old roads and accessways on the Refuge would be closed and rehabilitated in an effort to protect sensitive Refuge resources and ensure public safety. The generalized trail corridors for the designated trail system proposed for the Otay-Sweetwater Unit under Alternative C are also proposed under Alternative D; however, trails proposed for Lot 707 and Mother Miguel Mountain in Alternative C are not proposed under this alternative. In addition, the multiple use trail proposed for the Las Montañas area under Alternative C, would be restricted to hiking only under Alternative D; with the emphasis of this area focused on birdwatching and the interpretation of the area's natural resources.

As discussed under Alternatives B and C, the exact alignment of the trails proposed under this alternative would be determined during the preparation of a step-down trail plan for the Otay-Sweetwater Unit. The plan would identify the specific trail alignments that collectively would represent the designated trail system for this unit of the Refuge. This plan would also address parking to accommodate trail use and would include a review of current and potential future access points onto the Refuge to ensure that adjacent private lands are not being impacted.

The other proposals related to trails, as described under Alternative B, including assessment and repair or realignment of the county's Sweetwater Loop and River Trail to protect sensitive resources and improve public safety, the establishment of volunteer trail maintenance groups and volunteer trail patrols, and partnering with the county and Caltrans to identify a safe connection between the Sweetwater River Trail and the Par Four Trail would also be implemented under Alternative D.

Under Alternative D, leashed dogs would be permitted on all Refuge trails designated as multiple use, provided they are kept on a six-foot or shorter leash at all times and all waste is picked up and carried off site to an appropriate disposal site. Dogs would not be permitted on hiking-only trails. Approval to bring dogs onto multiple use trails would be conditional and subject to change without notice. Should leash and cleanup requirements be ignored, dogs would no longer be permitted within the Refuge, accept as permitted under Refuge hunting regulations.

The trail system described in Alternative B for the Del Mar Mesa Vernal Pool Unit would also be proposed under Alternative D.
<u>Geocaching</u>. Geocaching on the Refuge would not be permitted, but EarthCache sites may be provided as described under Alternative C.

<u>Research</u>. The proposals related to research under Alternative B would also be implemented under Alternative D.

# C. Refuge Operations

The proposals related to Refuge operations as described under Alternative C would also be implemented under Alternative D.

# D. Fire Management

The fire management strategies proposed under Alternative B would also be implemented under Alternative D.

# E. Law Enforcement

Under Alternative D, law enforcement activities would be expanded beyond those described under Alternative A to include the management and regulation of the proposed hunting program. Hunting on the Otay Mesa and Lakes area could be managed by CDFW, as it is located adjacent to State lands open to hunting. These details would be addressed in a step-down hunting plan.

# F. Land Acquisition

Land acquisition efforts would continue as described under Alternative A.

# G. Cultural Resource Management

Cultural resource management under Alternative D would include all of the actions described under Alternatives A and B.

# H. Environmental Contaminants Coordination

Coordination related to environmental contaminants would be the same as that described under Alternative A.

# I. Volunteers and Partners

Proposals related to volunteers and partnerships would be the same as those described under Alternatives A and B.

# **Modified Alternative D (Selected Action)**

<u>The management actions to be implemented under this alternative for the Otay-Sweetwater</u> and Del Mar Mesa Vernal Pool Units are illustrated in Figures 4-22 through 4-27.

# A. Wildlife and Habitat Management

The wildlife and habitat management actions described in Alternative B for the Otay-Sweetwater and Del Mar Mesa Vernal Pool Units, including the implementation of an IPM Plan, will be implemented under selected action. In addition, the Feral Pig Monitoring and Eradication Plan, described under Alternative D, would also be implemented under the selected action.

# B. <u>Public Use Program</u>

The public uses proposed under the selected action represent a mix of proposals from Alternatives A, B, and C, as well as expanded proposals for trails and trail planning.

# Public Access

<u>As indicated in Figures 4-22 – 4-27, with the exception of the area designated for hunting,</u> as well as limited environmental education, interpretive activities, and approved research projects, all public access on the Refuge will be provided via a designated system of trails.

# Wildlife-dependent Recreational Uses

Hunting. Hunting is a wildlife-dependent recreational use that the Improvement Act states "shall receive priority consideration in national wildlife refuge planning and management." As part of the CCP process, we evaluated how and where hunting could be permitted on the San Diego NWR and considered the variety of comments provided on this topic during the public comment period for the draft CCP/EA.

The Improvement Act states that the Secretary of Interior may permit hunting on a refuge if it is determined that such use is compatible and will not materially interfere with or detract from the fulfillment of the purposes of the refuge or the mission of the National Wildlife Refuge System. As described in the Land Protection Plan for the Otay-Sweetwater Unit of the San Diego NWR, the San Diego NWR was established to protect, manage, and restore habitats for federally listed endangered and threatened species and migratory birds and to maintain and enhance the biological diversity of native plants and animals" (USFWS 1997). The Refuge purposes also include provisions for incidental fish and wildlife-oriented recreational development.

Unlike many other Refuges across the country, the San Diego NWR lies in the urban interface immediately adjacent to significant areas of urban residential development, with more development proposed to the east in Proctor Valley. This situation necessarily influences management decisions related to both resource protection and public use. Refuge management and the provision of compatible public uses must take into account the need to protect large blocks of habitat to support the 13 federally listed endangered or threatened species and more than 30 MSCP-covered species known to occur on the Refuge, while also facilitating compatible wildlife-dependent recreational uses and other compatible uses in various areas throughout the somewhat disjunct lands that makeup the San Diego NWR.

After much consideration for how best to achieve all of the purposes and goals of this urban refuge, while also trying to meet the expectations of the public and adjacent residents, we selected the southern portion of the Otay Mesa and Lakes area of the Refuge as the area that will be opened to hunting (refer to Figure 4-26). Due to the potential for the presence of Quino checkerspot butterfly larvae and associated host plants on the ridge within the northern half of the southern Refuge parcel, only the southern portion of this parcel will be opened for hunting. As illustrated in Figure 4-28, the area selected as a future hunting area on the Refuge is located adjacent to CDFW and Bureau of Land Management lands that are already opened to hunting and an additional hunting area managed by CDFW is located to the northeast. No other public uses are proposed in the Otay Lakes and Mesa area of the Refuge under this alternative.



Figure 4-22. Modified Alternative D – McGinty Mountain Area, Otay-Sweetwater Unit



Figure 4-23. Modified Alternative D - Las Montañas Area, Otay-Sweetwater Unit



Figure 4-24. Modified Alternative D – Sweetwater River Area, Otay-Sweetwater Unit



Figure 4-25. Modified Alternative D - San Miguel Mountain Area, Otay-Sweetwater Unit



Figure 4-26. Modified Alternative D – Otay Mesa and Lakes Area, Otay-Sweetwater Unit



Figure 4-27. Modified Alternative D – Del Mar Mesa Vernal Pool Unit



Figure 4-28. Uses and Ownerships Surrounding the Area Proposed for Hunting in Modified Alternative D

Specific details of the proposed hunting program for the Otay-Sweetwater Unit will be further defined in a step-down hunt plan, to be developed following the approval of the CCP. Step-down planning will involve the hunting community and will include an opportunity for public input. The official opening of the Refuge to hunting requires that a notice be published in the Federal Register, which will be done as part of the Service's annual final rule on Refuge-Specific Hunting and Sport Fishing Regulations.

Following the completion of a hunt plan and processing of an opening package, approximately 160 acres will be opened to hunting. Hunting will generally occur in accordance with CDFW regulations for big game, resident small game, and resident and migratory upland game birds, although refuge-specific conditions may be applied for specific species. This is also an area where, with the assistance of the hunting community, a youth hunting program could be developed. Since the Refuge does not have frontage along Otay Lakes Road, access to the Refuge will likely be through the CDFW lands. During the development of the step-down hunt plan, Refuge staff will work with adjacent land managers (e.g., CDFW, BLM) in an effort to identify options for improving hunting access into this and adjacent hunting areas from Otay Lakes Road.

Fishing. The Refuge would remain closed to fishing as described in Alternative B. Wildlife Observation/Photography. Opportunities for wildlife observation and photography would be similar to those discussed under Alternative C.

Interpretation. The proposals for interpretation under the selected action are the same as those described under Alternative C with the following exceptions: an interpretive trail will not be provided in the vernal pool area on the Otay-Sweetwater Unit and a multiple use trail rather than an interpretive trail, will be provided on Lot 707.

<u>Environmental Education</u>. All of the proposals related to the implementation of environmental education programs on the Refuge, as described under Alternative C, would also be implemented under the selected action.

# **Other Public Uses**

Designated Trail Plan. Public access onto the Refuge is provided via a designated trail system, as illustrated in Figure 4-29 and 4-30 for the Otay-Sweetwater Unit. Figure 4-27 illustrates the trails proposed in the Del Mar Mesa Vernal Pool Unit. With a few exceptions for short interpretive trails, all of the trails on the Otay-Sweetwater Unit will be non-motorized multiple use trails, accommodating hikers, mountain bikers, and equestrians. The designated trail system has been designed to ensure compatibility with Refuge purposes and the mission of the National Wildlife Refuge System. It also takes into consideration the specific purposes for which individual parcels have been included within the Refuge. Originally, a step-down trail plan was to be developed following completion of the CCP, however, as a result of considerable input from the public during the public review period for the draft CCP/EA, additional meetings were held with trail advocates to receive input on specific trail proposals and gather additional input on the desire for a more interconnected trail system.



Figure 4-29. Modified Alternative D – Trail Plan for the McGinty Mountain Area



Figure 4-30. Modified Alternative D – Trail Plan for the Otay-Sweetwater Unit South of McGinty Mountain

Refuge staff hiked over much of the Refuge to evaluate site conditions and examine the various routes indicated on the maps prepared by trail users at four trail user meetings conducted during the CCP public review process, as well as proposals for specific trail routes that were received in letters or emails during the public comment period. Refuge staff walked these and essentially all of the trails, pathways, and old roads present on the Refuge. Some routes were recently created, while others have obviously been used for a long time. Other access routes have not been used in many years. Trail use patterns and site conditions were considered during the process of determining how best to achieve a trail system that meets Refuge purposes and addresses the concerns raised by the public.

The final trail plan takes into consideration the results of on-site analysis, along with data related to listed and sensitive species occurrences and the locations of sensitive habitat types. Also considered were issues related to legal access onto the Refuge and concerns expressed by adjacent property owners, land managers, and utilities. The final trail plan is intended to ensure the protection of listed and sensitive species and habitats, while also meeting the public's desire for an interconnected trail system within the Refuge and to the regional trail network where legal access is available.

The designated trail system also takes into consideration the County's trail plans for the area. Where ever possible we have provided the proposed alignment or a similar more appropriate alignment that considers biological resources and topography. There are however exceptions. Alignments are not included in the final trail plan if they impact listed or MSCP-covered species; alter the habitat quality of lands included within a mitigation bank or on land set aside as mitigation for impacts related to existing developments; and/or pass through or provide access to lands for which we have no legal access rights.

Examples include the portion of the Las Montañas area located north of Highway 94 (to protect habitat known to support the endangered Quino checkerspot butterfly), connections to properties located to the east and south of the southern Las Montañas area (to avoid directing trail users onto private property or private roads for which we have no access agreements); and the trail proposed to extend from the Sweetwater River east around San Miguel Mountain peak (to protect steep slopes and important golden eagle foraging areas).

The conditions on and off the various old roads, trails, and pathways within the Refuge were documented. Some of these routes follow the existing contours of the terrain and exhibit minimal erosion and relatively few off-trail impacts. A number of the trails and old roads travel down steep slopes instead of following the contours of the land. The result is deeply incised trail treads, pathways with serious cross-slope issues, and/or highly rutted trails with expanding footprints as users attempt to avoid disturbed sections. Use of these unsustainable trails has and will continue to result in excessive erosion, indirect impacts to sensitive vegetation from eroded soils, and direct loss of sensitive vegetation. There was also evidence of recent vegetation removal to create bike jumps and user-created trails that extend through endangered plant habitat.

Those trails that are generally sustainable and provide opportunities for users to enjoy and appreciate the resources protected on the Refuge have been incorporated into the final trail plan. The final trail plan also includes proposals for rehabilitating some of the existing trails through improvements to the trail tread, incorporation of measures to effectively move water off the trail, and/or realignment of particularly bad sections. In addition, several new trail connections are proposed for construction with assistance from trail

volunteers. To protect land and water quality, unsustainable access routes or routes that threaten habitat quality for listed and sensitive species will be closed.

Several new trails are proposed that will provide sustainable trail connections that do not currently exist. These include the construction of a sustainable trail between Hidden Valley and the Sweetwater River Trail, a trail that would provide access from Mother Miguel Mountain to the Sweetwater River Trail, and working in cooperation with the County, a trail connection from the Sweetwater River Trail to Jamacha Drive via The Pointe housing development. The specific alignments of these trails are yet to be determined and will require funding, staffing, and most importantly volunteer assistance. Working in partnership with the County and the Sweetwater Authority, a potential new route for the Sweetwater River Trail is under consideration that will avoid impacts to vernal pool habitat. The new alignment would also replace a portion of the trail that is highly eroded.

The final trail plan also includes a trail to the top of Mother Miguel Mountain, with plans to rehabilitate the existing trail to reduce erosion and improve the trail experience. Trail rehabilitation will occur in large part through the volunteer efforts of the San Diego Mountain Biking Association and Bonita Bikers, with additional assistance from the equestrian community.

Another consideration in the development of the final trail plan was the availability of legal access onto the Refuge and from the Refuge onto adjacent lands. Due to the Refuge's current ownership pattern, little of the Refuge abuts the public right-of-way. For instance, in the McGinty Mountain area, trail access onto the Refuge is available from a parking area located along the north side of Jamul Drive, approximately one-half mile west of Lyons Valley Road, but this access point is only possible because of existing easements that other landowners have provided along the route to enable the public to access this portion of the Refuge. There is currently no legal access onto McGinty Mountain from the southwest or west.

<u>Although there is the potential for an access point onto the south Las Montañas area off</u> <u>Highway 94, it is unknown at this time if Caltrans would grant an encroachment permit for</u> <u>access from Highway 94 onto the property. At present, there are no other opportunities for</u> <u>legal access onto the site. Vista Sage Lane is a private road and no access is currently</u> <u>available through the properties to the south. Refuge staff will continue to explore access</u> <u>options in this area and once they have been resolved, additional trail planning for the area</u> <u>can proceed.</u>

Discussions with adjacent land managers in the McGinty Mountain area have been initiated to identify one or more options for providing legal access into the area from the west and/or northeast. If legal access can be obtained, additional trail planning will be implemented on McGinty Mountain.

The final trail plan includes a trail connection that will allow access from the Par 4 area to Sweetwater Summit Park, from Sweetwater Summit Park up Mother Miguel Mountain and back down onto the Sweetwater River Trail, and ultimately from Sweetwater Summit or Par 4 to Proctor Valley. Loop trails will be provided on the lower western slopes of San Miguel Mountain and in the McGinty Mountain area. A future trail system is also proposed for the south Las Montañas area; however, until access can be provided to this area from the public right-of-way, the area will remain closed. The Refuge will continue to work with CDFW, the Sycuan Band of the Kumeyaay Nation, and the Kumeyaay-Diegueno Land  $\underline{Conservancy\ to\ identify\ a\ feasible\ access\ point\ onto\ McGinty\ Mountain\ from\ the\ east\ and/or\ the\ west.}$ 

<u>Trail use in the Del Mar Mesa Vernal Pool Unit is proposed consistent with the City of San Diego's approved Carmel Mountain and Del Mar Mesa Preserves Resource Management Plan (City of San Diego 2015).</u>

<u>Trail Staging Areas. This alternative includes the trail staging area proposals described</u> <u>under Alternative D with the exception of the staging area proposed off of Sloane Canyon</u> <u>Road. Under this alternative, no staging area will be provided at this location. Refuge staff</u> <u>will continue to work with adjacent land managers to identify a more appropriate location</u> <u>for trail staging in this area.</u>

Although a staging area is proposed for the southern portion of the Las Montañas Area, no funding is currently available and an appropriate location has not yet been identified. Vista Sage Lane is a private road and would require agreements with the existing landowners to provide public access to the Refuge from this roadway.

<u>Access and trail staging for the Del Mar Mesa Vernal Pool Unit is provided in accordance</u> with the City of San Diego's Carmel Mountain and Del Mar Mesa Preserves Resource <u>Management Plan (City of San Diego 2015).</u>

Potential for Seasonal Closure of Specific Trail Segments. Although the final trail plan has been designed to avoid important habitat for listed species, due to the number of listed species supported on the Refuge, it may be necessary to close one or more trail segments to protect listed species during nesting or other vulnerable stages of their life cycles. For instance, trails located within habitat known to support Quino checkerspot butterfly larvae could be subject to seasonal closure to protect the larvae while they are vulnerable to trampling. Additionally, if golden eagles are observed making preparation for or tending a nest, a disturbance avoidance area would be established around the nest site with a radius of approximately 4,000 feet (1,220 meters). If a trail is located within the disturbance avoidance area, the trail would be closed until the eagle chicks have fledged or the nest is no longer occupied. Seasonal closures would be posted on Refuge kiosks and the affected segment signed as temporarily closed to all trail use.

Trail Wayfinding. Another component of this designated trail system is the development and implementation of a trail wayfinding program. This program would include:

- Design, printing, and distribution of a Refuge trail map;
- Installation of kiosks at trailheads;
- <u>Placement of trail maps at trailheads and directional/mileage signs at major trail</u> <u>intersections;</u>
- <u>Installation of regulatory signs to inform users to stay on the designated trail</u> <u>system and keep all dog's on a leash; and</u>
- <u>Installation of fencing or other barriers where necessary to better direct users</u> <u>down the appropriate pathway and away from sensitive resources.</u>

<u>Trail Volunteers. The existing volunteer trail patrol on the Refuge would be expanded to assist the Refuge staff in monitoring trail use and updating the staff on potential hazards, maintenance issues, and inappropriate trail activities. In addition, new partnerships would be developed and existing partnerships expanded to ensure that all of the trails proposed</u>

throughout the Refuge are maintained in a manner that minimizing impacts to resources and maximizes the trail user's experience.

<u>Trail Accessibility.</u> Several actions are proposed to improve trail accessibility for all users. These actions, which would be implemented per available funding, include:

- <u>Retrofitting the approach ramps of the Sweetwater River Trail Bridge to comply</u> with the Accessibility Guidelines for Outdoor Developed Areas;
- Ensuring that accessibility is maximized to the extent possible when creating new trails, implementing trail improvements, and rerouting a trail segment; and
- <u>Repairing or realigning degraded segments of the Sweetwater River Trail.</u>

# **Other Public Uses**

<u>Geocaching</u>. <u>Geocaching on the Refuge would not be permitted, but EarthCache sites, as</u> <u>described under Alternative C, may be provided under the selected action.</u>

<u>Research.</u> The proposals related to research under Alternative B would also be implemented under the selected action.

# C. <u>Refuge Operations</u>

The proposals related to Refuge operations as described under Alternative C would also be implemented under the selected action.

# D. Fire Management

The fire management strategies proposed under Alternative B would also be implemented under the selected action.

# E. Law Enforcement

As described under Alternative D, law enforcement activities associated with the selected action would be expanded beyond those described under Alternative A to include the management and regulation of the proposed hunting program.

# F. Land Acquisition

Land acquisition efforts would continue as described under Alternative A.

# G. Cultural Resource Management

<u>Cultural resource management under the selected action would include all of the actions</u> <u>described under Alternatives A and B.</u>

# H. Environmental Contaminants Coordination

<u>Coordination related to environmental contaminants would be the same as that described</u> <u>under Alternative A.</u>

# I. Volunteers and Partners

<u>Proposals related to volunteers and partnerships expand those described under</u> <u>Alternatives A and B to include volunteers and partnerships necessary to implement</u> <u>construction, monitoring, patrol, and maintenance of the designated trail system.</u>

# 4.5 Alternatives Considered but Eliminated from the Detailed Analysis

The alternatives development process is designed to allow consideration of the widest possible range of issues and potential management approaches. During this process, various objectives and strategies for achieving the goals for the San Diego NWR were considered but not selected for detailed study.

<u>Opening the Entire Otay-Sweetwater Unit for Hunting</u>. Hunting is identified by the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act), which amended the National Wildlife Refuge System Administration Act (Administration Act), as one of the six wildlife-dependent recreational uses of a refuge. The overarching goal of the Refuge System wildlife-dependent recreation policy is to enhance opportunities and access to quality visitor experiences on refuges and to manage the refuge to conserve fish, wildlife, plants, and their habitats. Hunting is an important wildlife management tool in achieving this goal and is recognized as a healthy, traditional outdoor pastime, deeply rooted in the American heritage. It is recognized as a priority general public use of the Refuge System that should receive enhanced consideration over non-priority uses. In addition, a guiding principal of the refuge hunt programs is to minimize conflicts with visitors participating in other compatible wildlife-dependent recreational activities including wildlife observation, photography, environmental education, and interpretation.

In an effort to support the goals of the Refuge System and the guiding principles for refuge hunt programs, we considered a range of public use alternatives. A proposal to open the entire Otay-Sweetwater Unit to hunting was not studied in detail for several reasons including the desire to minimize conflicts between hunting activities and visitors participating in other compatible wildlife-dependent recreational activities and the need to minimize disturbance and loss of listed wildlife and plant species within the Refuge.

The Otay-Sweetwater Unit is located within the urban interface, in general proximity to large population areas. As a result, this portion of the Refuge is visited daily by adjacent residents and visitors from throughout the immediate and greater San Diego County area who are participating in wildlife observation, photography, and general trail use. Opening all of this area to hunting under these circumstances would likely result in some level of conflict between users. Another consideration involved the number of listed species present within the Otay-Sweetwater Unit and the need to close portions of the Refuge to all uses in an effort to achieve the Refuge purpose of conserving listed and threatened species.

Based on all of these considerations, the draft CCP/EA does not address in detail the potential for opening all of the Otay-Sweetwater Unit to hunting. Instead, specific areas within the Refuge have been analyzed as potential hunting areas. This would allow some portions of the Refuge to remain closed to all use; some portions to be open to hunting, and other areas set aside for non-consumptive wildlife-dependent recreational uses. This approach would minimize conflicts between users, as well as minimize disturbance and other impacts to listed and sensitive species.

<u>Opening Portions of the Refuge to Fishing</u>. The potential to provide the public with opportunities for recreational fishing along the Sweetwater River was initially evaluated because fishing is a priority public use, as identified in the National Wildlife Refuge Improvement Act. The refuge is not currently open to fishing, although evidence of fishing activity has been documented along the Sweetwater River, particularly around some year-round pools that exist along the Sweetwater River as it narrows south and west of State Highway 94.

There are several wetland areas on the Refuge: Sweetwater River, which flows through the Sweetwater River and San Miguel Mountain areas of the Otay-Sweetwater Unit; Steele Canyon Creek, an ephemeral drainage with only a few small pools holding water for all or most of the year; and three small stock ponds located along the base of Mother Miguel Mountain, only one of which holds water throughout the year. Of these areas, only the Sweetwater River is known to support game fish, however, no native game fish have occurred on the Refuge since the southern steelhead was extirpated from the Sweetwater River watershed (Good et al. 2005). While no specific fish surveys have been conducted on the Refuge, casual observations confirm the presence of four non-native fish species in the Sweetwater River. These include three game fish (i.e., green sunfish, largemouth bass, carp) and western mosquitofish. The non-native species red swamp crayfish and Asian clam are also present in the Refuge.

A review of the existing conditions within and along the river provided adequate justification for not pursuing the establishment of fishing opportunities on the Refuge. These include the lack of native game fish in the Sweetwater River, proposals in the CCP to eradicate the non-native fish and other non-native aquatic species present in the river because they prey on listed and sensitive species, the presence of listed and other sensitive breeding bird habitat present along the river banks, and the nature of the water flows within the Sweetwater River, which are managed by the Sweetwater Authority. In addition, a number of the listed species present on the Refuge, as well as several species that we propose to re-establish on the Refuge under one or more alternatives, are depend upon the aquatic habitat and associated native wetland plants supported along the Sweetwater River.

Opportunities for fishing are available upstream of the San Diego NWR at Loveland Reservoir, which is open most days throughout the year, and downstream of the San Diego NWR at Sweetwater Reservoir and Otay Lake, both of which are open several days a week throughout the year.

Based on all these factors, the proposal to permit fishing on the Refuge was not selected for detailed study with the draft CCP/EA.

<u>Incorporating All Existing User-Created Trails into the Designated Trail System.</u> Numerous unofficial pathways, old roads, utility easements, and user-created trails currently crisscross the Refuge, including more than 210 miles of user-created pathways and old roads within the Otay-Sweetwater Unit. The effects to refuge resources from trail use can range from soil erosion and degraded water quality to the direct loss of listed or sensitive species. Foot traffic, bicycle tires, and horse hooves can all cause physical impacts on soil surfaces, particularly when the trail surface is damp or wet or the trail grade is steep (Cessford 1995). It is anticipated that trail use within the Refuge will continue to cause soil erosion along some trails until a designated trail system is established, problem trails within the designated system are stabilized and/or rerouted, and poorly laid out pathways are closed and revegetated.

Trail use can also result in wildlife disturbance. The effects of disturbance vary with the wildlife species involved and the type, level, frequency, duration, and time of year that the disturbance occurs. A number of studies conducted to evaluate the effects of trail use on wildlife have found that wildlife observation can "negatively impact wildlife by altering wildlife behavior, reproduction, distribution, and habitat" (DeLong and Schmidt 2000). Human induced avoidance by wildlife can prevent animals from using otherwise suitable habitat (Whittaker and Knight 1998). Knight and Cole (1991) found that behavioral changes caused by disturbance from recreational use can include short-term shifts in habitat use and complete abandonment of disturbed areas in favor of undisturbed sites. Poorly designed or undefined trails can also lead to unauthorized off-trail

activity, resulting in damage or loss of vegetation, trampling of invertebrates and reptiles, and/or disturbance or damage to nesting and breeding wildlife.

To minimize the potential for impacts to Refuge resources, particularly listed and sensitive species, the current proliferation of unauthorized, poorly defined trails needs to be eliminated in favor of a designated system of sustainable trails. This designated system of trails would allow large portions of the Refuge to be closed to any public use, while still providing the public with opportunities to experience, observe, and enjoy the resources protected within the Refuge. Maintaining the current configuration of crisscrossing trails would not enable us to achieve the Refuge goal of habitat protection and the Refuge purpose of listed species conservation. Therefore, the draft CCP/EA does not address in detail the potential for incorporating all existing user-created trails into the designated trail system.

<u>Non-lethal Feral Pig Control Methods</u>. This alternative was considered in response to public comments received by the Forest Service on their environmental assessment for Feral Pig Damage Control Project on Cleveland National Forest and Bureau of Land Management Lands (USDA Forest Service 2013). Public comments recommended non-lethal methods of feral pig population control such as pig relocation and sterilization.

Feral pig control efforts have been carried out for many years across the United States and a variety of methods have been tried. Lethal methods are the most widely used and recognized as the most effective means of feral pig control (West et al. 2009). Although in some situations non-lethal methods may be appropriate and effective, in most cases they are not a good option, either because they do not work well or are too expensive (Hamrick et al. 2011a, 2011b). Methods such as relocation of feral pigs are complex, labor intensive, and not practical given the magnitude of the problem (Sweitzer 2003). There are no known facilities in the region that are capable of lawfully handling captured feral pigs for relocation purposes. In addition, wild pigs are known carriers of at least 45 different parasites (external and internal) and diseases (bacterial and viral) that pose a threat to livestock, pets, native wildlife, and in some cases, human health (Hamrick et al. 2011a).

In addition to relocation, other non-lethal methods of control include fertility control, fencing, repellents, and diversionary feeding. Fertility control can be effective in decreasing the numbers of feral hogs in cases where they occur in isolated populations (Massei et al. 2011), however, where immigration and emigration affect the population dynamics, this approach is generally ineffective in addressing ongoing habitat destruction. This approach also requires that the pigs be trapped, injected, and then released back into the native habitat areas. This is costly and fails to address the purpose and need for control, which is to protect sensitive resources and water quality from the adverse effects of pig activity on the Refuge.

The use of exclosure fencing to protect sensitive resource areas does have some benefits, but would not be effective in meeting the overall purpose and need for control, which is to keep all pigs off the Refuge. This is because it would be impractical to fence the enter Refuge and even if it was possible, it would have an adverse effect on public access. Fencing can also result in increased damage to resources in areas adjacent to exclosure fencing.

Other methods such as the use of repellents and diversionary feeding are generally ineffective for large habitat areas. Repellents are only effective for a short time and its use is only practical at a small scale. Similar to fencing, the use of repellents in one area could concentrate damage in adjacent areas (Massei et al. 2011). Diversionary feeding, which is more often considered in agricultural settings, is labor intensive and has the potential to increase reproductive output, which would exacerbate the existing problem.

The exclusive use of non-lethal methods of control would fail to provide a permanent solution to the feral pig problem in the region and would not address the purpose and need for this action. It is for this reason that this alternative was dropped from further consideration and will not be further evaluated in this document.

<u>Distributing Feral Pig Meat for Human Consumption</u>. This alternative was considered in a desire on the part of the Service that feral pig meat should not be wasted. Under this alternative, feral pigs would need to be captured alive and transported to an approved USDA inspected slaughter facility. The closest such facilities for pigs are located in northern California, several hundred miles from the project area. Capturing pigs alive in remote locations with rugged topography, dense vegetation, and limited access and transporting them to approved slaughter facilities would not be practical or financially feasible given the scale of the project. Therefore, this alternative was not given further consideration.

<u>Use Military or Volunteers to Dispatch Feral Pigs</u>. The alternative that volunteers or military personnel be offered the opportunity to hunt feral pigs was considered in response to public comments received by the Forest Service on their environmental assessment for Feral Pig Damage Control Project on Cleveland National Forest and Bureau of Land Management Lands (USDA Forest Service 2013). The proposal for military personnel to implement the program is not within the direct mission of the military. In addition, if military priorities shift, the program might not be completed. Effective removal of feral pigs from impacted areas requires the consistent presence of trained personnel throughout the control process.

With respect to volunteers, these programs are prone to turnover and participants vary considerably in their skills and physical abilities. In addition, the government assumes liability and is responsible for physical injuries or accidents when incurred as part of official volunteer duties. A single accident could significantly increase the cost of operations. To address issues of safety and efficiency, highly trained and experienced professional sharpshooters are required to carry out pig removal efforts on the Refuge. For these reasons, the use of military or volunteers to implement feral pig control was not consideration in detail.

<u>No Aerial Dispatch Alternative</u>. An alternative that addresses feral pig control without an aerial dispatch component (i.e., using trained sharpshooters to remove feral pigs in remote areas using a helicopter) was considered because of public concern about human and animal welfare/humane treatment associated with implementing lethal control of pigs from helicopters. However, we eliminated this alternative from detailed analysis for a variety of reasons, including our need to have access to all available tools to ensure early and complete control of feral pigs on the Refuge.

Although the potential for using this control technique on the Refuge is limited, we believe it is a valuable tool that may be necessary to completely remove feral pigs from Refuge lands. Aerial dispatch could assist in early, effective removal of pigs in inaccessible areas. Further, early control of the pig population will reduce the population numbers and minimize the potential for reproduction, thereby reducing the total number of pigs that would need to be killed.

Concerns about public safety will be mitigated by only using highly trained professionals and by conducting aerial operations in closed or inaccessible areas of the Refuge. This technique is being used elsewhere in the U.S. without human safety incidents. Concerns about noise will be mitigated by operational buffers around developed areas.

# 4.5.1 Comparison of the Alternatives for the San Diego NWR by Issue

Summarized in Table 4-5 is an issue-by-issue comparison of the four management alternatives described in this chapter for the San Diego NWR. Additional details are provided throughout Chapter 4.

Table 4-5 Comparison of Alternatives for the San Diego NWR CCP						
Issue Raised During Public Scoping	Alternative A	Alternative B	Alternative C	Alternative D	<u>Modified</u> <u>Alternative D</u> (Selected Action)	
Wildlife and Habitat	t Management	-	-	-		
Cooperatively conserve and manage conserved lands within the Refuge acquisition boundary regardless of ownership	In cooperation with a variety of partners, continue current conservation and management activities (e.g., reduce off-road vehicle activity; address illegal trespass, dumping, homeless encampments; species and habitat surveys; MSCP monitoring protocols).	Implement management activities on the Del Mar Mesa Vernal Pool Unit in accordance with the proposed Carmel Mountain and Del Mar Mesa Preserves Management Plan; on the Otay-Sweetwater Unit, continue to work with existing partners and seek additional partners as necessary to ensure seamless management of adjacent conserved lands.	Same as Alternative B	Same as Alternative B	<u>Same as Alternative B</u>	

Table 4-5   Comparison of Alternatives for the San Diego NWR CCP						
Issue Raised During Public Scoping	Alternative A	Alternative B	Alternative C	Alternative D	<u>Modified</u> <u>Alternative D</u> (Selected Action)	
Conduct habitat and species monitoring and surveys in accordance with accepted methods and protocols	Conduct MSCP protocol surveys for native habitat and listed species; conduct opportunistic inspections for San Diego thornmint, Hermes copper, and other species.	Same as Alternative A plus expand current species and habitat monitoring to include monitoring of population trends for least Bell's vireo, monitoring per approved protocols for Tecate cypress, Riverside fairy shrimp, and Thorne's hairstreak; expand the areas monitored for Quino checkerspot butterfly; and periodically monitor oak stands for signs of insect infestations and/or introduced plant pathogens.	Same as Alternative B	Same as Alternative B	<u>Same as Alternative B</u>	
Control invasive plant and animal species	Continue to control invasive weedy plants in recent burn areas, riparian areas, and habitat restoration or enhancement areas.	Control invasive plants and aquatic animals through an integrated approach to pest management; partner with other agencies to monitor and control of wild turkey and wild pig on the Refuge.	Same as Alternative B	Implement an IPM Plan, per Alternative B, and monitor and, if necessary, eradicate feral pigs from the Refuge.	<u>Same as Alternative D</u>	

Table 4-5 Comparison of Alternatives for the San Diego NWR CCP							
Issue Raised During Public Scoping	Alternative A	Alternative B	Alternative C	Alternative D	<u>Modified</u> <u>Alternative D</u> (Selected Action)		
Restore and enhance native habitats	On the Otay- Sweetwater Unit, continue to maintain existing restoration and enhancement projects, including vernal pool restoration, control of non-native weeds in recent burn areas, cactus revegetation sites, Otay tarplant enhancement, and others.	Same as Alternative A plus seek funding to: improve coastal sage scrub and vernal pool habitat by controlling non-native weeds and restoring key species; reestablish native grasslands; restore and enhance Quino checkerspot butterfly habitat; and enhance riparian and other wetland habitat on the Otay-Sweetwater Unit. Assist in the implementation of species and habitat management actions proposed for the Del Mar Mesa Reserve (refer to Table 4-3).	Same as Alternative B	Same as Alternative B	Same as Alternative B		

Table 4-5   Comparison of Alternatives for the San Diego NWR CCP						
Issue Raised During Public Scoping	Alternative A	Alternative B	Alternative C	Alternative D	<u>Modified</u> <u>Alternative D</u> (Selected Action)	
Expand occurrences and/or reintroduce appropriate listed and sensitive species on the Refuge	On the Otay- Sweetwater Unit, continue current management efforts to support listed species, including enhancing habitat quality to support Otay tarplant; protecting existing populations of San Diego ambrosia; and protecting and enhancing vernal pool habitat.	Same as Alternative A plus establish additional populations of Mexican flannelbush; create and install artificial bat roosting habitats; install burrowing owl boxes; and enhance various wetland habitats to support arroyo toad, red-legged frog, and southwestern pond turtle.	Same as Alternative B	Same as Alternative B	<u>Same as Alternative B</u>	
Monitor groundwater and surface water quality and quantity	No monitoring is currently occurring on the Refuge.	Seek funding to conduct periodic surface water quality monitoring and annual monitoring of groundwater levels in riparian and oak woodland habitats.	Same as Alternative B	Same as Alternative B	<u>Same as Alternative B</u>	
Implement fire management actions to protect sensitive habitat and listed species	Implement full suppression.	Support the use of prescribed burning as a fire and habitat management tool (An updated Fire Management Plan is required before this can be implemented.)	Same as Alternative B	Same as Alternative B	<u>Same as Alternative B</u>	

	Table 4-5   Comparison of Alternatives for the San Diego NWR CCP						
Issue Raised During Public Scoping	Alternative A	Alternative B	Alternative C	Alternative D	<u>Modified</u> <u>Alternative D</u> (Selected Action)		
Public Use							
Open the Refuge to hunting	Hunting is not permitted on the Refuge.	Refuge would remain closed to hunting.	Open portions of the Refuge to hunting including 160 acres in the Otay Mesa and Lakes Area; as well as hunting of rabbit, dove, and quail on a portion of the Las Montañas area (about 300 acres) and a portion of the McGinty Mountain area (about 400 acres). Bowhunting of deer also proposed for a portion of the McGinty Mountain area.	Open 160 acres on the Otay Mesa and Lakes Area to hunting. Specific regulations will be developed as part of a step-down hunt plan.	Same as Alternative D		
Provide an opportunity for fishing	Fishing is not permitted on the Refuge.	Same as Alternative A.	Same as Alternative A	Same as Alternative A	Same as Alternative A		
Maintain current trails for multiple use	Only the Sweetwater River and Loop Trail and the Par Four Trail are officially recognized Refuge trails; all other trails are subject to closure or rerouting.	Both multiple use and pedestrian-only trails will be provided within designated trail corridors. All existing user-created trails are subject to closure, realignment, or rehabilitation.	Same as Alternative B, although the number of trails and permitted trail uses would vary.	Same as Alternative B, although the number of trails and permitted trail uses would vary.	Implement a system of designated trails that include existing trails, where appropriate, and new trails where needed to provide connections between areas within the Refuge or to adjacent areas where legal access is available.		

Table 4-5   Comparison of Alternatives for the San Diego NWR CCP						
Issue Raised During Public Scoping	Alternative A	Alternative B	Alternative C	Alternative D	<u>Modified</u> <u>Alternative D</u> (Selected Action)	
Expand public use opportunities, particularly for wildlife observation, photography, environment education, and interpretation	Maintain and support the existing wildlife- dependent recreational uses on the Refuge.	Within the Otay- Sweetwater Unit, facilitate wildlife observation and photography from a designated trail system; install a photo blind adjacent to a pond in the San Miguel Mountain area; expand interpretive signage near the Sweetwater River; and expand the existing environmental education program; and provide interpretive materials in kiosks at trailheads. Assist in the implementation of interpretive signage on Del Mar Mesa in accordance with the City's approved management plan for the larger preserve.	Same as Alternative B plus create an interpretive trail on Lot 707, a vernal pool interpretive trail on the Shinohara parcel; and develop an interpretive program involving the EarthCache sites.	Same as Alternative B plus create a vernal pool interpretive trail on the Shinohara parcel; develop an interpretive program involving the EarthCache sites; and develop a birding trail and interpretive program for the south Las Montañas area.	Same as Alternative B plus; develop an interpretive program involving the EarthCache sites; and develop a birding trail and interpretive program for the south Las Montañas area when access issues to this area have been resolved.	

Table 4-5 Comparison of Alternatives for the San Diego NWR CCP							
Issue Raised During Public Scoping	Alternative A	Alternative B	Alternative C	Alternative D	<u>Modified</u> <u>Alternative D</u> (Selected Action)		
Establish a designated trail system for the Refuge and develop a trail sign plan	A designated system of trails is not currently in place for the Refuge. The county Sweetwater River and Loop Trail and the Par Four Trail used by equestrians and others are currently the only authorized trails on the Refuge. These trails are available for non- motorized multiple uses (i.e., hiking, biking, horseback riding).	For the Otay- Sweetwater Unit, general corridors within a designated trail system are proposed with specific alignments to be determined during step-down trail planning. A wayfinding and trail sign plan will also be developed during step-down planning. Trails will be a combination of multiple use regional trails and pedestrian- only trails. On the Del Mar Mesa Vernal Pool Unit, trails will be provided consistent with those shown in the City's draft management plan.	Same as Alternative B, although the number of trails and permitted trail uses would vary.	Same as Alternative B, although the number of trails and permitted trail uses would vary.	Implement a system of designated trails that include existing trails. where appropriate, and new trails where needed to provide connections between areas within the Refuge or to adjacent areas where legal access is available.		

Table 4-5   Comparison of Alternatives for the San Diego NWR CCP						
Issue Raised During Public Scoping	Alternative A	Alternative B	Alternative C	Alternative D	<u>Modified</u> <u>Alternative D</u> (Selected Action)	
Permit geocaching on the Refuge	Placing traditional geocaches on the Refuge is not permitted. Caches are removed when identified.	Same as Alternative A plus implement the procedures developed by Groundspeak to inform cache owners when a cache is removed from the Refuge.	Same as Alternative B plus develop a Refuge- sponsored geocaching program, possibly "EarthCache" sites, that would be a component of the Refuge's interpretive program.	Same as Alternative C	<u>Same as Alternative C</u>	
Provide a visitor center on the Refuge	There is currently no visitor center for the San Diego NWR.	Seek funds to design and construct visitor facilities in the Sweetwater River, including a temporary visitor contact station, restrooms, parking, trailhead, and interpretive elements.	Seek funds to design and construct visitor facilities in the Sweetwater River; including a refuge office, permanent visitor contact station, restrooms, parking, trailhead, and interpretive elements.	Same as Alternative C	<u>Same as Alternative C</u>	
Provide opportunities for research that will benefit Refuge management and species and habitat conservation	Research projects that can provide benefits to the Refuge are permitted via the issuance of a Special Use Permit.	Work with academic institutions and other public, private, and non- profit researchers to expand the kinds of research projects being implemented on the Refuge to address a wider range of issues affecting Refuge management and species conservation.	Same as Alternative B	Same as Alternative B	<u>Same as Alternative B</u>	

Table 4-5   Comparison of Alternatives for the San Diego NWR CCP						
Issue Raised During Public Scoping	Alternative A	Alternative B	Alternative C	Alternative D	<u>Modified</u> <u>Alternative D</u> ( <u>Selected Action)</u>	
<b>Refuge Operations</b>	-	-				
Identify and protect cultural resources	All applicable regulations and policies related to the protection of cultural resources are followed.	Same as Alt. A. plus pursue with the Kumeyaay Cultural Repatriation Committee a MOU to address the inadvertent discovery of NAGPRA-related resources on the Refuge.	Same as Alternative B.	See Alternative B, in addition, the control of feral pigs would reduce the threat of disturbance from pig activity to subsurface cultural resources	<u>Same as Alternative D</u>	
Cleary post Refuge boundaries and secure entry points to reduce unauthorized access	Boundary signs are installed or replaced as necessary; partnerships exist with adjacent property owners to secure entry points onto the Refuge through adjacent parcels.	Install additional signs to ensure that all boundaries are clearly posted, and install new fencing and gates as needed.	Same as Alternative B	Same as Alternative B	<u>Same as Alternative B</u>	
Expand the current volunteer program	Volunteers are currently managed in partnership with other entities.	Add one full-time equivalent (FTE) community outreach position to the Refuge Complex staff, with 0.5 FTE devoted to volunteer assistance at the San Diego NWR.	Same as Alternative B	Same as Alternative B	Same as Alternative B	

Table 4-5   Comparison of Alternatives for the San Diego NWR CCP						
Issue Raised During Public Scoping	Alternative A	Alternative B	Alternative C	Alternative D	<u>Modified</u> <u>Alternative D</u> (Selected Action)	
Continue acquisitions within acquisition boundary from willing sellers	Opportunistic acquisition of parcels from willing sellers continues per available funding.	Focus acquisition from willing sellers on parcels within MSCP- designated core areas and in areas identified by the MSCP as important linkages between core areas.	Same as Alternative B	Same as Alternative B	Same as Alternative B	

# 5 Environmental Consequences

# 5.1 Introduction

This chapter provides an analysis and evaluation of the environmental consequences of implementing the alternatives described in Chapter 4. These alternatives include:

# Alternative A - No Action

Alternative A proposes no changes to the present wildlife and habitat management actions implemented on the Refuge, and no new public use programs would be implemented. This alternative represents the baseline from which other "action" alternatives will be evaluated.

# Alternative B - Maximize Habitat Values and Species Protection

New and expanded wildlife and habitat management actions would be implemented under Alternative B to protect, restore, and enhance habitat values for listed and sensitive species on Refuge lands. The wildlife-dependent recreational uses currently occurring on the Refuge (i.e., wildlife observation, photography, environmental education, interpretation) would be managed to minimize disturbance to plants and wildlife, while also providing opportunities for the public to observe and appreciate the native species and natural lands protected within the Refuge. A designated system of trail would be developed that provides both non-motorized multiple trail use opportunities and pedestrian-only trails. Many existing user-created trails would be subject to closure, rehabilitation, or rerouting. No dogs would be permitted on the Otay-Sweetwater Unit. Public uses on the Del Mar Mesa Vernal Pool Unit would be permitted in accordance with the City of San Diego's Carmel Mountain and Del Mar Mesa Preserves Resource Management Plan, and such uses would be limited to the designated trail system.

# Alternative C - Expand Opportunities for Wildlife-dependent Recreational Uses

Alternative C proposes to expand the opportunities for wildlife-dependent recreational uses on the Otay-Sweetwater Unit, including providing hunting opportunities in designated locations within this Unit. The wildlife and habitat management activities proposed for the Refuge under Alternative C would remain generally consistent with those described under Alternative B. Additionally, public uses and access on the Del Mar Mesa Vernal Pool Unit would be consistent with those proposals presented in Alternative B. A designated system of trail would be developed that proposes to establish primarily non-motorized multiple use trails. Leashed dogs would be permitted on Refuge trails.

# <u>Alternative D (Preferred Alternative in the draft CCP/EA) - Optimize Species Protection While</u> <u>Providing Opportunities for Compatible Public Use</u>

Alternative D intends to implement all of the wildlife and habitat management activities described under Alternative B, as well as implement a Feral Pig Monitoring and Eradication Plan to protect refuge resources from damage caused by feral pigs.

Alternative D also proposes to provide a range of compatible public use opportunities that minimize disturbance to sensitive resources. Under this alternative, hunting is proposed on a portion of the Otay Mesa and Lakes management area and the designated trail system would include multiple use and hiking only trails. Leashed dogs would only be permitted on those trails designated for multiple use. Public access on the Del Mar Mesa Vernal Pool Unit would be consistent with the proposals described under Alternative B.

# Modified Alternative D (Selected Action)

After considering the range of comments provided during the public comment period, a modified Alternative D was evaluated for implementation. Under this alternative, all of the wildlife and habitat management actions proposed under Alternative D (including the implementation of the IPM Plan and Feral Pig Monitoring and Eradication Plan), along with the proposal for hunting in a portion of the Otay Lakes and Mesa area of the Refuge, would be implemented per available funding and staffing. The actions to be implemented under Alternative D in the Del Mar Mesa Vernal Pool Unit would also be implemented under the modified Alternative D. The differences between Alternative D and Modified Alternative D (Selected Action) include: elimination of the proposal to develop a vernal pool interpretive trail; a proposal to provide a trail in Lot 707, but no interpretation would be included in the trail design; elimination of a trail staging area and trail access route in the vicinity of Model A Ford Lane; and the identification of a designated trail system in the Final CCP that takes into consideration the comments received during the public comment period. This alternative also acknowledges that some areas of the Refuge will require future trail planning once legal access to the area has been acquired. Finally, under this alternative, Refuge staff will continue to work with adjacent land managers to identify legal access points for future trail connections onto the Refuge.

An evaluation of the impacts associated with implementing the various proposals included under Alternatives A, B, C, D, and Modified D has been conducted for each aspect of the environment described in Chapter <u>4 of the Final CCP</u>, including physical, biological, cultural, and socioeconomic resources. The adverse and beneficial effects of each alternative are generally described under several action categories, including wildlife and habitat management (including habitat enhancement and restoration), public use, and where applicable, Refuge operations. Cumulative effects (impacts) on the environment of implementing the four alternatives are presented later in this chapter.

# 5.2 Effects to the Physical Environment

Topics addressed under the physical environment section include direct and indirect effects to topography, visual quality, geology and soils, geological hazards, paleontological resources, mineral resources, agricultural resources, hydrology/water quality, climate change, air quality, greenhouse gas emissions, and contaminants.

Noise is not addressed in this section because no activities are proposed in proximity to sensitive noise receptors (i.e., residential uses) that would generate noise levels in excess of existing county standards. The potential for activities to generate what might be considered nuisance noise is addressed under land use compatibility in the section titled Effects to the Social and Economic Environment.

The criteria used in this document to determine if a particular impact represents a significant adverse effect are present here for each topic.

- <u>Topography</u> An adverse topographic effect is considered significant if grading or other land altering activity is proposed in a highly scenic area or would alter a locally or regionally important topographic landmark, or if any proposed activities would substantially alter the existing landform.
- <u>Visual Quality</u> An adverse visual impact would be considered significant if a proposal would substantially alter the natural landform or block public views to a public resource.
- <u>Geology, Soils, and Geological Hazards</u> Impacts related to geology and soils would be considered significant if a proposed action would trigger or accelerate substantial slope instability, subsidence, ground failure, or erosion affecting on-site facilities or adjacent facilities, such as roadway embankments and bridge abutments. Impacts would also be considered significant if any proposed structures would be susceptible to geological hazards, such as liquefaction, settlement, ground rupture, or lateral spreading.
- <u>Paleontological Resources</u> A significant adverse effect related to paleontological resources would occur if a proposed action could directly or indirectly damage a unique paleontological resource or site, or if grading or excavation would disturb the substratum or parent material below the major soil horizon in a paleontologically sensitive area.
- <u>Mineral Resources</u> A significant adverse effect related to mineral resources would occur if a proposed action resulted in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State, such as proposing incompatible uses on or within the vicinity (generally up to 1,300 feet) of an area classified as MRZ-2; on land classified as MRZ-3; on land underlain by Quaternary alluvium; or on or within the vicinity of areas containing industrial material and gemstone resources.
- <u>Agricultural Resources</u> A significant adverse effect on agricultural resources would occur if a proposed action would result in the conversion of a substantial amount of Prime Farmland or Farmland of Statewide Importance to non-agricultural use (e.g., commercial, residential, industrial use), or if uses proposed in proximity to existing agricultural areas could result in indirect impacts to the adjacent agricultural activities.
- <u>Hydrology</u> An adverse hydrologic effect is considered significant if an action would result in increased storm flooding on- or off-site, a net deficit in the aquifer volume, a drop in the

local groundwater table, or changes in historical storm flow direction and velocities that would trigger or accelerate slope/bank instability or erosion affecting facilities located both on and off the Refuge.

- <u>Water Quality</u> Adverse impacts to water quality would be considered significant if the action would violate any water quality standards or waste discharge requirements, substantially increase sedimentation or turbidity in water courses, introduce contaminants (non-point source pollution) into the watershed, or otherwise substantially degrade water quality.
- <u>Climate Change</u> The predicted effects of climate change on a proposed action would be considered significant if these effects would substantially alter or degrade sensitive habitats and/or habitats that support listed species, migratory birds, or other species of concern. In addition, effects of climate change would be considered significant if Refuge property, such as structures, trails, roads, signage, and other facilities, could be damaged or destroyed due to changing site conditions, including increasingly severe weather.
- <u>Air Quality</u> Direct adverse effects related to air quality would be considered significant if the action would result in emissions equal to or in excess of the NAAQS; sensitive receptors are exposed to substantial pollutant concentrations, including air toxics such as diesel particulates; or air contaminants are released beyond the boundaries of the Refuge.
- Significant indirect effects to air quality would occur if a proposed Refuge action results in the degradation of the existing level of service on adjacent roadways.
- <u>Greenhouse Gas Emissions</u> The Service has not developed a quantitative threshold for determining whether a project's GHG emissions will have a significant effect on the environment, and no statewide threshold has been adopted by the State of California. The California Air Pollution Officers Association (CAPCOA), in its publication "CEQA & Climate Change: Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act" (2008), does explore various options for establishing significance thresholds for GHG emissions. These options include setting the threshold at zero and setting a non-zero level for GHG emissions. Another option involves addressing project effects without establishing a threshold. This could be accomplished through a quantitative or qualitative evaluation of individual projects. Because significance thresholds for GHG emissions have yet to be established, our significance determination is currently based on the specific context of an individual action. To the extent possible, our determination is based on an estimate of the expected GHG emissions and the extent to which efforts are made to reduce expected emissions.
  - <u>Contaminants</u> Adverse effects related to contaminants are considered significant when constituents of concern are present in or could be introduced into the soil, groundwater, or surface water at levels that exceed standard screening levels for assessing ecological risk.

# 5.2.1 Effects to Topography

# 5.2.1.1 Alternative A – No Action

# Wildlife and Habitat Management

Conducting the wildlife and habitat management activities currently occurring on the Refuge (e.g., monitoring of Federal and State listed, endangered, and threatened species; restoring and enhancing native habitat; removing trash, debris, and illegal encampments; maintaining existing access roads, gates, and fencing; conducting scientific research) would require some soil disturbance, but no substantial alteration of the existing landform would occur. Therefore, continuing to implement these actions would not significantly affect existing site topography or any important topographic features located within the Refuge boundary.

# Public Use

Under Alternative A, trail use would continue on the Refuge generally as it is occurring today. There is the potential that some of the user-created trail segments present on the Refuge could be closed and possibly revegetated in an effort to protect sensitive Refuge resources and address user safety. Existing interpretive elements and environmental education programs would utilize the existing trail network; therefore, no new trail construction would occur under this alternative. No other facilities are proposed to accommodate public use. Continuation of the current public use program on the Refuge is not anticipated to significantly affect existing site topography or any important topographic features located within the Refuge boundary.

# **Refuge Operations**

The activities implemented to support Refuge operations under Alternative A result in minor, if any, physical changes to the natural landform. As a result, no significant adverse effects to existing landform are anticipated under Alternative A.

# 5.2.1.2 Alternative B

# Wildlife and Habitat Management

The management activities conducted under Alternative A would also occur under Alternative B. As described under Alternative A, none of these activities would result in adverse effects to topography. In addition, Alternative B calls for expanded habitat restoration and enhancement efforts within the Otay-Sweetwater Unit, which would require some site preparation (e.g., removal of invasive plants, minor soil disturbance). These actions would not result in any substantive changes to the topographic character of the site.

Other proposals, such as increased monitoring of species and habitat and implementation of an IPM Plan would have little, if any, effect on the existing landform, while actions to facilitate the reintroduction of one or more listed species could result in some small changes in the landform to improve habitat quality. These changes would most likely be limited to riparian areas where minor land alteration could be required to improve opportunities for water pooling to support certain life stages for arroyo toad and/or southwestern pond turtle. In some cases, this alteration of landform would be required to correct previous human alteration of the riparian system. Such changes would be minor and once the sites have revegetated, the alterations would be virtually undetectable. No significant adverse effects to existing topographic features are therefore anticipated from the implementation of these activities.

The wildlife and habitat management actions proposed under this alternative would not result in any substantive modifications to highly scenic areas nor would they affect a locally or
regionally important topographic landmark. In addition, no grading to implement these actions would result in the substantial alteration of the existing landform by creating manufactured slopes higher than 10 feet or steeper than 2:1 (50 percent).

#### Public Use

Alternative B proposes to expand current public use programs on the Refuge. The installation of kiosks and interpretive signs to support these programs would have no effect on the area's natural landform. Environmental education and interpretive programs would generally be conducted on designated trails, with limited activities, primarily those related to habitat restoration and enhancement, occurring off trail.

Establishment of a designated, sustainable trail system within the Refuge is intended to reduce the effects to the landform of scaring and erosion that have resulted from the proliferation of user-created trails in the area. Within the Del Mar Mesa Vernal Pool Unit, some trails would be closed, while others would be realigned in an effort to protect listed vernal pool species and sensitive vernal pool habitat. These efforts would be implemented in coordination with the City of San Diego and other Del Mar Mesa Preserve partners. Implementing these actions would result in only minor changes to the existing landform; therefore, no significant adverse effects to site topography in this area are anticipated.

The proposal to realign or close some trails within the Otay-Sweetwater Unit would, in most cases, have little, if any, effect on the natural landform. When an existing trail segment is proposed for realignment to eliminate erosion problems or avoid sensitive habitat areas, the new (realigned) trail segment would be designed and constructed to include appropriate minimum and maximum slopes and follow existing contours, thereby minimizing the initial and long-term effects of trail construction on the existing landform.

There are a few places on the Refuge where user-created trails and/or old ranch roads have become highly eroded, supporting deep ruts. Rehabilitating severely damaged areas may require a combination of earthwork to improve drainage through the area and potentially the import of clean fill to assist in achieving the desired topographic contours. Once the erosion damage has been addressed, the areas would be revegetated with appropriate native species. Implementing this work would benefit the natural landform and improve the visual quality of the area. Other trail closures and realignments within the Otay-Sweetwater area would have similar beneficial effects.

Within the Otay-Sweetwater Unit, several new staging/parking areas are proposed to accommodate Refuge visitors. Potential sites for these new parking areas include the northeast portion of the McGinty Mountain area, the south side of Highway 94 in the Las Montañas area, the south side of Highway 94 to the west of Millar Ranch Road in the Sweetwater River area, and a yet-to-be-determined site off Proctor Valley Road on the Refuge's Hidden Valley property. Each parking lot site has its own topographic characteristics with the north McGinty Mountain site providing the greatest challenge. This site includes a sloping and somewhat eroded, disturbed area at the base of an old excavated access route that connects to Sloane Canyon Road just to the southeast of the intersection of Model A Ford Lane and Sloane Canyon Road. Alternative B proposes to construction a four to six space parking area at this location. No design for this parking area is currently available and would not be prepared until funds have been identified for site design and construction, <u>but construction would result in modification to the existing topography in order to create a usable pad located a sufficient distance from the adjacent dirt roadway.</u>

The Refuge proposes to design the parking area in north McGinty Mountain in a manner that would minimize the extent of landform modification (i.e., grading) to the maximum extent practical, but some landform modification and potentially some small retaining walls may be needed to achieve a level surface for the parking area. The site is already disturbed and generally void of vegetation; therefore, the creation of a small, unpaved parking area at this site is not expected to significantly alter the existing topographic character of the area.

The other two locations where new parking areas and access roads would be provided (i.e., south of Highway 94 in the Las Montañas and Sweetwater River areas) are generally flat, requiring minimal landform alteration. As with the McGinty Mountain site, the actual size and layout of these parking areas would be determined when funding for engineering design and construction is identified. Based on the relatively flat topography in these areas, there appears to be limited potential for impacts to the existing landform. In addition, no important topographic landmarks are present within or immediately adjacent these sites. Therefore, no significant adverse effects to topography are anticipated.

Alternative B also proposes coordinating with other agencies to identify a safe trail connection between the north and south sides of Highway 94 at the Sweetwater River. No major adverse modifications to the existing landform are anticipated from providing an undercrossing, atgrade crossing, or overpass to accommodate trail access at this location. There are no regionally important topographic landmarks at this location and construction of a trail crossing here is not expected to degrade or otherwise affect the existing visual quality of the area. However, until a site-specific design and engineering is completed for the project, the full extent of the project construction cannot be determined, therefore, additional analysis in accordance with NEPA would be conducted prior to project implementation.

## **Refuge Operations**

The development of several refuge facilities are proposed under Alternative B, including a visitor contact station and associated visitor-serving facilities on approximately 2.4 acres to the south of Highway 94 and west of Millar Ranch Road in the Sweetwater River area. The proposal for this site would require site grading for a pad to accommodate a trailer or other temporary visitor contact station and public restroom, grading to create a parking area and trailhead, and construction of a trail and potentially a trail bridge to provide access from the parking area to the Sweetwater River Trail. This area is relatively flat; therefore, no extensive landform alteration is anticipated. The specific design and layout of this site would be developed in the future when funding for the project is identified. At that time, additional analysis of the project's potential effects on site topography would be conducted in compliance with NEPA.

Alternative B also includes proposals to construct a greenhouse/native plant nursery and firefighter/volunteer staff barracks at Rancho Jamul, and to relocate an existing storage building on San Miguel Mountain to Rancho Jamul. The site preparation required to accommodate these facilities would occur in previously disturbed, flat areas of the Rancho Jamul compound and are not expected to impact any natural landforms. Therefore, no adverse effects to topography are anticipated.

Another proposal involves the closure of abandoned mines shafts when discovered, including some located on Mother Miguel Mountain and McGinty Mountain. These closures would involve some minor disturbance at the entrance to the shafts to accommodate the installation of bat-compatible steel gates, when applicable, or to fill the shafts with polyurethane foam. Such disturbances would have virtually no effect on existing area topography.

Maintenance activities proposed under this alternative, including the repair of a small dam in the San Miguel Mountain, removal of water tanks on Mother Miguel Mountain, removal of abandoned pump houses and wells in the Sweetwater River area, and removal or rehabilitation of fencing in the Hidden Valley area, would have no effect of the existing landform.

#### 5.2.1.3 Alternative C

#### Wildlife and Habitat Management

The effects of implementing the wildlife and habitat management proposals included under Alternative C would be essentially the same as those described under Alternative B. No significant adverse effects to the existing landform on the Refuge are anticipated.

#### Public Use

The primary differences between Alternatives B and C relate to the types of uses permitted on the Refuge, therefore the effects described under Alternative B related to trails, the construction of parking areas, the implementation of expanded public use programs, and the installation of new kiosks and interpretive signs would apply to the implementation of Alternative C.

A few additional trail corridors are included under this alternative, including a trail that would extend from the western ridge of the Sweetwater River area down to the Sweetwater River Trail, an interpretive trail on Lot 707, and a trail up to the top of Mother Miguel Mountain. These trail alignments would follow the existing contours of the land to minimize impacts to the landform and ensure a sustainable trail tread. Another 500-foot-long interpretive trail, constructed as a boardwalk, would be installed within the vernal pool restoration site in the San Miguel Mountain area. This area is relatively level, requiring limited ground disturbance. No adverse impacts to the existing landform are anticipated from these trail projects.

#### **Refuge Operations**

The construction projects proposed in Alternative B to support Refuge operations are also proposed under Alterative C. In addition, Alternative C proposes relocating the Refuge office from Rancho Jamul to the Sweetwater River area once the transfer of 2.4 acres of Caltrans land to the Refuge is completed. Under Alternative B, this site would accommodate a temporary visitor contact station and various visitor services-related amenities. Many of the uses proposed for this site under Alternative B would also be provided under Alternative C. In addition, Alternative C proposes the construction of an approximately 2,500-square-foot, permanent Refuge office and visitor contact station, along with parking for Refuge staff and Refuge vehicles. Due to the lack of significant topographic relief within the project site, no adverse effects to the existing landform are anticipated. Additional review in accordance with NEPA would occur following the completion of site-specific design and construction plans.

## 5.2.1.4 Alternative D

#### Wildlife and Habitat Management

The effects of implementing the wildlife and habitat management proposals included under Alternative D would be essentially the same as those described under Alternative B. No significant adverse effects to the existing landform on the Refuge are anticipated.

#### Public Use

The primary differences between Alternatives C and D relate to the types of uses permitted on the Refuge, therefore the effects described under Alternative C related to trails, the

construction of parking areas, the implementation of expanded public use programs, and the installation of new kiosks and interpretive signs would also apply to the implementation of Alternative D.

## **Refuge Operations**

The construction projects proposed in Alternative C to support Refuge operations, including construction of a refuge office and visitor contact facility in the Sweetwater River management area, are also proposed under Alternative D. Therefore, the potential effects to landform described under Alternative C for these projects would also apply to the implementation of Alternative D.

## 5.2.1.5 Modified Alternative D

## Wildlife and Habitat Management

<u>Wildlife and habitat management activities proposed on the Otay-Sweetwater Unit would</u> require some site preparation (e.g., removal of invasive plants, minor soil disturbance). These actions would not however result in any substantive changes to the topographic character of the site.

Other proposals, such as increased monitoring of species and habitat and implementation of an IPM Plan would have little, if any, effect on the existing landform, while actions to facilitate the reintroduction of one or more listed species could result in some small changes in the landform to improve habitat quality. These changes would most likely be limited to riparian areas where minor land alteration could be required to improve opportunities for water pooling to support certain life stages for arroyo toad and/or southwestern pond turtle. In some cases, this alteration of landform would be required to correct previous human alteration of the riparian system. Such changes would be minor and once the sites have revegetated, the alterations would be virtually undetectable. No significant adverse effects to topographic features are anticipated from the implementation of these activities.

## Public Use

The installation of kiosks and interpretive signs to support wildlife-dependent recreational uses would have no effect on the area's natural landform. Environmental education and interpretive programs would generally be conducted on designated trails, with limited activities, primarily those related to habitat restoration and enhancement, occurring off trail.

Establishment of a designated, sustainable trail system within the Refuge is intended to reduce the effects to the landform of scarring and erosion that have resulted from the proliferation of user-created trails in the area. Proposals to realign or close some trails within the Otay-Sweetwater Unit would, in most cases, have little, if any, effect on the natural landform. When an existing trail segment is proposed for realignment to eliminate erosion problems or avoid sensitive habitat areas, the new (realigned) trail segment would be designed and constructed to include appropriate minimum and maximum slopes and follow existing contours, thereby minimizing the initial and long-term effects of trail construction on the existing landform.

Impacts related to trail staging/parking areas on the south side of Highway 94 to the west of Millar Ranch Road in the Sweetwater River area and at a site off Proctor Valley Road on the Refuge's Hidden Valley property would be the same as described under Alternative D. These locations are generally flat, requiring minimal landform alteration. In addition, no important topographic landmarks are present within or immediately adjacent these sites. A third staging area may be developed in the future off Highway 94 onto the Las Montañas (south) area, that could require some landform alteration, however, this area was subject to previous grading prior to acquisition, therefore, no significant adverse effects to the existing landform are anticipated. No parking area is proposed near Model A Ford Lane under this alternative; therefore, no changes to the existing landform in this area would occur.

<u>Under this alternative, no actions are proposed that would result in any substantive</u> <u>modifications to highly scenic areas nor would a locally or regionally important topographic</u> <u>landmark be affected. In addition, no grading to implement these actions would result in the</u> <u>substantial alteration of the existing landform by creating manufactured slopes higher than 10</u> <u>feet or steeper than 2:1 (50 percent).</u>

<u>Public use proposals (primarily trails) on the Del Mar Mesa Vernal Pool Unit are limited and would result in only minor changes to the existing landform; therefore, no significant adverse effects to site topography in this area are anticipated.</u>

## **Refuge Operations**

<u>The construction projects proposed in Alternative C to support Refuge operations, including construction of a refuge office and visitor contact facility in the Sweetwater River management area, are also proposed under this alterative. Therefore, the potential effects to landform described under Alternative C for these projects would also apply to the implementation of this alternative.</u>

## 5.2.2 Effects to Visual Quality

## 5.2.2.1 Alternative A – No Action

## Wildlife and Habitat Management

Current wildlife and habitat management activities that could affect visual quality include the removal of invasive plants, installation of native plants in disturbed or fire damaged areas, the installation or replacement of fencing, access road maintenance, and removal of trash and debris. While activities such as vegetation removal associated with the control of invasive species, including non-native trees and palms, may change the visual character of the affected areas; these impacts are temporary in nature and result in only minor changes to the Refuge's visual quality. Following invasive species control, affected areas would be planted with appropriate native vegetation or allowed to revegetate naturally. These actions serve to mitigate temporary minor impacts to the visual character of the site.

Continuation of existing wildlife and habitat management activities, as proposed under Alternative A, would not result in any significant adverse effects to visual quality. Some minor beneficial effects would result from be trash and debris removal and the replacement of weedy and invasive species with native plants.

#### Public Use

The Refuge is currently crisscrossed with various user-created trails, old truck trails, and utility easements, which are visible from other areas within and outside of the Refuge. Although no designated trail system is proposed under this alternative, there is the potential that some existing user-created trail segments could be closed to protect sensitive Refuge resources. Such actions would have a minor beneficial effect on visual quality, as these disturbed areas would no longer be visible once they are revegetated. No actions are proposed that would block views of significant landmarks on or off the Refuge, and no significant land alteration is proposed that would adversely affect the existing visual quality of the lands preserved within the Refuge.

## **Refuge Operations**

The activities implemented to support Refuge operations under Alternative A result in minor, if any, physical changes that could alter a site's existing visual character. As a result, no significant adverse effects related to visual quality are anticipated under Alternative A.

## 5.2.2.2 Alternative B

## Wildlife and Habitat Management

The management activities conducted under Alternative A would also occur under Alternative B, and as described under Alternative A, would result in only minor changes to the Refuge's visual quality.

Additional management actions proposed under Alternative B, such as expanded habitat restoration and enhancement efforts within the Otay-Sweetwater Unit, would alter the existing visual appearance of a site. Upland areas supporting weedy vegetation may be initially transformed into a barren site that would ultimately become revegetated with primarily native vegetation. In riparian areas, non-native shrubs, reeds, and trees would be removed and ultimately replaced with native plants such as willows, mulefat, or sycamores. Although the visual character of the restored or enhanced areas would be altered, this change is not considered a significant adverse effect. The control of feral pigs, should they enter the Refuge, is not proposed under this alternative, therefore, future impacts to visual quality due to rooting and wallowing in native vegetation could occur, if a feral pig population is established on the Refuge.

Other proposals, such as increasing monitoring of species and habitat and implementing an IPM Plan would have little, if any, effect on the visual character of the Refuge. No significant adverse effects related to visual quality are therefore anticipated from these activities.

## Public Use

Establishing a designated trail system for the Refuge, as proposed in Alternative B, would lead to the closure or realignment of many of the user-created trails that crisscross the lands within the Refuge. The proposal to realign or close some trails within the Otay-Sweetwater Unit would have no adverse effect on the existing visual quality of the area. In some cases, the closure and rehabilitation of an area that currently supports a poorly aligned, highly eroded trail would provide minor benefits as the area becomes revegetated and the previously disturbed site ultimately blends into the existing hillside. New trail segments that may be created to replace eroded sections of trails would be aligned to follow existing contours, thereby minimizing the initial and long-term visual effects of the trail.

The new parking areas and associated amenities (e.g., information kiosks, interpretive signs) proposed to accommodate trail users within the McGinty Mountain and Las Montañas area would require the removal of existing vegetation and grading of currently undeveloped areas. These changes would necessarily alter the sites' visual quality. To ensure that no significant adverse impacts to the visual quality of these sites as viewed from the public right-of-way and from within the Refuge would occur, the following measures would be incorporated into the future design of these parking area projects:

- For the parking lot surface, avoid the use of light concrete and asphalt and instead use materials and colors that allow the parking surface to better blend into the existing environment;
- Minimize the removal of native trees and shrubs, revegetate disturbed areas with native plants and, where appropriate, plant native trees and shrubs to soften the view of the parking area and/or structures (e.g., restrooms, contact station, trash receptacles, trailhead kiosk) from the roadway; and
- Should retaining walls be required, plant appropriate native shrubs or other native vegetation in front of the retaining walls to soften their appearance.

The effects to the visual quality of the area by providing a trail crossing at Highway 94 and the Sweetwater River would vary depending upon the final solution. A fair weather undercrossing or at-grade crossing would have minimal effects on the visual quality of the area, while an overcrossing would have high visibility, the overall effects of which would be dependent upon the ultimate design. When funding is identified to address this trail connection problem, additional public input and analysis in accordance with NEPA would be required prior to implementation.

## **Refuge Operations**

The construction of a temporary visitor contact station and other visitor service-related facilities in the Sweetwater River area would alter the existing visual character of the site but would not significantly change the overall character of the views observed along Highway 94, which include a mixture of open native habitat and urban development. View corridors from Highway 94 onto the Refuge would be maintained, and the site design for this Refuge facility would take into consideration views from Highway 94 of the riparian woodlands that parallel the roadway, as well as need to maintain the open rural character of the community. The measures described previously to minimize adverse visual effects from the construction of proposed parking areas would also be implemented at this site. Through appropriate design features, the use of materials and colors that complement the setting, and the strategic use of native plants, the effect of the structures on the visual character of the area can be minimized. Prior to project construction, design and engineering plans would be prepared and additional analysis under NEPA would be required. At that time, the proposed design would be evaluated to ensure that the structure would not result in significant adverse effects to the visual character of the area.

The installation of new structures (i.e., a greenhouse/native plant nursery, firefighter/ volunteer staff barracks, a relocated storage building) in proximity to the existing office facilities at Rancho Jamul would not significantly alter the existing visual character of the site, which already includes a variety of buildings and other structures. The proposal to close old mine shafts located on the Otay-Sweetwater Unit and the removal of water tanks, pumphouses, and fencing would have little, if any, effect on visual quality.

## 5.2.2.3 Alternative C

## Wildlife and Habitat Management

The effects of implementing the wildlife and habitat management proposals included under Alternative C would be essentially the same as those described under Alternative B.

## Public Use

The analysis of potential effects to visual quality from implementing the public use proposals include under Alternative C would be essentially the same as those described for Alternative B. The incorporation of the measures presented in Alternative B into future parking lot design and layout would minimize the potential for adverse effects to visual quality. Through proper alignment of the trails proposed for Lot 707, the western slopes of the Sweetwater River area, and Mother Miguel Mountain, visual impacts from trail construction would be minimized. No visual impacts are anticipated from the installation of an interpretive boardwalk trail at the restored vernal pool site on the Otay-Sweetwater Unit.

## **Refuge Operations**

The construction projects proposed in Alternative B to support Refuge operations are also proposed under Alterative C; therefore, the potential effects to the visual quality of the affected areas would be the same as those described under Alternative B. In addition, the measures proposed to minimize the visual impacts of the visitor service-related facilities along Highway 94 in the Sweetwater River area would minimize the potential for visual impacts related to the construction of a permanent Refuge office, visitor contact station, and staff parking area.

## 5.2.2.4 Alternative D

## Wildlife and Habitat Management

The effects of implementing the wildlife and habitat management proposals included under Alternative D would generally be the same as those described under Alternative B. However, under Alternative D, the Refuge would implement a Feral Pig Monitoring and Eradication Plan. One component of this plan, as described in Appendix E, is to strategically place temporary traps on the Refuge, if pigs are determined to be present. The number of traps would be limited, relatively small in size, and would not block viewsheds. Various types of traps including cage traps, box traps, and/or corral traps would be utilized in areas frequented by pigs (see Appendix E). Traps would be installed in a manner that would avoid any degradation to the visual character of the site. To the extent practicable, traps would be placed in areas not visible from trails or the public right-of-way, and would be removed as soon as they were no longer required. In most cases, traps would remain in use for no more than 30 days.

Controlling feral pigs as soon as they are identified on the Refuge will minimize the potential for them to disperse further onto the Refuge, avoiding adverse effects to visual quality associated with vegetation and soil disturbance from pig activity and reducing the need for temporary tramps that could be visible from some trails.

## Public Use

The primary differences between Alternatives C and D relate to the types of uses permitted on the Refuge, therefore the potential effects to visual quality and the measures presented to minimize these effects, as described under Alternative C, would also apply to the implementation of Alternative D.

## **Refuge Operations**

The construction projects proposed in Alternative C to support Refuge operations, including construction of a refuge office and visitor contact facility in the Sweetwater River management area, are also proposed under Alterative D. Therefore, the potential effects and recommended measures to minimize such effects to visual quality under Alternative C would also apply to the implementation of Alternative D.

## 5.2.2.5 Modified Alternative D

### Wildlife and Habitat Management

The potential for impacts to visual quality as a result of implementing the wildlife and habitat management actions proposed under this alternative would be the same as those described for Alternative D.

### Public Use

Establishing a designated trail system for the Refuge, as proposed under this alternative, would result in the creation of some new trails and the closure of others. The proposal to realign or close some trails within the Otay-Sweetwater Unit would have no adverse effect on the existing visual quality of the area. New trail segments would be aligned to follow existing contours, thereby minimizing the initial and long-term visual effects of the trails.

Other public use proposals are similar to those described under Alternative D. New parking areas and associated amenities (e.g., information kiosks, interpretive signs) proposed to accommodate trail users would require the removal of existing vegetation and grading of currently undeveloped areas. These changes would necessarily alter the sites' visual quality. Project specific analysis in accordance with NEPA will be conducted when final design plans are completed. The potential for adverse effects to visual quality as a result of project implementation can be avoided through the implementation of design measures and the installation of native vegetation that minimize the visibility of constructed features from natural areas.

## 5.2.3 Effects to Geology, Soils, and Geological Hazards

## 5.2.3.1 Alternative A – No Action

## Wildlife and Habitat Management

Conducting the wildlife and habitat management activities currently occurring on the Refuge would not result in adverse effects to geology or soils. None of the management activities proposed under this alternative (e.g., species monitoring, trash and debris removal, fence relocation, invasive plant control, maintenance of access roads and gates) would trigger or accelerate substantial slope instability, subsidence, ground failure, or erosion, thus affecting on-site facilities or adjacent facilities, such as roadway embankments and bridge abutments and pilings. Neither would Alternative A make the Refuge and its facilities any more susceptible to geological hazards, such as liquefaction, settlement, ground rupture, or lateral spreading.

In some areas of the Refuge where invasive species control is implemented, the underlying soils may be prone to erosion, therefore, best management practices (BMPs), such as the temporary installation of fiber rolls or silt fencing, would be implemented to minimize runoff through these denuded areas. Once native vegetation has become established, these BMPs would no longer be necessary. Through the implementation of appropriate BMPs, significant adverse effects related to geology or soils would be avoided.

#### Public Use

The many rock outcrops present on the Refuge's steeper slopes represent a potential rock fall threat to Refuge visitors, particularly those visitors who wander off the trail and disturb highly erosive soils beneath the rock outcrops. Another potential soil-related trail impact is erosion.

Various areas within the Refuge are overlain with highly erosive soils. Off-trail activity can break up cryptobiotic soil crust and lead to erosion in these sensitive soil areas, while off-trail travel in vernal pools when they are wet can alter and erode the microtopography on which the pools rely. In many cases, user-created trails follow the fall line of the slope rather than following the existing topographic contours of the site. As a result, water follows down the center of the trail, damaging the trail tread and making navigation of the trail difficult for users, and thus encouraging users to widen the trail or create a network of braided trails. Corrective measures such as water bars and drainage cuts can reduce but not eliminate these erosion hazards. To eliminate such problems would require rerouting and/or closure of the non-sustainable trail segment.

In addition to the existing trails on the Refuge, the other public use facilities currently present on the Refuge are limited to an existing parking area and kiosk in the McGinty Mountain area, and an informational kiosk, interpretive signs, and a trail bridge in the Sweetwater River area. The existing parking lot occurs on soils with a moderate to high potential for erosion; therefore, periodic monitoring of the site is conducted to determine if corrective measures, such as augmentation of the existing gravel surface, are needed to avoid erosion and downstream sedimentation due to the presence of water or from continued vehicle travel.

## **Refuge Operations**

The activities implemented to support Refuge operations under Alternative A result in minor, if any, physical changes; therefore, no adverse effects associated with the geological or soil conditions on the Refuge would result from the continuation of current Refuge operations.

## 5.2.3.2 Alternative B

## Wildlife and Habitat Management

The management activities conducted under Alternative A would also occur under Alternative B. As described under Alternative A, none of these activities would trigger or accelerate substantial slope instability, subsidence, ground failure, or erosion, nor would they make the Refuge and its facilities any more susceptible to geological hazards, such as liquefaction, settlement, ground rupture, or lateral spreading.

The expanded habitat restoration and enhancement activities proposed in Alternative B would require some site preparation (e.g., removal of invasive plants, minor soil disturbance) that could expose moderate to highly erosive soils to the forces of wind and runoff. However, as described under Alternative A, the implementation of appropriate BMPs would minimize runoff and the potential for erosion from these sites.

Another action proposed under Alternative B that is affected to some extent by the types of soils that overlay the site is the implementation of an IPM Plan—in particular, the use of herbicides. To ensure maximum effectiveness, while minimizing the amount of chemical being applied to a site, it is important to consider the types of soils present in an area proposed for treatment. Some active ingredients respond differently depending upon the soil type (sandy soils versus clay soils) and soil permeability. For example, some products bind with clay soils; therefore, higher application rates may be necessary in clay soil environments to ensure that adequate amounts of the herbicide are available for uptake by the targeted invasive plants. To minimize the amount of product applied to a site, chemicals being considered for use in a specific area will be evaluated based on volatility, mobility in soil, and water solubility.

The control of feral pigs, should they enter the Refuge, is not proposed under this alternative, therefore, there is a potential under this alternative for future erosion and sedimentation due to soil disturbance associated with pig rooting and wallowing.

### Public Use

To minimize the potential for impacts related to rock fall, in addition to requiring all trail users to stay on designated trails, periodic monitoring (every few years) of potential rock fall areas would be conducted to identify any potential hazards that may warrant the closure of a particular trail segment. Additionally, monitoring would occur following a severe rainstorm event or a wildfire that exposes large rock crops to increased erosional forces.

Under Alternative B, a designated trail system would be established for the Refuge and specific trail alignments would be described in a step-down trail plan for the Otay-Sweetwater Unit. The types of soils present on the Refuge will influence trail discussions, including trail closures, trail realignments, and trail rehabilitation. The McGinty Mountain area, the southern portion of the Las Montañas area, the northern portion of the Sweetwater River area, and the Hidden Valley portion of the San Miguel Mountain area are overlain with Cieneba and Vista series soils, both with erosion hazards that range from moderate on flatter areas to very high on steep slopes. The eastern slopes of the Sweetwater River area and a major portion of the San Miguel Mountain area are overlain with San Miguel-Exchequer rocky silt loams that demonstrate runoff potential of medium to rapid depending upon the slope and an erosion hazard of moderate to very high.

Another factor to be considered in determining trail sustainability is the presence of clay soils. Linne clay loam and Diablo clay soils are present within the San Miguel Mountain area. When wet, these soils can hold water, resulting in soggy trail treads. Use of these wet trails can create large holes in the trail that exacerbates the problem the next time it rains, or users may create new pathways around the wet trail, damaging native habitat on either side of the trail. Clay soils are very slippery when wet and may present a safety hazard to hikers, or at least make the hike less pleasant.

To address these soil-related problems, as well as the erosion hazards associated with the vast majority of the soils on the Otay-Sweetwater Unit, trail layout and design would incorporate measures to ensure a sustainable trail; one that will not result in excessive erosion caused by water flow or use. Sustainable trail practices, <u>such as those developed by the California</u> <u>Department of Parks and Recreation</u>, will be implemented as part of all trail rehabilitation, trail realignment, or new trail construction projects. <u>These practices</u> would include but are not limited to adequately outsloped tread, sustainable grades, frequent grade reversals, erosion resistance, special treatments in areas where soil is prone to retaining moisture, and rolling contours (Hesselbarth et al. 2007). These and other practices would be described in detail in the step-down trail plan for the Otay-Sweetwater Unit.

The site of the proposed parking lot at the north end of McGinty Mountain, adjacent to Sloane Canyon Road, is overlay with Cieneba very rocky, coarse sandy loam, having a high to very high potential for erosion. To avoid adverse effects related to erosion and downstream siltation, the grade and drainage within of the parking lot, as well as the slopes and anticipated drainage patterns of the slopes adjacent to the parking lot would <u>have</u> to be taken into consideration during site design, <u>particularly because drainage from the site would extend onto an existing dirt road with no drainage facilities</u>. BMPs would <u>have to be incorporated into the project design to address the potential</u> for erosion during and after construction. Temporary measures to control runoff and sedimentation during construction could include the use of fiber

rolls, detention basins, and/or silt fencing. Post construction BMPs would involve long-term measures to minimize the potential for erosion due to use and seasonal rains. These long-term measures would include sustainable grading practices, the use of appropriate permeable surface materials, revegetating the undeveloped portions of the site with appropriate native vegetation, and providing for proper drainage through the site.

The soils that overlay the area to the south of Highway 94 in the Las Montañas area have varying degrees of erodibility, with the Ramona and Vista soil series characterized by a slight to moderate potential for erosion and Cieneba soil series having a high to very high potential for erosion. Based on the existing topography in the area, it is likely that the parking lot would be located within the area overlain by Ramona sandy loam, which has a lower potential for erosion than the areas to the east. Nevertheless, to avoid adverse effects related to erosion, the implementation of BMPs to address temporary and long-term erosion control would be incorporated in to the project design.

Another parking area is proposed under Alternative B for the area south of Highway 94 and west of Millar Ranch Road. The soils in this area, Visalia sandy loam, two to five percent slopes, have a moderate potential for erosion. To minimize the potential for adverse effects, the BMPs described previously for the Las Montañas and McGinty Mountain areas would also be incorporated into the future design and engineering plans for this parking area, as well as the larger construction site that will include a temporary visitor contact station, restrooms, and trail staging area.

Soil and erosion-related issues associated with a trail connection across Highway 94 at the Sweetwater River would vary depending upon which option is ultimately selected for crossing.

An at-grade crossing is likely to be influenced the least by soil and erosion issues, while a fair weather crossing would require further geotechnical analysis and the implementation of both short-term and long-term BMPs to minimize the potential for silt entering the adjacent floodway. The construction of an overcrossing would require additional geotechnical analysis and the implementation of BMPs during project construction. Prior to the construction of a trail connection in this area, additional public input and analysis in accordance with NEPA would be required.

Alternative B proposes to expand current public use programs and facilities on the Refuge. Within the Del Mar Mesa Vernal Pool Unit, some trails would be closed, while others would be realigned in an effort to protect listed vernal pool species and sensitive vernal pool habitat. These efforts would be implemented in coordination with the City of San Diego and other Del Mar Mesa Preserve partners. Implementing these actions would improve conditions on the trail and reduce the potential for erosion. No other impacts related to geology or soils are anticipated in this portion of the Refuge.

## **Refuge Operations**

Potential impacts related to erosion on construction sites for the greenhouse/native plant nursery, firefighter/volunteer staff barracks, and relocated storage building at Rancho Jamul is relatively low and would be further minimized through the implementation of short-term BMPs to control erosion during construction and long-term BMPs, primarily revegetation of disturbed areas. BMPs would also be implemented during proposed dam repair and pump house demolition. No erosion issues are anticipated during operations associated with well or mineshaft closures.

With respect to geologic and soil hazards, the lands within the Refuge do not include significant areas of expansive soils, landslide prone soils, or areas prone to liquefaction (County of San Diego 2007a); therefore, structures and parking lots proposed for the Otay-Sweetwater Unit would not be subject to such hazards.

## 5.2.3.3 Alternative C

#### Wildlife and Habitat Management

The effects related to geology and soils of implementing the wildlife and habitat management proposals included under Alternative C would be essentially the same as those described under Alternative B. Restoration and enhancement projects incorporate the use of short and long-term BMPs into the project design to minimize the potential for erosion and downstream sedimentation. Therefore, the implementation of this alternative would not trigger or accelerate substantial slope instability, subsidence, ground failure, or erosion, nor would they make the Refuge and its facilities any more susceptible to geological hazards, such as liquefaction, settlement, ground rupture, or lateral spreading. The types of soils present within a proposed invasive plant species control site would be evaluated prior to herbicide application as described under Alternative B.

#### Public Use

The effects of implementing the public use proposals included under Alternative C would be generally the same as those described under Alternative B. However, some additional trail projects are proposed under Alternative C, including a trail on the western slopes of the Sweetwater River area, an interpretive trail on Lot 707, a trail to the top of Mother Miguel Mountain, and an interpretive boardwalk trail at the vernal pool site in the San Miguel Mountain area. The western slopes of the Sweetwater River area to the south of Highway 94 are overlain with Friant rocky fine sandy loam soils, which demonstrate rapid to very rapid runoff velocities with a high to very high potential for erosion (Bowman et al. 1973). The area where a trail is proposed on Mother Miguel Mountain is overlain with San Miguel-Exchequer rocky silt loams, which have runoff potential of medium to rapid depending upon the slope and an erosion hazard of moderate to very high. To minimize the potential for erosion and siltation, BMPs, as presented in Section 6.9.3 (Conservation Measures) of the draft CCP/EA, would be implemented during construction and adherence to sustainable trail design standards would be followed during both trail layout and construction. The only potential geologic hazard in these areas is the potential for rock fall on Mother Miguel Mountain. Periodic monitoring of site conditions, as described under Alternative A, would occur in this area following trail construction.

## **Refuge Operations**

The construction projects proposed in Alternative B to support Refuge operations are also proposed under Alterative C. As described under Alternative B, no geologic hazards are present in the areas proposed for future construction projects; therefore, no adverse effects related to geologic hazards are anticipated and the implementation of BMPs during and after construction would avoid any adverse effects related to soil erosion.

## 5.2.3.4 Alternative D

## Wildlife and Habitat Management

The effects related to geology and soils of implementing the wildlife and habitat management proposals included under Alternative D would be generally the same as those described under Alternative C. The BMPs described under Alternative B would also be implemented under

Alternative D. The proposal to monitor for and control as necessary feral pigs that may enter the Refuge will provide greater benefits to the environment with respect to minimizing the potential for soil disturbance and erosion than the other action alternatives.

## Public Use

The effects of implementing the public use proposals included under Alternative D would be generally the same as those described under Alternative C. However, the interpretive trail on Lot 707 and the trail to the top of Mother Miguel Mountain would not be constructed under this alternative.

## **Refuge Operations**

The construction projects proposed in Alternative B to support Refuge operations are also proposed under Alternative D. As described under Alternative B, no geologic hazards are present in the areas proposed for future construction projects; therefore, no adverse effects related to geologic hazards are anticipated and the implementation of BMPs during and after construction would avoid any adverse effects related to soil erosion.

## 5.2.3.5 Modified Alternative D

## Wildlife and Habitat Management

The effects related to geology and soils of implementing the wildlife and habitat management proposals included under modified Alternative D would be essentially the same as those described under Alternative D.

## <u>Public Use</u>

The effects of implementing the public use proposals included under modified Alternative D would be generally the same as those described under Alternative C.

## **Refuge Operations**

The construction projects proposed in Alternative B to support Refuge operations are also proposed under modified Alterative D. As described under Alternative B, no geologic hazards are present in the areas proposed for future construction projects; therefore, no adverse effects related to geologic hazards are anticipated and the implementation of BMPs during and after construction would avoid any adverse effects related to soil erosion.

## 5.2.4 Effects to Paleontological Resources

## 5.2.4.1 Alternatives A, B, C, D, and Modified Alternative D

Although there is the potential for paleontological resources to be present within the Sweetwater River and San Miguel Mountain areas of the Otay-Sweetwater Unit and within the Del Mar Mesa Vernal Pool Unit, the nature of the action proposed under Alternatives A, B, C, D, <u>or modified</u> <u>Alternative D</u>, which are generally limited to habitat conservation and compatible public uses, would result in a minor amount of excavation on the Refuge. Therefore, no adverse effects to subsurface paleontological resources are anticipated. Protection of these resources, should they be inadvertently discovered, would occur in compliance with all applicable policies and regulations. In addition, the regulations that prohibit the collection of paleontological resources on Federal lands managed by the Service would be enforced on the Refuge.

# 5.2.5 Effects to Mineral Resources

## 5.2.5.1 Alternatives A, B, C, D, and Modified Alternative D

Portions of the Otay-Sweetwater Unit include areas where adequate information indicates that significant deposits of aggregate resources are present or are likely to be present (see Figure 4-8). These areas occur primarily within the Sweetwater River floodplain. Within the acquisition boundary of the Refuge, approximately 33 acres, including some lands already incorporated into the Refuge, are classified as MRZ-2 (areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood exists for their presence). Within the Refuge, these areas are generally located upstream of the Sweetwater Reservoir. The potential for impacts to the reservoir in terms of water quality and increased siltation makes it unlikely that these resources would be available for extraction even if they were not located within the Refuge.

Other areas within the acquisition boundary of the Otay-Sweetwater Unit have been classified as MRZ-3 (areas where significant aggregate resources are potentially present). Approximately 3,000 acres within the acquisition boundary have been classified as MRZ-3, and these areas are distributed in approximately four general locations within the acquisition boundary: north of Dehesa Road, south of the Las Montañas area, east of Brown Field, and northeast of Brown Field. It is unlikely that all 3,000 acres classified as MRZ-3 would be acquired for inclusion in the Refuge; however, if they were to be acquired, these parcels would represent less than three percent of the total area (about 97,000 acres) within the county that are classified as MRZ-3. In addition, approximately 24,000 acres within the county and outside the Refuge acquisition boundary are designated MRZ-2. As a result, the Refuge and the activities proposed for implementation within the Refuge would not represent a significant reduction in aggregate resources available for commercial use in the county. In addition, the Refuge would not result in the irrevocable loss of aggregate resources, as they would continue to be preserved on Refuge property.

Although there is evidence of past mining activity on the Refuge for minerals other than aggregate material, most of the evidence seems to indicate that mining was generally exploratory in nature or of limited scale. Only Peg Leg Mine seems to have been in production for an extended time. Alternatives B, C, D, <u>and modified Alternative D</u> all propose to close old mining shafts when they are located. This activity, as well as the other activities proposed in the CCP under the various alternatives, would not result in any adverse effects to the region's mineral resources.

# 5.2.6 Effects to Agricultural Resources

## 5.2.6.1 Alternatives A, B, C, D, and Modified Alternative D

The effects to agricultural resources from implementing any of the management alternatives considered for San Diego NWR would be the same. In all cases, the majority of the lands within the Refuge would be maintained to protect native habitat, sensitive species, and the general diversity of the native species present on the Refuge. Under any of the alternatives, the lands within the Refuge would not be used or made available for agricultural purposes. Although the majority of the lands within the Refuge have been identified as having value for grazing, these areas do not support soils that are classified as prime farmland or farmland of statewide importance (County of San Diego 2007b).

The California Department of Conservation (2000) does identify areas within the McGinty Mountain area and the Sweetwater River area as Farmland of Local Importance. In addition,

portions of the non-contiguous mitigation parcels recently added to southwestern end of the San Miguel Mountain area are identified as Farmland of Local Importance. These parcels are not however of adequate size to support agriculture and all are located immediately adjacent to urban development.

In the case of the McGinty Mountain area, only a small portion of the area classified as Farmland of Local Importance actually supports soils that are considered candidates for classification as Prime Farmland or Farmland of Statewide Importance soil candidates (County of San Diego 2007b). In addition, this portion of the Refuge, although located within the San Diego County Water Authority service boundary, contains no waterlines or water meters. Preserving this portion of the Refuge to support important biological resources would therefore not represent a significant adverse effect to agricultural resources, because this action would not result in the conversion of Prime Farmland or Farmland of Statewide Importance to non-agricultural use.

The Sweetwater River area includes several areas overlain with soils that are candidates for Prime Farmland or Farmland of Statewide Importance, and the locations of these soils generally coincide with the areas on the Refuge that have been classified by the California Department of Conservation (2010b) as Farmland of Local Importance. As indicated in Figure 4-10, the areas classified as Farmland of Local Importance are relatively narrow and occur along major riparian corridors (i.e., Sweetwater River, Steele Canyon Creek) within the Refuge. The configuration of these areas (i.e., long and narrow) along with the lack of any infrastructure to support irrigation severely limits the value of this area for agricultural use. Similar situations exist on lands included within the Refuge acquisition boundary, and in these cases, the value for agricultural use is also considered relatively low. None of the lands included within the Refuge boundary or within the acquisition boundary are classified as Prime Farmland or Farmland of Statewide Importance.

The implementation of the CCP under any of the alternatives would not result in any irrevocable loss of important farmland. Further, the management actions and public uses proposed under any of the alternatives would have no effect on any existing or future agricultural activities occurring in proximity to the Refuge, therefore no direct or indirect impacts to agricultural resources are anticipated.

# 5.2.7 Effects to Hydrology

## 5.2.7.1 Alternative A – No Action

## Wildlife and Habitat Management

The management activities occurring on the Refuge, involving trash, debris, and homeless camp cleanups; invasive species control; and maintenance of access roads, fencing, and signage have limited effect on the natural flows within the Sweetwater River, Steele Canyon Creek, and other drainages on the Refuge. In addition, these activities have little influence on stormwater flow and velocity within the Refuge. Current habitat enhancement and restoration projects involve only minimal alteration of the existing soil and therefore do not result in any significant increases in stormwater runoff volumes or velocities. Trash and debris cleanups and removal of invasive plant material that are implemented within major drainages and along the floodplain of the Sweetwater River would improve, to some extent, the hydrological conditions within the drainages in which this work is conducted. The overall effect on the watershed would however be minimal.

## Public Use

Wildlife-dependent recreational uses occurring on the Refuge have limited impact on hydrology within or outside of the Refuge. Existing user-created trails however can have adverse effects on hydrology, particularly if the trail alignment follows the fall line of the slope. Trails created on the fall line allow stormwater to flow down the trail at higher velocities and volumes than would occur under natural slope conditions. The result is changes in the existing hydrology on the slope and increased erosion along the trail, as well as at the bottom of the slope where the water flows into existing drainages. Such impacts are localized and can be most effectively addressed through trail closure and slope rehabilitation. Other temporary measures such as minor realignments, installation of water bars, or changes in cross slope can reduce but would not eliminate the impacts. Other facilities on the Refuge, including the parking lot at Jamul Drive and the multiple use trail bridge that crosses the Sweetwater River, do not result in any impacts to the hydrology on the site.

Hydrologic hazards include flooding, mudslides, and river scour and deposition that could affect existing trails, particularly user-created trails that follow existing drainages and/or are constructed parallel to the fall line. Although most visitors would not be on the trails during a significant rain event, poorly laid out trails could create hazards to trail users associated with flash flooding and/or mud or rock slides.

Within the Del Mar Mesa Vernal Pool Unit, site hydrology is important at two scales: the larger landscape scale associated with the canyon and mesa topography and the much smaller microrelief scale associated with the mimamound and vernal pool topography present on the mesa. The microdrainages that form in these areas of the mesa facilitate the filling of the vernal pools during the winter rains. Even minor disruption of these drainage patterns can adversely affect the quality of the vernal pool habitat. Trail use and unauthorized trail construction within this portion of the Refuge can affect hydrological processes both at the landscape scale and at the microrelief scale.

## **Refuge Operations**

The activities implemented to support Refuge operations under Alternative A result in minor, if any, impacts to the existing hydrology on the Refuge or at Rancho Jamul; therefore, no adverse effects related to hydrology would result from the continuation of current Refuge operations.

## 5.2.7.2 Alternative B

## Wildlife and Habitat Management

The effects to hydrology of expanding the existing management actions on the Refuge to address listed species protection and recovery, as well as maintenance of habitat and native plant and wildlife diversity, would be similar to those described under Alternative A. Although there are proposals to improve habitat quality within the Sweetwater River and some of its tributaries, these actions (i.e., removing invasive shrubs and trees, restoring native vegetation, managing some vegetation to mimic a natural flood regime) would not significantly alter the existing hydrologic conditions within the Refuge.

## Public Use

The construction of some trail segments and the closure of others in accordance with the designated trail system proposed under Alternative B would not impact site hydrology, however, future trail bridges could impede water flow if not properly designed. To ensure that trail bridges do not impact water flows, particularly during flood events, the siting, structural

design, and elevation of a proposed trail bridges would take into consideration the hydrology and flood flow elevation of the affected stream or river. The same would apply to any future proposal to construct a fair weather trail undercrossing below Highway 94 at the Sweetwater River. The design and construction of such a facility would have to take into consideration hydrologic conditions occurring under the bridge to ensure that no adverse effects to the bridge or facilities located up or down stream of the undercrossing, particularly during a flood event. Additional environmental review and analysis would be required if and when preliminary design and engineering plans are prepared for such an undercrossing.

The design and construction of new parking areas would be designed to avoid any obstructions to both seasonal low flow volumes and higher stormwater flows.

To avoid impacts to facilities and users associated with hydrologic hazards, the siting of trails, bridges, staging areas, interpretive elements, and a visitor contact station and associated visitor-serving facilities must take into consideration the potential for flood hazards, mud or rockslides, and river scour and deposition. The majority of the impacts related to these hazards can be avoided by providing adequate buffers between existing floodways and proposed facilities, aligning new trails perpendicular to the fall line and within the limits of the maximum sustainable grade, and minimizing alterations to the existing floodway that could affect downstream river scour or deposition. In some instances, it may also be necessary to close temporarily one or more trails during and immediately after a significant storm event to protect visitors from potential hazards.

Where appropriate, additional hydrological analysis would be conducted as part of construction design to ensure that no significant adverse effects to the proposed facility and/or to up or downstream properties would result from project implementation.

## **Refuge Operations**

Construction of Refuge support facilities at Rancho Jamul would not result in any impacts related to hydrology. The proposal to implement repairs to the existing Saddle Road Dam and address the existing seepage problem on the outside of the dam face would require consideration of the existing hydrologic conditions in the vicinity of the dam. The proposed repair work would be expected to benefit hydrologic conditions downstream and minimize the potential for future dam failure. Proposed mineshaft closures would have minimal, if any, effects on hydrology.

## 5.2.7.3 Alternative C

## Wildlife and Habitat Management

The effects to hydrology of implementing the wildlife and habitat management actions described under Alternative C would be the same as those described under Alternative B.

## Public Use

The effects to hydrology of implementing the public use proposals described under Alternative C would be similar to those described under Alternative B. With respect to the proposal to construct a boardwalk through a portion of the Shinohara vernal pool site, the design for the facility will take into account the need to protect the microhydrology of the site, which supports the vernal pool habitat. The boardwalk would be constructed using a pin foundation system or a similar product that does not require any grading on the site. This will ensure that no adverse effects to hydrology would result from the implementation of this project.

## **Refuge Operations**

The effects to hydrology of implementing the Refuge operations proposed under Alternative C would be the same as those described under Alternative B.

## 5.2.7.4 Alternative D

## Wildlife and Habitat Management

The effects to hydrology of implementing the wildlife and habitat management actions described under Alternative D would be the same as those described under Alternative B.

## Public Use

The effects to hydrology of implementing the public use proposals described under Alternative D would be similar to those described under Alternative C.

## **Refuge Operations**

The effects to hydrology of implementing the Refuge operations proposed under Alternative D would be the same as those described under Alternative B.

## 5.2.7.5 Modified Alternative D

## Wildlife and Habitat Management

The effects to hydrology of implementing the wildlife and habitat management actions would be the same as those described under Alternative B.

## Public Use

The effects to hydrology of implementing the public use proposals described under modified Alternative D would be similar to those described under Alternative C.

## **Refuge Operations**

<u>The effects to hydrology of implementing the Refuge operations proposed under modified</u> <u>Alternative D would be the same as those described under Alternative B.</u>

## 5.2.8 Effects to Water Quality

## 5.2.8.1 Alternative A – No Action

## Wildlife and Habitat Management

Best management practices (BMPs) (e.g., installation of fiber rolls, silt fencing) are currently implemented by Refuge staff during maintenance activities such as access road repairs and fencing removal and replacement, as well as around areas undergoing preparation for native habitat restoration. These BMPs are intended to minimize erosion and sedimentation into adjacent wetlands. The continued implementation of these types of measures would minimize or avoid water quality impacts within the Sweetwater River, Steele Canyon Creek, and other smaller drainages, as well as downstream reservoirs and ultimately San Diego Bay.

Erosion control has also been used on the Refuge following loss of vegetation due to wildland fire. Depending upon the severity and extent of a fire, various erosion control methods have been and will continue to be implemented to minimize erosion from burn areas into adjacent drainages. These measures include the installation of fiber rolls, silt fencing, check dams, or water bars to reduce the potential for siltation due to erosion during storm events and, as appropriate, reseeding with native species to minimize the time that barren soils are exposed to wind and water erosion. The specific measures to be implemented following a wildland fire event are determined based on a rapid evaluation of the effects of the fire on the physical characteristics of the burn site, such as the extent of any remaining vegetation cover, size of the burn area, steepness of the slopes, soil types present, and proximity to major drainages.

## Pest Management

The control of invasive plant species on the Refuge involves mechanical removal and the periodic application of herbicides. Although mechanical removal has the potential to expose soils to wind and water erosion, these activities are generally limited to the use of hand tools and/or are focused on individual plant removal rather than the removal of large areas of vegetation. Therefore, the continuation of mechanical control methods is not expected to impact water quality within adjacent wetland areas.

Because the Service uses insecticides, herbicides, and fungicides on refuges, a formal pesticide use review process is employed to ensure that all chemical pesticides approved for use have been reviewed for their potential impacts to groundwater, surface water, and terrestrial and aquatic non-target vegetation and wildlife, including threatened and endangered species. This process involves the preparation and approval of a Pesticide Use Proposal (PUP). The Service maintains a database (Pesticide Use Proposal System [PUPS]) that contains a list of all pesticides approved for use on each Refuge, as well as details regarding target pests, products applied, application dates, rates, methods, number of applications, site description, sensitive habitats, and BMPs employed to avoid impacts to Refuge resources. Pesticides approved for use must be shown to pose the lowest toxicity-related threat to non-target terrestrial and aquatic ecosystems while addressing the specific pest control objectives. The pesticides approved for use on the San Diego NWR are described in Chapter <u>3 of the Final CCP</u>.

The use of herbicides to control invasive plants could also pose several environmental risks, including water contamination and persistence in the environment (Bossard et al. 2000). The potential for such risks under this alternative is considered minimal due to the types and limited quantities of herbicides used on the Refuge, combined with the requirements for review and approval of all products used on the Refuge through the PUPS and the requirement that all applications of approved pesticide products be conducted in accordance with the specifications on the project label. Products currently used on the Refuge to control invasive plants include Telar XP, with the active ingredient chlorsulfuron; Fusilade DX, with the active ingredient fluazifop; and Makaze, Prosecutor, Roundup, Roundup Pro, and Rodeo all of which contain the active ingredient glyphoste. Table 5-1 presents information regarding the basic hazards and environmental fate of these herbicides.

Table 5-1 Environmental Fate of Herbicides Presently Used on the Refuge (Alt. A) (Factors Specific to Air and Water Quality)					
Active Ingredient	Application Details	Solubility in Water	Basic Hazard Identification		
Chlorsulfuron	Applied at very low application rates, and apply only one application per growing season, implement measures to control spray drift	Very high at pH 7; decreases to medium at pH 5	Potential for off target movement and non-target effects via runoff, leaching (half-life in water is one month); high mobility in soils with affinity for dry, light sandy soils that can move by wind or water (half-life in soil averages 40 days)		
Fluazifop	Runoff potential reduced by avoiding application when rainfall could occur within 48 hours	None	Non-volatile but may increase with temperature, soil moisture; not water soluble, high runoff potential of several months after application; binds strongly to soils, low soil mobility (half-life in soil averages 15 days)		
Glyphosate	Application should not occur during a temperature inversion, as drift potential is high	Very High	Non-volatile; runoff, leaching potential (half-life in water 35-63 days); low mobility in soil (half-life in soil averages 25–47 days, range 2– 130 days)		

Potential impacts to water quality from the use of herbicides can occur because of product drift during application. Several factors influence drift, including spray droplet size, wind and air stability, humidity and temperature, physical properties of herbicides and their formulations, and the method of application. Accidental drift is most likely to happen when the chemical is applied by broadcast method, particularly via a boom. Drift is less likely to occur when other methods are used such as basal bark, cut stump, or wick application.

There is also the potential for surface water contamination when herbicides are applied intentionally or accidentally near wetland areas or when soil-applied herbicides are carried away in runoff to surface waters. To minimize such impacts, decisions as to which herbicide should be used in a particular area are determined based on site and weather conditions, soil type, depth of water table, presence of water sources, and guidance provided via the PUPS approval process. Application schedules are designed to avoid impacts to water quality while remaining consistent with the objective of the vegetation treatment program.

To ensure that adverse effects to water quality related to the application of pesticides will not occur, Refuge staff will adhere to all label directions (e.g., application methods and rates; proper cleaning, storage, and disposal of application equipment and herbicide products), Service regulations, and guidance provided through the PUPS approval process.

#### Public Use

Many of the user-created trails within the Refuge do not meet the definition of a sustainable trail and, as a result, contribute to moderate to severe erosional issues on the Refuge. Usercreated trails, sometimes referred to as social trails, generally do not follow the existing contours of the hillsides and instead follow the fall line of the slope or are created in the flat terrain at the bottom of the slopes. Both of these situations result in problems that ultimately contribute to increased siltation in downstream drainages. As water flows down the slope, it will follow the path of least resistance; this is the fall line. Trails that follow the fall line tend to channel stormwater and often develop deep gullies due to the erosional forces of high velocity stormwater. This is a particular concern because many of the soils present on the steeper slopes within the Otay-Sweetwater Unit are described as having a high erosion hazard. Trail users, including bikers, hikers, and equestrians who attempt to maneuver down these steep trails, can exacerbate erosional problems on a trail. Braking tires, sliding feet, and heavy horse hooves can loosen disturbed soil making the gullies deeper or causing additional disturbance outside the boundaries of the trail by traveling off the trail to avoid the gullies.

Trail widening and trail braiding, which often occur along eroded trail segments, result in further exposure of soils, increasing the extent of erosion associated with trail use in a particular area. In the same way, trails created in flat areas can collect water, causing muddy situations that trail users avoid by creating new pathways around the problem. The result is two to three new trail treads that will likely also be subject to water collection over time. During heavy rainstorms, silt from these muddy areas can flow into adjacent waterways, increasing turbidity and degrading downstream water quality.

Measures that could be implemented to reduce or eliminate these impacts to water quality include closing and rehabilitating some trails and/or rerouting unsustainable trail segments. Less severe problems may be addressed through corrective measures such as establishing an appropriate outslope, constructing knicks or rolling grade dips to allow water to move off the trail, or armoring in flat, wet areas can reduce the potential for erosion.

The existing parking lot in the McGinty Mountain area consists of a pervious surface that minimizes the potential for sheet flow and increased storm water velocities across the site. No adverse impacts to water quality have been identified in this portion of the Refuge.

Another potential impact to water quality related to trail use is the accumulation of horse and dog waste on the trail and in staging areas. The phosphorous, nutrients, and potential forms of bacteria, including fecal coliform, present in horse urine and/or manure and dog waste, can all be detrimental to water quality.

Dog waste carries bacteria, viruses, and parasites that can threaten the health of humans and wildlife, and generally contains nutrients that promote weed and algae growth. On average, dogs produce  $5 \times 10^9$  fecal coliform bacteria per animal per day (Horsley and Witten, Inc. 1996), some of which are *Escherichia coli* (*E. coli*). Dogs can also carry *Salmonella* and *Giardia*. When a pet owner fails to properly clean up and dispose of their pet's waste, which includes roughly 40 percent of pet owners in America, the feces can be picked up by stormwater runoff and washed into nearby wetland areas. Once in the water, coliform bacteria and parasites can be released, and the decaying pet waste can consume oxygen and sometimes release ammonia, leading to degraded water quality and impacts to the health of aquatic organisms.

Horse manure and urine can also poses a threat to ground or surface water quality; however, the risk from trail horse activity is considered low (Westendorf 2011). The nitrogen present in

horse urine is highly volatile and quickly converts to ammonia gas. Nutrients in horse feces are primarily organic matter containing nitrogen that is slowly converted to ammonium or nitrate over several years. Nitrate does have the potential to leach into the ground but the process is slow. This slow leaching process combined with relatively low numbers of horses on the trail results in a very low potential for groundwater contamination.

The traces of phosphorus and potassium found in horse urine are not considered a threat to groundwater contamination, but because these constituents bind to soil particles, there is the potential for the contaminated sediments to erode into surface water bodies, particularly when trails are located in proximity to streams or other drainages.

A number of pathogenic microorganisms have been identified in horse manure; however, for the most part, these organisms are usually present in insignificant levels. Studies conducted by the National Animal Health Service found *Salmonella* in 0.02 percent of the horses in the northern region of the United States (1 in 500 horses shedding *Salmonella*). Research conducted at the University of California found insignificant amounts of *E. coli* in adult horse intestines (Westendorf 2011). *Cryptosporidium* and *Giardia* are also present at low levels in horses. One study found 0.33 percent of horses were carrying *Cryptosporidium parvum* and 0.66 percent of horses carrying *Giardia* (Westendorf 2011). Vegetated buffer strips demonstrated some ability to remove *Cryptosporidium* oocysts from runoff before deposition in a water source. The success of the removal process varied depending upon soil type, soil density, and percent slope (Atwill et al. 2002).

Ongoing equestrian use on some Refuge trails is not expected to result in significant impacts to water quality on the Refuge or downstream within the Sweetwater Reservoir. Impacts related to dog waste on the Refuge are currently a concern, with demonstrating a need for additional user education and compliance with waste removal requirements.

## **Refuge Operations**

The activities implemented to support Refuge operations under Alternative A result in minor, if any, impacts to the existing water quality on the Refuge or at Rancho Jamul.

## 5.2.8.2 Alternative B

## Wildlife and Habitat Management

The BMPs described under Alternative A for actions related to wildlife and habitat management, including actions taken after fires, would also be implemented, as appropriate, when conducting the additional wildlife and habitat management actions proposed under Alternative B. The implementation of these BMPs would minimize or avoid water quality impacts within the Sweetwater River, Steele Canyon Creek, and other smaller drainages, as well as downstream reservoirs and ultimately San Diego Bay.

The control of feral pigs, should they enter the Refuge, is not proposed under this alternative, therefore, there is a potential under this alternative for future impacts to water quality associated with pig activity on Refuge lands. Specifically, feral pigs typically feed by digging or rooting through the upper soil layer. This disturbance can be extensive and frequently occurs in riparian areas (USDA Forest Service 2013). The result of this activity is displaced soils and vegetation, leaving large areas of bare ground vulnerable to erosion. The correlation between soil erosion and the presence of feral pigs in a watershed is supported in the scientific literature (Browning 2008).

In California, feral pigs are a documented source of coliform bacteria in watersheds (USDA Forest Service 2013). The foraging and wallowing behavior of pigs can markedly increase water turbidity, but more importantly, feral pigs can introduce infectious waterborne organisms into the watershed. Important protozoan parasite pathogens, such as Giardia, Cryptosporidium, Balantidium, and Entamoeba are often present in the feces of feral pigs. In a study conducted in California, it is suggested "that given the propensity for feral pigs to focus their activity in riparian areas, feral pigs may serve as a source of protozoal contamination for surface water" (Atwill et al. 1997). The presence of feral pigs on the Refuge could affect water quality within the Sweetwater River, Sweetwater Reservoir, and Otay Lakes.

## Pest Management

Under Alternative B, pesticide use on the Refuge would be addressed through the IPM Plan presented in Appendix D. The herbicides described under Alternative A would also be considered for use under Alternative B, along with several additional products. The basic hazards and environmental fate of the herbicides proposed for use under Alternative B are presented in Table 5-2.

Table 5-2 Environmental Fate of Herbicides Proposed For Use on the Refuge (Alt. B) (Factors Specific to Air and Water Quality)					
Active Ingredient	Application Details	Solubility in Water	Basic Hazard Identification		
Chlorsulfuron	Applied at very low application rates, and apply only one application per growing season, implement measures to control spray drift	Very high at pH 7; decreases to medium at pH 5	Limited volatility; potential for off target movement and non-target effects via runoff, leaching (half-life in water, one month); high mobility in soils with affinity for dry, light sandy soils that can move by wind or water (half-life in soil averages 40 days)		
Aminopyralid	Highly volatile, apply at cool temperatures, low wind speed and no inversion conditions	High	Low volatility; low potential for groundwater contamination		
Fluazifop-P- butyl	Runoff potential reduced by avoiding application when rainfall could occur within 48 hours	None	Non-volatile; not water soluble, high runoff potential for several months after application; binds strongly to soils, low soil mobility (half-life in soil averages 15 days)		
<b>Glyphosate</b> (containing surfactant)	Do not apply directly to water or when winds exceed 10 miles per hour or inversion conditions exist	Very High	Non-volatile; runoff, leaching potential (half-life in water 12 days to 10 weeks); immobile in soil (half-life in soil, 1 to 174 days)		
<b>Glyphosate</b> (mixed w/ H <sub>2</sub> O or nonionic surfactant)	Application should not occur during a temperature inversion, as drift potential is high	Very High	Non-volatile; runoff, leaching potential (half-life in water 12 days to 10 weeks); immobile in soil (half-life in soil ranges from 1 to 174 days)		
Triclopyr (ester)	Highly volatile, apply at cool temperatures and no wind	Medium	Insoluble and persistent in water; very high mobility in soil (average half-life in soil, 30-90 days; in anaerobic soils, half-life is considerably longer (1,600-1,300 days)		
Oryzalin	Do not apply directly to water or where soils have rapid to very rapid permeability	Slightly	Limited volatility; low water solubility (half-life in water, 8-40 days); moderate soil mobility (half-life in soil averages 20 days); leach potential		
Clethodim	Do not apply when conditions are favorable for drift (drought, high temperatures, low relative humidity), especially when sensitive plants are located nearby	Highly dependent on pH	Non-volatile; highly persistent in the aquatic environment; slight soil mobility, but not a threat to groundwater; low persistence in most soils (half-life in soil is about 3 days)		

Integrated pest management not only involves the selective use of pesticides, it also incorporates the following additional strategies: prevention, mechanical, physical, and cultural methods for controlling pest, biological control, and habitat maintenance, enhancement, and restoration. The effects of these non-pesticide IPM strategies (e.g., the physical removal of invasive plants with hand tools, possible future use of biological controls, restoration of native species in disturbed areas) to address pest species on the Refuge would have potential effects to water quality similar to those described under Alternative A.

Pesticides considered for use on the Refuge are evaluated through the PUPS process using scientific information and analyses that is documented in Chemical Profiles of the IPM (Appendix D, Attachment B). These profiles, which are described in detail in the IPM Plan, provide quantitative assessment/screening tools and threshold values to evaluate potential effects to water, soil, and air. PUPs are approved where the Chemical Profiles provide scientific evidence that potential impacts to the Refuge's physical environment are likely to be only minor, temporary, or localized in nature.

A number of BMPs intended to protect water quality would be implemented on the Refuge as part of the pesticide application process. Some of these BMPs are presented here.

- To avoid spills, spray tanks will not be left unattended during filling.
- To ensure the greatest efficacy of the product and minimize the need for reapplication, water quality parameters (e.g., pH, hardness) will be considered when specified on the pesticide label.
- All pesticide spills will be addressed immediately using procedures identified in the Complex's Emergency Action Plan Incidental or Emergency Chemical Spills.
- Refuge staff will use low impact herbicide application techniques (e.g., spot treatment, cut stump, oil basal, Thinvert system applications) rather than broadcast foliar applications (e.g., boom sprayer, large tank wand applications), wherever practical.
- Equipment will be calibrated regularly to ensure that the proper rate of pesticide is applied to the target area or species.
- Spray applications will not be conducted on days with a greater than 30 percent forecast for rain within six hours, except for pesticides that are rapidly rain fast (e.g., glyphosate in 1 hour) to minimize or eliminate potential runoff.

A complete list of the BMPs to be implemented for pesticide use on the Refuge is provided in the IPM Plan (Appendix D).

In some cases (as described in the Environmental Fate discussion found in the IPM Plan [Appendix D]), product specific BMPs must be implemented to ensure that impacts to water quality are not significant. For example, to minimize the potential for groundwater quality degradation caused by leaching and/or surface runoff, a pesticide with a soil half-life or aquatic persistence half-life of more than 100 days would only be approved for use on the Refuge if one or more of the following BMPs are implemented: 1) limiting application of a particular product to one application per site per year; 2) not using a particular product on coarse-textured soils where the groundwater table is less than 10 feet below the surface and the average annual precipitation is greater than 12 inches; and/or 3) not using a particular product on steep slopes

if substantial rainfall is expected within 24 hours or the ground is already saturated. The same BMPs are required if the soil or aquatic dissipation time (i.e., the time required for 50 percent of the deposited pesticide to degrade and move from a treated site) for a proposed product is greater than 100 days.

The potential for a pesticide to move to groundwater is another factor that is considered in the PUPs approval process. This potential is determined using the Groundwater Ubiquity Score (GUS) (refer to Appendix D for more information about GUS). Where GUS is greater than 4.0, a PUP will only be approved with additional BMPs implemented specifically to protect water quality. These are the same BMPs described previously for soil half-life and dissipation time.

Based on scientific information and analyses documented in the Chemical Profiles in the IPM plan, pesticides allowed for use on Refuge lands would be relatively low risk to surface and groundwater quality due to low toxicity levels or short persistence in the environment, and/or the implementation of general and pesticide specific BMPs. Information regarding the risks to water quality of particular pesticides is provided on the product labels and is available in the Pesticide Properties Database (PPDB 2009) developed by the Agriculture & Environment Research Unit of the University of Hertfordshire and found online at http://sitem.herts.ac.uk/aeru/footprint/en/index.htm.

The potential impacts, if any, to water quality from the application of these pesticides in accordance with the directions on the label and the general BMPs described in Appendix D would be minor, temporary, or localized in nature.

#### Public Use

Future actions associated with the provision of public uses on the Refuge under Alternative B include establishment of a designated trail system, the closure and/or rerouting of trails that represent an adverse effect to sensitive habitats and species or were created without regard for topography and water movement, and the development of new visitor services facilities (e.g., parking lots, staging areas, refuge offices). Water quality impacts associated with these types of actions would be avoided or minimized through sensitive project design and the implementation of temporary and long-term BMPs. These BMPs could include but are not limited to the use of silt fencing, straw wattles, and filter fabric to prevent the introduction of exposed soils into adjacent wetland areas; proper maintenance and fueling of construction vehicles to avoid spills and tracking of dirt onto public roadways; and appropriate erosion control techniques following construction to minimize the potential for erosion while the desired vegetation becomes established. With the implementation of appropriate BMPs, which are further addressed in Section 6.9.3 of the draft CCP/EA, no adverse effects related to water quality would occur under Alternative B.

The development of any new trails on the Refuge, as well as trail rehabilitation and/or realignment projects, would occur in accordance with sustainable trail practices, such as those implemented by the California Department of Parks and Recreation. Guidance for developing sustainable trails is addressed in Section 6.9.3 of the draft CCP/EA.

The potential for impacts to water quality from larger projects, such as the provision of visitorserving facilities on the 2.4-acre Caltrans site near Millar Ranch Road, would be further reduced by the implementation of a Storm Water Pollution Prevention Plan (SWPPP). A SWPPP is required by the State of California as part of the California NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities for all construction projects on the Refuge, including restoration projects, that disturb one or more acres of land surface.

Potential impacts to water quality due to the presence of horses on the Refuge would be reduced, to some extent, by the closure of user-created trails located within the riparian zone of the Sweetwater River and the realignment of certain trails currently located too close to the Sweetwater River corridor. In addition, equestrian-related water quality BMPs developed in response to NPDES permits issued by the Santa Ana and San Diego Regional Water Quality Control Board (Task Force 2004) would be implemented as applicable for the proposed trail system and within trail staging areas.

Staging area plans will take into consideration site drainage and will include facilities necessary to ensure proper containment and disposal of horse manure. Equestrians would also be asked to implement additional BMPs to reduce opportunities for *Cryptosporidium parvum* and fecal coliforms to enter the watershed. These include establishing a volunteer manure cleanup program on the Refuge and not allowing horses to eliminate in or adjacent to watercourses. According to Adda Quinn of EnviroHorse, equestrians are being educated not to allow their animals to eliminate during stream crossings and to avoid stopping in the watercourse while making a crossing. The construction of the Sweetwater River Trail bridge has substantially reduced the number of horses entering the river floodway.

Under Alternative B, no dogs would be permitted on the Refuge, which would reduce the concerns related to water quality impacts from dog feces.

Should a fair weather undercrossing be proposed for construction under Highway 94 at the Sweetwater River, a range of BMPs would be required during and after construction to protect water quality. These BMPs include many already presented in this document, as well as limitation on where and how construction vehicles can be fueled and serviced, how soil can be stockpiled during construction, requirements for spill response kits to be on-site at all times during construction, and the possible use of coffer dams to separate the construction site from the floodway. The implementation of specific BMPs, which would be identified during subsequent site-specific engineering and NEPA analysis, would be included as part of the scope of work. Adherence to these requirements would minimize the potential for impacts to water quality during and following construction.

## **Refuge Operations**

The same BMPs described previously for the construction of public use facilities would also be implemented during the construction of the proposed visitor contact station, the Refuge support facilities proposed at Rancho Jamul, the repair of the Saddle Road Dam, and closure of mind shafts. In addition, when required, a Storm Water Pollution Prevention Plan (SWPPP) will be implemented during construction. These actions would minimize the potential for adverse effects to water quality on and downstream of the Refuge.

## 5.2.8.3 Alternative C

## Wildlife and Habitat Management

Proposals for wildlife and habitat management under Alternative C would be essentially the same as those described under Alternative B, and the same BMPs would be implemented to minimize the potential for adverse effects to water quality.

## Pest Management

The analysis of potential effects to water quality from the implementation of the IPM Plan would be the same under this alternative as described previously for Alternative B.

#### <u>Public Use</u>

The primary difference between Alternatives B and C that relate to water quality include an increase in the number of trails that will be open to multiple uses, which results in the potential for additional horses to be present on the Refuge. In addition, leashed dogs and hunting dogs would be permitted on the Refuge under this alternative. As a result, the impact analysis described under Alternative A with respect to horse manure and dog waste would also be relevant under Alternative C. With respect to dogs, Alternative C allows dogs to be present on the Refuge. Leashed dogs would be permitted on trails provided users collect and properly dispose of dog waste. If dog waste is allowed to accumulate at trailheads or along the trails, the ability to bring leashed dogs onto the Refuge could be revoked without notice. Dogs would also be permitted to accompany hunters in accordance with Refuge-specific regulations. Hunting dogs, which would be present on the Refuge in limited numbers, would be required to be under voice control at all times. Assuming trail users and hunters adhere to Refuge regulations related to dogs, the effects to water quality would be minimal. If noncompliance results in the accumulation of waste, potentially impacting water quality within the Refuge watercourses, dog walking would no longer be permitted on the Refuge.

#### **Refuge Operations**

The effects to water quality of implementing the Refuge operations proposed under Alternative C would be the same as those described under Alternative B.

### 5.2.8.4 Alternative D

#### Wildlife and Habitat Management

Proposals for wildlife and habitat management under Alternative D would be generally the same as those described under Alternative B, and BMPs would be implemented to minimize the potential for adverse effects to water quality.

A potential benefit to water quality under this alternative is the proposal to implement a Feral Pig Monitoring and Eradication Plan. Although feral pigs were not known to occur on the Refuge as of January 2014, should they disperse from their current locations onto the Refuge, their activities could result in adverse effects to water quality, as described under Alternative B. The prompt control of feral pigs on refuge lands in accordance with the proposed Feral Pig Monitoring and Eradication Plan would minimize or avoid such impacts.

To avoid any potential for sedimentation or other water quality-related impacts from the implementation of the Feral Pig Monitoring and Eradication Plan, corral style traps would not be installed within wetlands, the ordinary high water mark, or the bed and bank of any drainage. In addition, no pig carcasses will be left within the ordinary high water mark or within the bed and bank of any drainage or wetland.

## Pest Management

The analysis of potential effects to water quality from the implementation of the IPM Plan would be the same under this alternative as described previously for Alternative B.

## Public Use

The effects to water quality under Alternative D would be similar to those described under Alternative C; however, dogs would only be permitted on multiple use trails and in the designated hunting area on the Otay Mesa and Lakes area. Assuming visitors adhere to Refuge regulations related to dogs, the effects of this alternative as they relate to water quality would be similar to those described under Alternative A. The measure addressed under Alternative C to reduce the potential effects to water quality from horse activity on the Refuge would also be implemented under Alternative D.

## **Refuge Operations**

The effects to water quality of implementing the Refuge operations proposed under Alternative D would be the same as those described under Alternative B.

## 5.2.8.5 Modified Alternative D

## Wildlife and Habitat Management

Proposals for wildlife and habitat management under Alternative D would be generally the same as those described under Alternative B, and BMPs would be implemented to minimize the potential for adverse effects to water quality. The actions proposed to avoid water quality impacts from feral pig eradication, as described under Alternative D, would also be implemented under this alternative.

## Pest Management

The analysis of potential effects to water quality from the implementation of the IPM Plan would be the same under this alternative as described previously for Alternative B.

## Public Use

<u>The effects to water quality would be similar to those described under Alternative C. Assuming visitors adhere to Refuge regulations related to dogs, the effects of this alternative as they relate to water quality would be similar to those described under Alternative A. The measure addressed under Alternative C to reduce the potential effects to water quality from horse activity on the Refuge would also be implemented under this alternative.</u>

## **Refuge Operations**

The effects to water quality of implementing the Refuge operations proposed under this alternative would be the same as those described under Alternative B.

# 5.2.9 Effects from Climate Change

## 5.2.9.1 Alternatives A, B, C, D, and Modified Alternative D

According to Ackerly (2012), "climate change per se is a pervasive feature of earth history," however, "the pace of change currently forecast for the next 100 years is virtually unparalleled in its speed, magnitude, and global extent. If the rate of change exceeds the pace of biological response, especially the capacity of populations to migrate or undergo adaptive evolutionary change, impacts on species distributions, community structure, and ecosystem function may be profound. Projecting the magnitude and distribution of these impacts poses a considerable challenge, requiring integration of theory and observation from a range of disciplines, including paleoecology, ecophysiology, population biology, and biogeography." As discussed in Chapter <u>4 of the Final CCP</u>, world climate is changing as a result of the accumulation of carbon dioxide and other greenhouse gases in the atmosphere (USFWS 2010h, Cayan 2009). These changes in climate are expected to affect mean average temperature, extreme temperatures, duration of extreme temperature events, average rainfall, amount of rainfall versus snowfall, increases in severe storm events, sea levels, and other associated climatic factors. Global average temperature increases of 0.74 degrees Celsius (°C) are already documented, and temperature increases in some areas are projected to exceed 3.0°C over the next decade. In California, the surface air temperature has risen about 1°F over the last 100 years (Cayan 2009), and there is general consensus that temperatures in southwestern California will increase in most months by about 2°C over the next 100 years (PRBO Conservation Science 2011).

Regional climate models have also projected a significant increase in extreme temperature events in coastal southern California, as well as increases in prolonged hot spells. In addition, some models project even higher summer temperatures in the areas of southern California located outside the influence of the coastal zone (Cayan 2009). Although there appears to be general consensus that temperatures will increase in most months in southern California, there is no consensus regarding the projected effects of climate change on precipitation patterns in southern California. Some models predict a decrease in mean annual rainfall, while others suggest little, if any, change over current conditions (PRBO Conservation Science 2011).

Observations made across the country indicate that climate change is affecting wildlife, plants, and habitat quality. In southwestern California, chaparral and coastal sage scrub vegetation is projected to decrease, while areas of non-native grasslands are projected to increase. This change will have a significant impact on the range of species that depend on scrub habitat for survival, including a number of listed bird, plant, and insect species. This change in vegetation type, along with increased temperatures and possibly increases in periods of drought, would also be expected to result in increased fire frequency, which would further exacerbate the conversion of native habitats to non-native grassland.

Climate change is considered a major threat to biodiversity at the global and local level (Dawson et al. 2011, Gardali et al. 2012); however, we have only just begun to assess the full extent of this threat. According to Dawson et al. (2011), "Assessing the biodiversity consequences of climate change is complicated by uncertainties about the degree, rate, and nature of projected climate change, the likelihood of novel and disappearing climates, the diversity of individual-species responses to a broad suite of interacting climate variables, and interactions of climate-change effects with other biotic factors (e.g., competition, trophic relationships) and stressors (land use, invasive species, pathogens, pollutants)." To address this threat, it is important to understand the various aspects of a species' vulnerability (e.g., exposure, sensitivity, adaptive capacity) to climate change. With this information, it may be possible to adapt management actions to address these vulnerabilities and to take advantage of a species' adaptive capacities.

Magness et al. (2011) used this approach to examine the vulnerability of the reserve units within the NWRS and then suggested a suite of management approaches that would capitalize on local conditions to facilitate adaptation and help spread ecological risk across the NWRS network. These management approaches ranged from retrospective strategies (e.g., maintaining historic conditions) for refuges with slow rates of environmental change to prospective approaches that would facilitate ecological transitions consistent with future climatic conditions.

The Service has developed a draft National Fish, Wildlife and Plants Climate Adaptation Strategy (public review draft dated January 2012) to address the effects of climate change, conserve ecosystems, and make these ecosystems more resilient. The seven goals of this Strategy include:

- **Goal 1:** Conserve habitat to support healthy fish, wildlife, and plant populations and ecosystem functions in a changing climate.
- **Goal 2:** Manage species and habitats to protect ecosystem functions and provide sustainable cultural, subsistence, recreational, and commercial use in a changing climate.
- **Goal 3:** Enhance capacity for effective management in a changing climate.
- **Goal 4:** Support adaptive management in a changing climate through integrated observation and monitoring and use of decision support tools.
- **Goal 5:** Increase knowledge and information on impacts and responses of fish, wildlife, and plants to a changing climate.
- **Goal 6:** Increase awareness and motivate action to safeguard fish, wildlife, and plants in a changing climate.
- **Goal 7:** Reduce non-climate stressors to help fish, wildlife, plants, and ecosystems adapt to a changing climate.

The wildlife and habitat management actions currently being implemented, as well as those proposed in Alternatives B, C, D, <u>and modified D</u>, are consistent with these goals. Expanded monitoring proposals included in Alternatives B, C, D, <u>and modified D</u> would provide additional data about existing habitat quality and species distribution and abundance, allowing biologists to identify changes over time and adapt management actions accordingly.

## 5.2.10 Effects to Air Quality

## 5.2.10.1 Alternative A – No Action

## Wildlife and Habitat Management

Current wildlife and habitat management activities on the Refuge require the use of motorized vehicles for access to the six management areas within the Refuge. The staff on the Refuge consists of a full-time Refuge Manager, Refuge Operations Specialist and Wildlife Biologist. The Refuge also relies on contractors, other agency staff, and researchers to assist in management activities such as habitat and endangered species monitoring, invasive species control, habitat restoration, research, and general species surveys. Refuge staff generate approximately 80 vehicle trips to and from the Refuge office per week and an additional 20 to 30 trips per week associated with traveling to and from various parts of the Refuge. Trips generated by other entities working on the Refuge are variable, with some occurring seasonally and others only occurring during the duration of a particular project. The sum of these trips contributes extremely low levels of emissions, and the pollutions generated are considered negligible in the context of the larger air basin regulated by the San Diego Air Pollution Control District.

The wildlife and habitat management activities occurring on the Refuge result in limited exposure of soils to wind erosion; therefore, the contribution of particulate matter from the operation and management of the Refuge to the larger air basin is also negligible.

## Pest Management

As described previously in the water quality section, herbicides are used on the Refuge to control invasive plants. Herbicides and pesticides in general can volatilize from soil and plant surfaces and move from the treated area into the atmosphere. The potential for a pesticide to volatilize is determined by the pesticide's vapor pressure. As indicated in Table 5-2, the only product used on the Refuge at this time with high volatility is Pathfinder II (active ingredient triclopyr). This product, along with the other products used on the Refuge, are applied at such low volumes on the Refuge that even volatile products quickly become diluted in the atmosphere, minimizing the effect on local air quality. In addition, Pathfinder II is permitted to be applied only once a year on the Refuge.

The potential for adverse air quality impacts from the use of these products is further reduced through compliance with all Federal, State, and local pesticide use laws and regulations, as well as Department of the Interior (DOI), Service, and NWRS pesticide-related policies. This includes compliance with the FIFRA, which requires all pesticides to be applied at the rates and with the application equipment specified on the pesticide label.

Based on the analysis provided previously, the implementation of the habitat and pest management proposals included under Alternative A are not expected to result in any significant adverse effects to air quality.

## Public Use

The public use program currently conducted on the Refuge generates vehicular emissions because of visitors traveling to and from various parts of the Refuge to use the trails, observe wildlife and plants, or attend special events. The total number of trips generated from these visits to the Refuge is unknown. Based on the estimate of 22,000 visitors to the Refuge in 2011, a worst-case scenario would be that visitors traveled to and from the Refuge in a car by themselves, generating 44,000 trips per year. The total number of trips is likely lower, as many users travel to the Refuge in groups of two or more, some travel via bicycle and others walk onto the Refuge from nearby homes. In the context of the emissions generated throughout the air basin, even if the total number of trips generated by visitors to the Refuge was 50,000 trips per year, the emissions from these trips, which represents fewer trips that those occurring along Highway 94 in one day, are negligible. Therefore, continuation of the current public use programs on the Refuge would not result in any significant adverse effects to air quality.

## **Refuge Operations**

The potential effects to air quality as they relate to current Refuge operations would be the same as those addressed previously under Wildlife and Habitat Management and Public Use.

## 5.2.10.2 Alternative B

## Wildlife and Habitat Management

Each of the wildlife and habitat management activities conducted under Alternative A would also occur under Alternative B. As described in Alternative A, none of these activities would result in adverse effects to air quality. The additional management activities included within Alternative B such as habitat restoration and enhancement, expanded monitoring and research, and the construction of new visitor-serving facilities in various locations on the Refuge, as well as operation-related facilities at Rancho Jamul (e.g., native plant nursery, staff barracks, storage facility) would all generate new vehicle trips and associated emissions. Some trips, such as those associated with new construction and research projects, would be temporary, while others would result in long-term increases in miles driven, such as increases in staffing.

This alternative proposes to increase the number of staff members by seven, resulting in approximately 140 new trips per week. This increase in trips is still relatively low and, in the context of the emissions generated throughout the air basin would be inconsequential.

Construction projects that require vegetation removal and grading could result in temporary, localized adverse impacts to air quality related to fugitive dust and tailpipe emissions generated by construction equipment (e.g., graders, tractors, dump trucks). The effects to air quality of implementing the individual projects would not generate dust or emissions in excess of current air quality standards. Additionally, these projects would be implemented at different times as funding sources are identified, so emissions from construction would be spread over many years.

To reduce the generation of emissions is the maximum extent practicable, the measures presented here would be included in all construction specifications for projects implemented on the Refuge.

- The load of all haul vehicles shall be covered to reduce fugitive dust generated during the transport of materials and any stockpiled material shall be covered to reduce the production of dust.
- To prevent visible dust emissions from leaving the project site boundary, measures including but not limited to, watering prior to and during any earth movement, watering exposed soil three times per day, as applicable, installing wind fencing when conditions warrant, covering excavated materials to prevent erosion, and stopping work during high wind conditions, shall be implemented.
- Construction equipment and vehicles shall not track dirt and dust onto public roads, and all equipment and tires shall be washed or swept prior to leaving the project site.
- All equipment used on the site shall meet San Diego APCD standards.

Through the implementation of these measures, short-term emissions generated during construction and/or site preparation would not adversely affect regional air quality. In addition, the emissions from these activities are not expected to exceed San Diego APCD thresholds and Federal de minimis levels.

## Pest Management

As described under Alternative A, some pesticides can volatilize from soil and plant surfaces and move from the treated area into the atmosphere. An integrated approach to pest management is proposed under Alterative B that would include the use of herbicides to control invasive plant species. Several additional products are proposed for use on the Refuge, as presented in Table 5-2; however, only Pathfinder II is characterized as volatile. Other products may be approved in the future that are also characterized as volatile, but as described under Alternative A, herbicide use the Refuge occurs at low volumes, and the number of applications per year is limited. As a result, there is little, if any, potential for air quality impacts, when herbicides are applied in accordance with label requirements; all Federal, State, and local pesticide use laws and regulations; and DOI, Service, and NWRS pesticide-related policies. This includes compliance with FIFRA, which requires all pesticides to be applied at the rates and with the application equipment specified on the pesticide label.

The IPM Plan (Appendix D) includes a number of BMPs that would be implemented in association with pesticide use of the Refuge to further minimize potential effects to air quality. A summary of these BMPs is presented here.

- Low impact herbicide application techniques (e.g., spot treatment, cut stump, oil basal, Thinvert system applications) will be used to the extent practicable.
- Low volume rather than high volume foliar applications will be used when low impact methods will not provide adequate and/or uniform application rates.
- Applicators will use and adjust spray equipment to apply the coarsest droplet size spectrum with optimal coverage of the target species while reducing drift.
- Applicators will use drift reduction technologies such as low-drift nozzles.
- Spray applications will be made at the lowest height for uniform coverage of target pests to minimize or eliminate potential drift.
- If windy conditions frequently occur during afternoons, spraying (especially boom treatments) will be conducted during early morning hours.
- Spraying will occur during low (average less than 7 mph and preferably 3 to 5 mph) and consistent direction wind conditions with moderate temperatures (typically less than  $85 \,{}^{\circ}\text{F}$ ).
- Applicators will avoid spraying during inversion conditions (often associated with calm and very low wind conditions) that can cause large-scale herbicide drift to non-target areas.
- Equipment will be calibrated regularly to ensure that the proper rate of pesticide is applied to the target area or species.

A complete list of the BMPs to be implemented on the Refuge during pesticide application is provided in the IPM Plan (Appendix D).

The implementation of the BMPs presented in the IPM Plan will ensure that localized and regional air quality impacts related to herbicide use will be minimized, avoiding any adverse effects to air quality.

## Public Use

Alternative B includes a number of public use proposals not considered under Alternative A, including trail closures and realignments, construction of new parking areas and a visitor contact station. These facilities would generate additional long-term visitor trips to the Refuge, as well as short-term construction related emissions.

Vehicular emissions generated by new visitors to the Refuge would, however, continue to represent relatively low numbers when considered in the context of the larger San Diego air basin. To reduce total emissions generated from public use activities, carpooling to Refuge events will be encouraged, and, to the extent possible, special events will be schedule outside of peak traffic periods to avoid incremental increases in existing traffic congestion in the region, a contributing factor to degraded air quality.

## **Refuge Operations**

Construction projects proposed under Alternative B that relate to Refuge operations (e.g., barracks, plant nursery, Refuge office/visitor contact station) would be subject to the air quality BMPs described previously. The implementation of these measures would minimize the extent of the air emissions generated by ongoing management activities on the Refuge.

## 5.2.10.3 Alternative C

### Wildlife and Habitat Management

The wildlife and habitat management activities proposed under Alternative C and the measures proposed to minimize the potential for impacts to air quality from implementing these activities would be essentially the same as those described under Alternative B.

#### Pest Management

The analysis of potential effects to air quality from the implementation of the IPM Plan would be the same under this alternative as described previously for Alternative B.

#### Public Use

Although public uses would be expanded to some extent under Alternative C, the increase in the number of visitors to the Refuge and the potential for additional construction activity as a result of this expansion of use would be minor in the context of the larger San Diego air basin. Therefore, the implementation of the public uses proposed under Alternative C would have the same effect on air quality as those described for Alternative B.

#### **Refuge Operations**

Moving the Refuge office from Rancho Jamul to the Sweetwater River area would reduce the number and length of vehicle trips associated with Refuge operations and management, resulting in some benefits, albeit minor, to air quality. The effects to air quality of implementing the other refuge operation actions described under Alternative C would similar to those described under Alternative B.

## 5.2.10.4 Alternative D

## Wildlife and Habitat Management

The wildlife and habitat management activities proposed under Alternative D and the measures proposed to minimize the potential for impacts to air quality from implementing these activities would be essentially the same as those described under Alternative B.

#### Pest Management

The analysis of potential effects to air quality from the implementation of the IPM Plan would be the same under this alternative as described previously for Alternative B.

#### Public Use

Public uses proposed under Alternative D would be similar to those proposed under Alternative B. Therefore, the implementation of the public uses proposed under Alternative D would have the same effect on air quality as those described for Alternative B.
# **Refuge Operations**

The effects to air quality of implementing the refuge operation actions described under Alternative D would similar to those described under Alternative B.

# 5.2.10.5 Modified Alternative D

## Wildlife and Habitat Management

<u>The wildlife and habitat management activities proposed under modified Alternative D and the</u> <u>measures proposed to minimize the potential for impacts to air quality from implementing</u> <u>these activities would be essentially the same as those described under Alternative B.</u>

#### Pest Management

The analysis of potential effects to air quality from the implementation of the IPM Plan would be the same under this alternative as described previously for Alternative B.

# <u>Public Use</u>

<u>Public uses proposed under modified Alternative D would result in increases in air pollutants</u> over those proposed under Alternative B, therefore, the implementation of the public uses proposed under this alternative would have the same effect on air quality as that those described for Alternative B.

# **Refuge Operations**

The effects to air quality of implementing the refuge operation actions described under modified Alternative D would similar to those described under Alternative B.

# 5.2.11 Effects Related to Greenhouse Gas Emissions

# 5.2.11.1 Alternative A, B, C, D, and Modified Alternative D

The scientific community overwhelmingly agrees that the earth's climate is becoming warmer and that human activity is contributing to this change. Unlike other environmental impacts, climate change is a global phenomenon in which large and small GHG generators throughout the earth contribute to the impact. Therefore, although many GHG sources are individually too small to make any noticeable difference to climate change, the number of small sources around the world combine to produce a very substantial portion of total GHG emissions (CAPCOA 2008).

On February 18, 2010, the White House Council on Environmental Quality (CEQ) issued draft guidance on when and how Federal agencies should analyze the environmental effects of climate change and GHG emissions when they describe the environmental impacts of a proposed action under NEPA. Within this draft guidance, CEQ suggests that Federal agencies consider during the scoping process whether a quantitative and qualitative analysis of GHG emissions from a proposed action would provide meaningful information to decision makers and the public. CEQ proposes that direct emissions of 25,000 metric tons or more of  $CO_2$ -equivalent GHG emissions on an annual basis should be considered the indicator that a quantitative and qualitative assessment may be warranted. This level of GHG emissions is not, however, intended to be an indicator of a threshold of significant direct or indirect effects. Further, CEQ does not propose to make this guidance applicable to Federal land and resource management actions and is instead seeking public comment on the appropriate means for assessing the GHG emissions of Federal land and resource management decisions and resource management decisions.

At the State level, various options are being considered for setting a threshold for GHG emissions in California, including zero and non-zero levels, while another option involves addressing project effects without establishing a threshold. The latter could be accomplished through a quantitative or qualitative evaluation of individual projects.

GHG emissions are reported in metric tons of  $CO_2$  equivalent emissions, which represent a single metric that embodies all GHGs, including  $CO_2$ , methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Because these GHGs all have varying heat-trapping abilities and atmospheric lifetimes, a global warming potential (GWP) value has been assigned to each GHG to facilitate comparison among GHGs, with the GWP representing the heat-trapping impact of a GHG relative to  $CO_2$ , which has a GWP of 1.0 (CEQ 2012).

Under any of the alternatives, activities associated with wildlife and habitat management, public use, and Refuge operations would result in the generation of GHGs. Alternatives B, C, <u>D</u>, and <u>Modified Alternative D</u> would result in slightly higher emissions than Alternative A due to an increase in the number of staff members proposed (an increase from 3.0 to 9.5 full-time equivalents, or FTEs), limited expansion of opportunities for wildlife-dependent recreational uses, and small and moderate scale construction projects to support visitor services and Refuge operations. The emission associated with the construction projects would be temporary and limited in duration.

The relative differences between the alternatives can be described qualitatively, but quantifying the amount of GHG emissions generated from these types of uses is difficult. According to the USEPA Greenhouse Gas Equivalencies Calculator (USEPA 2011b), the use of 115 gallons of gasoline and the consumption of 1,500 kilowatt-hours of electricity each generate one metric ton of  $CO_2$  equivalent. Currently, the office facility at Rancho Jamul, which accommodates Refuge, CDFW, and BLM staff, consumes approximately 60,000 kilowatt-hours of electricity annually, or 41.4 metric tons of  $CO_2$  equivalent. Only a slight increase in energy consumption at this location would be expected should staff levels increase by 5.75 FTEs since much of the energy consumed is the result of heating and cooling the existing facility. The consumption of  $CO_2$  equivalent annually. Even with the implementation of the various construction projects proposed under Alternatives B, C, D, <u>or modified D</u>, the GHG emissions would not begin to approach the 25,000 metric tons or more of  $CO_2$  equivalent annually that CEQ suggests would warrant analysis to determine significance.

Nevertheless, the Service has a mandate to reduce the total GHG emissions generated from the operation and maintenance of the Refuge. Therefore, as vehicles are replaced, new vehicles will be selected that have better fuel economy; wherever possible, tasks requiring off-Refuge travel will be combined to reduce the total number of miles driven by Refuge staff; office equipment, including light fixtures, will be evaluated and replaced as necessary with "Energy Star" qualified products; power management features on all computers and monitors will be activated, laptop power cords will be unplugged when not in use; and all equipment and lights will be turned off at the end of the day. Future structures, such as a Refuge office, visitor contact station, or green house would also incorporate the use of solar panels to minimize GHG emissions from the Refuge.

Based on this analysis, GHG emissions anticipated to result from the implementation of any of the alternatives are not expected to represent a significant direct or indirect impact on the environment under any of the alternatives.

# 5.2.12 Effects Related to Contaminants

# 5.2.12.1 Alternative A, B, C, D, and Modified D

Under any alternative, evaluation of potential sources of environmental contaminants on the Refuge would continue to be overseen by the Service's Contaminants Program at the Carlsbad Fish and Wildlife Office to ensure that potential contaminants issues are appropriately addressed as part of the Refuge's overall management plan and do not result in any significant adverse effects to Refuge resources, Refuge visitors, or Refuge personnel.

Alternatives D and modified D include a proposal to control feral pigs on the Refuge, which will require disposal of pig carcasses, particularly when pigs are dispatched within corral traps. In most cases, pig carcasses will be transported off the Refuge. Transport and disposal would occur in accordance with applicable laws and regulations. Because the intent is to identify and dispatch pigs as soon as they are identified on the Refuge, the number of carcasses to be removed is expected to be small. If a pig is shot in a very remote location, the carcass may be left in place, where it would provide food for a range of native species (e.g., vultures, mountain lion, coyote, bobcat). Animal carcasses are not considered hazardous waste by the U.S. EPA; therefore, if a carcass must be left in remote locations, it would not result in any impacts related to contaminants.

# 5.3 Effects to Habitat and Vegetation Resources

The effects to the habitats and vegetation supported on the San Diego NWR associated with implementing the no action and three action alternatives are described in this section. Potential impacts to these resources are characterized here as direct and indirect effects. Direct impacts would involve the removal of native vegetation in preparation for construction projects, while indirect impacts would involve changes to habitat or vegetation that are incidental to the implementation of an action.

An adverse effect to habitat or vegetation resources would be considered significant if:

- A substantial portion of native habitat would be removed or otherwise modified to accommodate a proposed action, and/or
- An action would result in the direct mortality or habitat loss, lowered reproductive success, or habitat fragmentation of a sensitive or narrow endemic plant species.

The potential effects to habitats and native vegetation are described here for each of the three alternatives.

# 5.3.1 Alternative A – No Action

#### Wildlife and Habitat Management

Continuation of current wildlife and habitat management activities (e.g., conducting surveys and implementing monitoring protocols, mechanically removing invasive plants, conducting Refuge cleanups to remove trash, debris, and illegal camps, maintaining access roads, fencing, and signage), as proposed under Alternative A, could result in some temporary impacts to native habitat from trampling or minor vegetation clearing. These impacts would be limited in scope and would not result in any significant adverse impacts to native vegetation.

To reduce illegal off-road activity on various Refuge parcels, a combination of fencing, signage, public outreach, and law enforcement are implemented. The effectiveness of these actions is sometimes limited given the size and fragmented nature of the Refuge. To increase the effectiveness of these measures, particularly with respect to control of off-road vehicle use, the Refuge works in partnership with land managers of adjoining parcels to share patrol responsibilities and add fencing and other deterrents along major roads where historically vehicles were crossing other properties to access the Refuge. This practice has been fairly successful in the Proctor Valley area.

Beneficial effects to native vegetation from these activities would include reductions in human disturbance from unauthorized use of the Refuge for habitation or dumping, elimination of competition for nutrients and water once invasive weeds are removed, and avoidance of impacts to vegetation from unauthorized trespass or off-road vehicle activity following installation of fencing and signage.

#### Pest Management

Under Alternative A, invasive plant removal involves both mechanical and chemical control methods, with much of the control focused on non-native grasses and invasive, non-native annual plants. Additional control of perennial non-native invasive plant species also occurs to a lesser extent within existing riparian and other wetland areas on the Refuge. When

mechanical control methods are implemented, the unintentional removal of native plant species is minimized by ensuring that all participants in the removal process are familiar with various species present in the control area, ensuring that only the species intended for control is removed from the site.

When chemical control is proposed, the area where an herbicide is to be applied is surveyed prior to any application to determine the extent of native vegetation present in the area and to identify and record the presence of any sensitive plant species. Areas to be avoided are flagged or otherwise delineated to ensure protection of sensitive species. Next, the herbicides that have been approved for use on the Refuge through the PUPS are reviewed to determine the potential effect of each herbicide on native vegetation in the event that unintentional pesticide drift should occur. The product with the least potential for impact to native vegetation, while also providing effective control of the pest species, is selected.

When applying a pesticide, application equipment is selected that will provide site-specific delivery to target pests while minimizing or eliminating direct or indirect (e.g., drift) exposure to non-target areas. Where possible, target-specific equipment (e.g., backpack sprayer, wiper) are used to treat target pests. Other target-specific equipment to apply pesticides could include use of a hand wand attached to an ATV sprayer, soaked wicks or paintbrushes for wiping invasive vegetation, and lances, hatchets, or syringes for direct injection into stems. Following these procedures, as well as the application requirements provided on the product label, will minimize the potential for impacts. No significant adverse effects to habitat and native vegetation are anticipated as a result of herbicide use. The use of these produces does provide benefits to native habitat as the control of non-native vegetation in combination with the revegetation of native plants results in improved habitat quality particularly in riparian corridors and burn areas where the initial growth following a fire includes a significant number of invasive plant species.

#### Public Use

The primary impacts to native vegetation on the Refuge from public use activities include continued expansion of the user-created trail system and off-trail activities such as cross country hiking and riding, illegal fishing, geocaching, and general "exploring." All of these activities result in the trampling of vegetation, the removal of vegetation, particularly shrub species, soil compaction, and general degradation of habitat quality.

Wildlife-dependent recreational uses occurring on the Refuge can also result in off-trail activity, causing trampling of vegetation and damage to shrubs. These uses are generally conducted from existing trails such as the Sweetwater River Trail and the trail located to the west of Par Four Drive. Some off-trail activity associated with these uses does occur, but this activity is limited and does not appear to have a significant adverse effect on the native vegetation.

Under current conditions, the primary public use on the Refuge, both on the Otay-Sweetwater Unit and the Del Mar Mesa Vernal Pool Unit, is trail use. Trails are used by hikers, runners, mountain bikers, equestrians, and dog walkers. Although some wildlife-dependent recreational uses are occurring on the trails, it appears that the majority of the visitors are present for general trail use. Under Alternative A, these activities would continue with no designated system of trails. Of the more than 200 linear miles of trails, pathways, access roads, and old ranch roads present throughout the Refuge, only two of the trails, the Sweetwater River Trail and a trail located to the north of Highway 94 in the Sweetwater River area, have been addressed in previous NEPA documents. Trail use and unauthorized trail construction have, over the years, resulted in substantial changes to the natural landscape, including the removal of native vegetation. Trail use on the Refuge has had both direct and indirect impacts on native vegetation. These impacts include:

- temporary and/or permanent loss of vegetation due to intentional removal to clear impediments to travel;
- incidental destruction of vegetation caused by repeated foot, bicycle, horse, and motor vehicle traffic;
- destruction of vernal pool basins and trampling of vernal pool plants from feet, hooves, and tires traveling through the ponds;
- compaction of soil in native grasslands and forblands;
- shrub and tree root exposure;
- introduction of weeds into wildlife habitat; and
- changes in localized drainage patterns due to erosion and associated deposition within or adjacent to poorly laid out trails.

These impacts could be avoided and possibly reversed through the creation of a designated trail system and the closure of trails that extend into sensitive habitat areas and/or are poorly aligned and are experiencing extensive erosion, rutting, and braiding.

# **Refuge Operations**

Refuge operations occurring at Rancho Jamul have no effect on native vegetation.

Establishment of eight fuel modification zones on the Refuge has resulted in the unmitigated replacement of approximately 30 acres of native vegetation and wildlife habitat with exotic annual weeds that are annually disced, mowed, or otherwise destroyed. Under Alternative A, suppression of native vegetation in fuel modification zones would continue. Other activities related to Refuge operations would have effects similar to those described under Wildlife and Habitat Management.

# 5.3.2 Alternative B

# Wildlife and Habitat Management

The primary difference between Alternative A and Alternative B with respect to effects on native vegetation is that Alternative B includes a number of restoration and enhancement proposals, as described in Chapter 4, that would result in added benefits for native vegetation. Areas dominated by non-native plants would be replaced with appropriate native vegetation (e.g., native grassland species, coastal sage scrub vegetation), some recent burn areas would be replanted with native species, and invasive species would be controlled in sensitive habitat areas, including the vernal pool habitat on the Shinohara parcel.

The proposal to manage some portions of the Refuge's riparian habitat in a manner that would mimic a natural disturbance regime would require habitat manipulation, such as cutting back some willows and mulefat to provide greater structural diversity and to provide openings in the tree canopy, within portions of the existing riparian vegetation. These actions would facilitate the development of young willow and mulefat shrubs, as well as the growth of important understory plants, all of which support the nesting and foraging needs of the federally endangered least Bell's vireo. Although these actions would result in improvement of habitat quality for some species (including the vireo) that are dependent on early-successional riparian vegetation, the effects would have to be weighed carefully against potential adverse impacts to

habitat quality for species that rely on late-successional riparian forests (e.g., yellow-billed cuckoo, warbling vireo [*Vireo gilvus*], Bullock's oriole [*Icterus bullockii*], Swainson's hawk [*Buteo swainsoni*] and possibly Swainson's thrush [*Catharus ustulatus*]).

Other actions proposed under Alternative B include the removal of cattle and goats from the Refuge when observed and the future control of wild pigs from the Refuge, should their range extend onto Refuge land. Without the implementation of proposed eradication and/or control methods, these species would damage or destroy Refuge vegetation, reduce reproductive success of seed bearing plants, and impact important soil structure, all of which could result in significant adverse impacts to the native habitats and plants species present on the Refuge.

As this alternative does not include a proposal to eradicate feral pigs should they be identified on the Refuge, there is the potential for future adverse effects to Refuge vegetation from feral pig activity. Native flora could be subject to trampling and removal as feral pigs root and wallow within vegetated areas, particularly in wet areas and oak woodlands. Studies have shown that foraging by feral pigs reduces oak regeneration (Sweitzer and Van Vuren 2002, 2008), and Cushman et al. (2004) hypothesized that vegetation changes due to pig rooting and wallowing provide greater opportunities for non-native grass colonization. This could lead to the conversion of native vegetation to non-native grasslands, reducing the habitat quality for a range of wildlife species.

#### Pest Management

Potential effects to native vegetation, sensitive plant species, and overall habitat quality from implementation of the IPM Plan would generally be minor, temporary, or localized in nature. Mechanical and/or physical control of invasive plant species could result in the inadvertent removal of native vegetation. To minimize the potential for such impacts, those conducting physical control would be trained to distinguish native vegetation from non-native vegetation, and any control being conducted in proximity to listed plant species would be supervised by individuals trained to recognize all growth stages of the species.

The IPM Plan also addresses the selective use of pesticides to eradicate, control, or contain pest species in order to achieve resource management objectives. Based on scientific information and analyses documented in "Chemical Profiles" in the IPM Plan, the pesticides currently being considered for use on the Refuge, as well as those that may be considered in the future, are evaluated to ensure that their use would represent relatively low risk to non-target species.

Where there is the potential for risk to non-target plants from the use of a specific herbicide, BMPs related to proper application of each product, precautions to be taken during mixing, and various steps to be taken to avoid overspray or drift (refer to Appendix D for a complete listing of BMPs for pesticide use) would be implemented to ensure that adverse effects to nontarget vegetation is minimized and/or avoided.

Table 5-3 outlines the ecological risk of the pesticides currently proposed for use under Alternative B. Three of the herbicides presented in Table 5-3—Surflan AS (active ingredient oryzalin), Telar XP (active ingredient chlorsulfuron), and Pathfinder II (active ingredient triclopyr)—represent a risk to non-target plant species via spray drift, runoff, or accumulation in the soil. Aquatic plant toxicity in chlorsulfron ranges from non-toxic to highly toxic, with five non-target plant incidents reported in the USEPA EIIS database related to chlorsulfuron. These reports document cases of reduced reproductive effects as a result of sublethal exposure to this herbicide (USEPA 2005). Based on the results of various field, greenhouse, and laboratory studies, several researchers have concluded that small quantities of chlorsulfuron applied at label rates may result in high risk to non-target plants growing near the application site. The primary effect is a change in plant reproduction without altering vegetative growth. To minimize the potential for impacts to non-target native plants, the chemical profile prepared for this herbicide includes a specific BMP that restricts the use of this product to ground application only, with wide area applications prohibited and only spot treatment of targeted species permitted on the Refuge.

Table 5-3 Ecological Risks of Pesticides Proposed for Use under the Integrated Pest Management Plan							
Product Name	Active Ingredient	Ecological Risk to Plants	Toxicity to Birds	Toxicity to Mammals	Toxicity to Fish/Aquatic Invertebrates	Toxicity to Honeybees	Other Ecological Risks
Makaze Prosecutor	Glyphosate	Non-selective, but harmless to most plants once in the soil	Practically nontoxic	Low toxicity	Practically nontoxic	Practically nontoxic	Surfactants may be highly toxic to aquatic organisms
AquaNeat	Glyphosate	Non-selective but harmless to most plants once in the soil	Practically nontoxic	Low toxicity	Slightly to moderately nontoxic	Practically nontoxic	None identified
Fusilade DX	Fluazifop-P- butyl	Selective for grasses	Slightly to practically nontoxic	Slightly to practically nontoxic	Highly toxic	Very low toxicity	Shown to inhibit fungal growth at high doses (Tu et al. 2001)
Telar XP	Chlorsulfuron	Risk to non- target plants, minimize spray drift	Practically nontoxic	Practically nontoxic	Practically nontoxic	Practically nontoxic (also for beetles)	Aquatic plant toxicity ranges from nontoxic to very highly toxic
Milestone, VM	Aminopyralid	Potential for non-target effects; more toxic to dicots than monocots	Very low toxicity	Practically nontoxic	Practically nontoxic	Practically nontoxic	Slightly toxic to aquatic vascular plants

Table 5-3 Ecological Risks of Pesticides Proposed for Use under the Integrated Pest Management Plan							
Product Name	Active Ingredient	Ecological Risk to Plants	Toxicity to Birds	Toxicity to Mammals	Toxicity to Fish/Aquatic Invertebrates	Toxicity to Honeybees	Other Ecological Risks
Surflan AS	Oryzalin	Risk to acute to non-target plants, minimize spray drift and avoid runoff from treated areas	Slightly toxic to practically non-toxic	Practically nontoxic	Highly toxic	Nontoxic	Poses a risk to endangered aquatic species in shallow water adjacent to treated areas
Pathfinder II	Triclopyr tiethylaminer (ester formulation)	Triclopyr soil residues can cause damage to non-target plants via root uptake	Slightly toxic	Slightly toxic; there is the potential for long- term exposure to species that eat fruit or foliage of treated plants	Highly toxic	Practically nontoxic	Very persistent in evergreen foliage and twigs; inhibits growth of some species of fungi (Tu et al. 2001)
Envoy Plus	Clethodim	Selectively toxic to plants, affecting only grass species	Practically nontoxic	Slightly toxic	Slightly toxic	Practically nontoxic	None identified

Care should be taken if this product is used in proximity to vernal pool habitat and other wetland areas. For all herbicide applications, the potential for impacts to non-target plants would be minimized by adherence to the BMPs outlined under the sections on air quality and water quality previously, which address spray drift and runoff. In addition, adherence to product label directions and implementation of general and product specific BMPs (as presented in the chemical profiles) would reduce potential adverse effects to below a level of significance.

## Public Use

Under Alternative B, wildlife-dependent recreational uses including wildlife observation, photography, environmental education, and interpretation would be accommodated primarily using a designate system of trails. All activities would for the most part be confined to this trail system, leaving large blocks of native habitat closed to public access. Providing opportunities for these uses on a designated system of trails rather than on the proliferation of user-created trails that currently exist on the Refuge would be expected to reduce ongoing off-trail activity and the continued creation of unauthorized trails on the Refuge. Although attempts to reduce off-trail activities would be encouraged through a public outreach and education program, it is likely that some impacts (e.g., trampling, shrub damage, removal of flowers) to native vegetation in proximity to existing trails would continue to occur. These impacts would be limited in scope and are not expected to result in significant adverse effects to the native vegetation.

The construction of new parking areas in the McGinty Mountain and Las Montañas areas and the construction of a temporary visitor contact station, restrooms, parking area, and access route to the Sweetwater River Trail would require the removal of a combination of non-native and native vegetation. The extent of native habitat removal is expected to be minimal; however, until a site design specific to the site has been prepared, these impacts cannot be quantified. <u>Subsequent to the completion of the draft CCP/EA</u>, surveys of the area in and <u>around the proposed McGinty Mountain parking lot and access trail were conducted that</u> <u>identified the presence of several sensitive plant species</u>. <u>Based on the extent of sensitive plant</u> <u>species in the area, construction of the parking lot and access trail would likely result in</u> <u>significant impacts to sensitive plant species, requiring reevaluation of this proposal</u>.

<u>The 2.4-acre parcel along Highway 94 where a parking lot is proposed would be surveyed and subsequent analysis under NEPA would be conducted.</u> Those areas with the least potential for impacts to native vegetation would be identified. Based on this information, a site design would be developed that avoids to the extent feasible existing sensitive habitat areas.

Whenever possible, sites supporting non-native vegetation would be selected over sites supporting native habitat. The general areas being considered for these facilities are not known to support listed or sensitive species, but if sensitive plants were located in the area, the facilities would be sited in such as manner as to avoid impacts to these species. Any loss of sensitive native vegetation would be mitigated through the revegetation of like species on highly disturbed sites within the Refuge at a 1:1 replacement ratio.

A designated trail system is proposed for the Otay-Sweetwater Unit and specific trail alignments for the routes included with the trail system would be developed with user involvement in a step-down trail plan. All trail alignments would be designed to be sustainable and to avoid short- and long-term significant adverse impacts to sensitive habitat and listed and sensitive plant species. To achieve a sustainable trail system, it may be necessary to reroute some or all of an existing trail or to incorporate trail design changes to adjust grades or outslope, and incorporate other corrective measures such as rolling grade dips and knicks. These actions may result in the removal of some native vegetation; however, where a trail is being realigned, mitigation for the loss of vegetation within the new alignment would be provided by reestablishing native habitat within the old trail alignment. Loss of vegetation to implement improvements to an existing trail would be minimal; in most cases, such improvements would eliminate long-term erosion along the trail that has led to trail widening and/or the creation of braided trails. Once the improvements are made, widened or braided sections of trail can be recontoured and planted with native vegetation.

Within the Del Mar Mesa Vernal Pool Unit, the designated trail alignments on the Refuge would be consistent with the adopted trail system for the Del Mar Mesa Preserve, as presented in the City of San Diego's approved Carmel Mountain and Del Mar Mesa Preserve Resource Management Plan (City of San Diego 2015). These alignments have been designed to minimize impacts to native vegetation and sensitive plant species, particularly listed species that are restricted to specialized vernal pool habitat.

Throughout the Refuge, areas of sensitive habitat would be monitored and signs of off-trail activity or the development of new user-created trails would be addressed through signage, fencing, trail rehabilitation, or other measures intended to discourage continued activity at a particular location.

# **Refuge Operations**

Support facilities proposed for construction at Rancho Jamul would be constructed in an area that has a long history of human disturbance and does not support native vegetation. As a result, no impacts to native habitat or sensitive plant species are anticipated. Alternative B also addresses the need to close abandoned mines shafts and wells, repair Saddle Road Dam, remove tanks at the old dairy near Mother Miguel Mountain, and remove a well and pump house from the vicinity of Jamacha Road. All of these activities would likely result in some trampling of native vegetation to access and implement actions. These effects would be short term and limited in nature. In other cases, some native vegetation, appropriate native species would be planted or seeded in the disturbed area to mitigate the impacts and to ensure that the disturbed area does not become infested with invasive, non-native vegetation. The implementation of these measures would minimize the potential for significant adverse effects to native vegetation.

Under alternative B, fuel breaks would be maintained (i.e., native vegetation would be prevented from regenerating in approximately 30 acres of exotic annual weeds).

# 5.3.3 Alternative C

# Wildlife and Habitat Management

The wildlife and habitat management proposals included under Alternative C would be essentially the same as those proposed in Alternative B.

#### Pest Management

The potential effects to habitat quality and individual plant species from the implementation of the IPM Plan would be the same under this alternative as described for Alternative B.

# Public Use

The public uses proposed under Alternative B would also be permitted under Alternative C. Therefore, the impacts associated with these uses would be generally the same as those described previously for Alternative B. Two additional trail corridors are included in the designated trail system under Alternative C, one leading up to Mother Miguel Mountain and the other providing access from the western ridge in the Sweetwater River management area down to the Sweetwater River Trail. The impacts of developing trails in these areas would be similar to the discussion provide in Alternative B. Alternative C also proposes to open a portion of the Refuge to hunting, which would have some effect on existing vegetation as described here.

Alternative C includes a proposal to open a portion of the McGinty Mountain area, the southern portion of the Las Montañas area, and the southwest portion of the Otay Mesa and Lakes area to hunting. The specific details of the hunting program would be developed during step-down planning. For the McGinty Mountain and Las Montañas areas, the hunt program would be limited in terms of specific areas open to hunting and the number of days within a hunt season in which hunting would be permitted. In addition, the number of hunters allowed within these areas would be limited to ensure a quality hunt for all participants. Hunting on the designated portion of the Otay Mesa and Lakes area would be generally consistent with State hunting regulations as they apply to State Ecological Reserves.

Hunting would be conducted on foot by individuals or small groups, often accompanied by a hunting dog. Since hunting is not limited to designated trails, direct impacts to vegetation could occur from trampling. However, because hunters tend to travel in dispersed patterns over wide areas rather than utilizing the same pathway over and over again, the effects of trampling would be limited and short term. In addition, hunting in most of the designated hunt areas would be a seasonal activity, generally occurring in the fall and winter months when limited growth, particularly of forbs, is occurring. As a result, impacts to Refuge vegetation by hunters would be expected to be minimal and insignificant. All prospective hunters will be required to attend a training session before they can hunt on the Refuge. As part of this training session, the need to protect habitat quality within the hunting area will be addressed.

The McGinty Mountain area does include sites that support listed plant species; therefore, the specific boundaries of the hunt area to be designed during step-down planning, would not include or would otherwise exclude access (e.g., through the installation of fencing or signage) to these sensitive locations. Information about the need to avoid these areas would be provided as part of required training classes.

Leashed dogs would be permitted on Refuge trails under this alternative. If dogs are leashed and their activities are confined to the trail, no adverse effects to vegetation are anticipated. If, however, leash regulations are not adhered to by users, impacts to vegetation are likely to occur. If such impacts are identified, the right to bring dogs onto the Refuge could be suspended to protect sensitive Refuge resources.

Also proposed under this alternative are two interpretive trails, one on Lot 707 and the other, an interpretive boardwalk trail, at the vernal pool restoration site on the San Miguel Mountain area. The Lot 707 trail would extend through an old olive grove that has experience some natural recruitment by coastal sage scrub species. No significant loss of native vegetation is anticipated. If the trail becomes part of an environmental education program, existing native habitat would likely be enhanced and new areas of native habitat established as part of that program. The interpretive boardwalk would be designed to avoid impacts to sensitive vernal

pool habitat, while providing important information to the public about the need to protect and restore rare vernal pool habitat.

# **Refuge Operations**

The facilities and actions related to refuge operations that were described under Alternative B would also be implemented under Alternative C. Therefore, the impacts associated with these uses would be the same as those described previously for Alternative B.

# 5.3.4 Alternative D

# Wildlife and Habitat Management

The wildlife and habitat management proposals included under Alternative D include all those proposals addressed under Alternative B, as well as a proposal to monitoring for and control, when present, of feral pigs. The implementation of the Feral Pig Monitoring and Eradication Plan (Appendix E) would provide benefits to sensitive habitats and vegetation not provided by the other alternatives. The prompt control of feral pigs on Refuge lands, as proposed under this alternative, would minimize or avoid such impacts.

Trampling of some vegetation by marksmen and their dogs may occur in areas of trapping and feral pig herding. These impacts are expected to be minor and transitory, however, trapping and herding would be avoided in areas that support sensitive plant species. Vegetation surveys would be conducted prior to trap placement, and the selection of trapping sites would be coordinated with the Refuge biologist to ensure that impacts to native vegetation are minimized. Packstock, which may be used on a limited basis in support of project activities, would be fed weed-free feed to minimize introduction of noxious weeds. None of the actions associated with feral pig control are likely to adversely affect native vegetation or measurably increase noxious weeds.

# Pest Management

The potential effects to habitat quality and individual plant species from the implementation of the IPM Plan would be the same under this alternative as described for Alternative B.

# Public Use

For the most part, the public uses proposed under Alternative C would also be permitted under Alternative D. The primary differences are that hunting would only be permitted on a portion of the Otay Mesa and Lake Area and the Lot 707 and Mother Miguel Mountain trails would not be included in the designated trail plan. The potential impacts to vegetation and sensitive plant species would however be generally the same as those described under Alternative C.

Leashed dogs would be permitted on all multiple use trails under this alternative. Provided dogs are leashed and their activities are confined to the trail, no adverse effects to vegetation are anticipated. If, however, impacts are identified due to off-trail activity by unleashed dogs, the right to bring dogs onto the Refuge could be suspended to protect sensitive Refuge resources.

# **Refuge Operations**

The facilities and actions related to refuge operations that were described under Alternative B would also be implemented under Alternative D. Therefore, the impacts associated with these uses would be the same as those described previously for Alternative B.

# 5.3.5 Modified Alternative D

# Wildlife and Habitat Management

The wildlife and habitat management proposals included under modified Alternative D include all those proposals addressed under Alternative D, including monitoring for and control, when present, of feral pigs. The implementation of the Feral Pig Monitoring and Eradication Plan (Appendix E) would provide benefits to sensitive habitats and vegetation not provided by the other alternatives. The prompt control of feral pigs on Refuge lands, as proposed under this alternative, would minimize or avoid such impacts. The potential for adverse effects of feral pig control would be the same as described under Alternative D.

### Pest Management

The potential effects to habitat quality and individual plant species from the implementation of the IPM Plan would be the same under this alternative as described for Alternative B.

#### <u>Public Use</u>

For the most part, the public uses proposed under Alternative D would also be permitted under modified Alternative D. The primary differences are the elimination of the proposals to develop an interpretive trail near the vernal pools on the Otay-Sweetwater Unit and the elimination of the proposal to construct a parking area and access route near Model A Ford Lane of Sloane Canyon Road. The elimination of these two proposals will reduce the potential for adverse effects to listed and sensitive species occurring in the vicinity of this potential project sites. For the other proposals included in Alternative D, including the establishment of a designated trail system and the presence of leashed dogs on Refuge trails, the potential impacts to vegetation and sensitive plant species would be the same as those described under Alternative C.

# **Refuge Operations**

<u>The facilities and actions related to refuge operations that were described under Alternative B</u> would also be implemented under Modified Alternative D. Therefore, the impacts associated with these uses would be the same as those described previously for Alternative B.

# 5.4 Effects to Wildlife

The effects to wildlife from implementing the various alternatives are described in this section. Once again, potential impacts to these resources are characterized here by evaluating direct and indirect effects. Direct impacts involve the primary effect of implementing an action, such as the flushing of a bird from its nest because of wildlife observation activities. Indirect impacts include habitat modifications that result in a change in abundance or breeding success of a species (or group of species), such as removing shrubs and other vegetation in important butterfly habitat. An effect to wildlife would be considered significant if:

- An action would result in a substantial reduction in the total acreage available on the Refuge to support native wildlife species or would substantially degrade the quality of available habitat supporting native wildlife species. (For migratory songbirds, a substantial reduction in habitat acreage resulting in a significant adverse impact would be defined as a reduction of five percent or more of the available acreage for these species within the Refuge.)
- An action would result in a substantial adverse effect, either directly or through habitat modifications, on any wildlife species identified as a sensitive or special status species in local or regional plans, policies, regulations, by CDFW or the Service, or any avian species identified as a Bird of Conservation Concern.
- There would be a permanent loss (adverse effect) or gain (beneficial effect) of occupied sensitive species habitat or the direct mortality (adverse effect) of individuals of sensitive species due to the proposed action.
- An action would substantially interfere with the movement of any native resident or migratory wildlife species or with established native resident or migratory wildlife corridors, or impede the use of wildlife breeding sites for sensitive or special status species or any other species of conservation concern.

# 5.4.1 Alternative A – No Action

# Wildlife and Habitat Management

Under Alternative A, current wildlife and habitat management activities—invasive plant control; trash and debris removal; road, fence/gate, and sign maintenance and replacement; environmental contaminants coordination; habitat enhancement and restoration; and species surveys and protocol monitoring—would continue on the Refuge. Implementing these activities could result in some impacts to wildlife, including temporary disturbance related to noise and human activity and direct loss of individuals due to trampling, inadvertent damage to nests or burrows, or other causes. However, none of the maintenance or management actions that could be implemented under Alternative A would result in a substantial reduction in the quantity or quality of available habitat to support the Refuge's native wildlife species. Further, the removal of invasive vegetation in riparian areas would include the restoration of native species following invasive vegetation removal to ensure appropriate vegetative structure for breeding migratory songbirds.

To minimize the potential for direct and indirect impacts to wildlife, care would be taken to avoid entering sensitive habitat areas whenever possible. When entry is required, it would be timed to avoid the sensitive life stages such as breeding seasons, dispersal periods, or

hibernation, unless the objective of the monitoring or research is to investigate specific species during this time. Monitoring activities that must occur within sensitive habitat during the breeding season will only be conducted by qualified personnel to avoid any unintentional impacts to listed or sensitive species. Deleterious effects to wildlife associated with its management will be mitigated by the benefits of management in manipulating populations of target species. The knowledge gained in monitoring and research will mitigate associated impacts by better informing and directing current and future management efforts.

# Pest Management

Mechanical and chemical control of invasive weedy plants is conducted in various locations throughout the Refuge as described in Chapter 4. This activity can result in disturbance to wildlife; however, to minimize the potential for adverse effects, control of invasive plants is not conducted in proximity to known nesting areas during the nesting season, and applications of pesticides are generally limited to one to three applications per year. When conducting control, a site reconnaissance occurs prior to work to ensure that the potential for direct effects to wildlife is minimized.

The herbicides currently used on the Refuge include products with active ingredients glyphosate, fluazifop-P-butyl, or chlorsulfuron. The risk to wildlife of using these products includes indirect exposure to mammals and birds from eating contaminated prey or vegetation and direct exposure of skin or eyes to product residue or if vapors or particulates are inhaled. However, as indicated in Table 5-3, none of the products used on the Refuge represent a significant threat to birds, mammals, or honeybees. Fluazifop-B-butyl can, however, be highly toxic to fish and aquatic invertebrates and has been shown to inhibit fungal growth. The surfactants used with glyphosate can be highly toxic to aquatic organisms. As a result, care must be taken when using these products adjacent to vernal pools and other wetlands. Understanding the ecological risks of these products is important when selecting a specific product to control invasive species in sensitive habitat areas. This, combined with BMPs to prevent spray drift, minimize the risk for runoff into adjacent wetland and other habitat areas, and avoid spills, will reduce the potential for adverse effects to wildlife to below a level of significance.

#### Public Use

<u>Wildlife-dependent Recreational Uses</u>. Wildlife and plant observation, photography, environmental education, and interpretation can result in direct and indirect impacts to wildlife. Nature observation and photography can involve close approaches to pursue identification or to get that perfect photograph. This can result in off-trail activity, causing trampling of wildlife habitat and disturbance to birds, reptiles, and small mammals. If this activity occurs during the nesting season, it can result in damage or loss of active nests. Activities associated with environmental education and interpretation can result in off-trail activities leading to the same effects. At present, the extent to which this disturbance from wildlife-dependent use is occurring does not substantially interfere with the movement of wildlife species and has not impeded the use of breeding sites for sensitive species. Therefore, these impacts are not considered significant.

The implementation of a public outreach program that encourages visitors to stay on the trails could further reduce the potential for impacts to wildlife. Deleterious effects to wildlife caused by wildlife-dependent recreation can be reduced when the public understands the value of the resources being protected in off trail areas. People who come to the Refuge to view and appreciate wildlife and nature are more likely to support (e.g., financially, civically, or politically) wildlife conservation on and off the Refuge. They may also be moved to consume

fewer resources (e.g., land, energy, water) that affect wildlife or may avoid actions (e.g., lighting fireworks in "vacant" land, littering) that have a detrimental effect on wildlife and habitat.

<u>Trails</u>. Existing trails on the Refuge are used by walkers, runners, mountain bikers, equestrians, and dog walkers. Although some wildlife-dependent recreational uses are occurring on the trails, it appears that the majority of the visitors are present for general trail use rather than wildlife-dependent activities. Under Alternative A, these activities would continue with no designated system of trails, although they are subject to closure or rerouting. Because the majority of the trails being used on the Refuge were created without consideration of the sensitivity of the resources they dissect, there is the potential for long-term disturbance to wildlife resources. Without a designated trail system, there is also the potential for off-trail activity and the continued proliferation of trails, resulting in additional disturbance and loss and fragmentation of wildlife habitat.

A number of studies have been conducted to evaluate the effects of recreational activities on wildlife. Potential impacts related to trails include the direct loss of habitat and wildlife, as well as indirect impacts associated with the habitat edges created when a trail traverses otherwise continuous habitat. In reviewing studies related to the influence of recreational trails on bird communities, Delong and Schmidt (2000) report findings that suggest that both the physical presence of a trail and human disturbance associated with the trail can affect bird abundance, species composition, and nest predation in the immediate vicinity of a trail. Miller et al. (1998) studied the influence of multiple use trails on breeding bird communities in forest and mixedgrass prairie ecosystems and found that species composition was altered in areas that included trail use, with generalist species more abundant near the trails and other species displaced away from trails. Other observed effects included few nests located near trails and an increased rate of nest predation for nests located in proximity to trails. The causes for these effects may include disturbance from human activity on the trail and/or the physical interruption in continuity of the habitat-by-habitat edge created by the presence of the trail. Studies indicate that many interior species avoid habitat edges or are present at lower densities in these edge areas (Kroodsma 1984, Van Horn et al. 1995). The results of a study conducted by Holmes and Geupel (2005) of the effects of trails on breeding birds in chaparral habitat indicated that fragmentation of chaparral habitat results in a negative effect on the density of some shrub-nesting bird species. From this, one could conclude that the number of trails extending through native habitat could degrade the overall quality of the habitat, particularly for some bird species.

Other studies of recreation effects on wildlife have found that that mammals exhibit both spatial and temporal displacement from recreational trails (George and Crooks 2006), and that smaller mammals flush from humans who are at a further distance away than do larger mammals (Taylor and Knight 2003). Lenth et al. (2008) observed that mule deer were less active for a distance of up to 165 feet (50 meters) along recreational trails. The distance was even greater in areas where leashed dogs were permitted on the trails.

Domestic dogs, which are currently present on Refuge trails, can also have a negative effect on wildlife species that are likely to perceive dogs as predators (George and Crooks 2006, Lenth et al. 2008). The presence of dogs in habitat management areas can alter patterns of habitat utilization for mule deer, small mammals (including rabbits), bobcats (Lenth et al. 2008), and birds (Banks and Bryant 2007).

The Refuge's location within and adjacent to urban/suburban development makes it attractive to the members of the public interested in recreation. While we acknowledge deleterious effects to wildlife from the presence of humans as noted by the references cited previously, closing all access to the Refuge would reduce the human communities' support for the Refuge's overall conservation program, including land acquisition, species monitoring, and habitat restoration and management. By making education and interpretation of the Refuge's biological diversity an important component of everyday Refuge work, some deleterious effects associated with allowing the public onto the Refuge could be reduced. However, the way in which the public interacts with the resources on the Refuge must be examined to ensure compatibility with Refuge purposes. The current state of the trail network on the Refuge is such that public outreach and public support for the Refuge can produce only minimal reductions in impacts to wildlife. Through proper trail planning and the development of a designated system of sustainable trails, as proposed in Alternatives B, C, and D, impacts to wildlife would be reduced over current conditions. Fragmentation of habitat would be reduced and impacts to sensitive habitat areas would be minimized. The establishment of clearly defined trails with appropriate signage is likely to reduce off-trail activity on the Refuge.

<u>Research</u>. Research conducted on the Refuge can also result in impacts to wildlife, primarily in the form of disturbance, but occasionally, direct take of an individual animal may be necessary to conduct research important to the conservation of the population. To ensure that no significant adverse effects to wildlife result from research projects conducted on the Refuge, all proposals for research are reviewed and approved by the Refuge Manager. In addition, the Refuge Manager prepares a Special Use Permit for all approved research projects with project specific conditions that must be adhered to while conducting activities on the Refuge. These specific conditions are intended to protect sensitive resources and minimize the effects of the research on all Refuge resources.

# **Refuge Operations**

Refuge operations occurring at Rancho Jamul have little, if any, effect on wildlife. Other activities related to current Refuge operations (e.g., law enforcement, sign and fence maintenance, trash and debris cleanup) would have effects similar to those described under Wildlife and Habitat Management.

# 5.4.2 Alternative B

# Wildlife and Habitat Management

In addition to the continuation of the wildlife and habitat management actions described under Alternative A, Alternative B proposes to expand these actions to address other habitats and species. These actions (described in <u>Chapter 3 of the Final CCP</u>), which would involve new habitat restoration and enhancement projects and listed species surveys and monitoring, would likely result in temporary impacts to wildlife in the form of disturbance and minor alterations in existing vegetative cover. The potential for impacts would be similar to those described under Alternative A. To avoid any significant adverse effects to listed species, these activities would be avoided to the extent feasible in periods and locations when sensitive wildlife species are particularly vulnerable (e.g., the nesting season for birds, hibernation for bats, within patches of *Plantago erecta* in early spring for Quino checkerspot butterfly larvae).

Any temporary effects to wildlife that may result from the implementation of these activities would be outweighed by the overall benefits that these actions would provide (e.g., improved habitat quality to support wildlife, better understanding of species distribution and population size).

# Pest Management

Under Alternative B, the control of pests on the Refuge would be conducted in accordance with the IPM Plan prepared for the San Diego NWR (Appendix D). Herbicide use currently being implemented on the Refuge, described in Alternative A, would continue under this alternative. Additional products may also be approved for use on the Refuge in the future through the PUP approval process. Under the IPM Plan, the potential effects to Refuge resources from the proposed site-, time-, and target-specific use of current and potentially future pesticides on the Refuge would be evaluated using scientific information and analyses documented in Chemical Profiles of the IPM Plan (Appendix D). These profiles provide quantitative assessment/ screening tools and threshold values to evaluate potential effects to species groups (e.g., birds, mammals, fish). A PUP (including appropriate BMPs) would be approved where the Chemical Profile provides scientific evidence that potential impacts to biological resources are likely to be only minor, temporary, or localized in nature. Along with the selective use of pesticides, the IPM Plan proposes other appropriate strategies (i.e., biological, physical, mechanical, cultural methods) to eradicate, control, or contain pest species to achieve resource management objectives. Based on scientific information and analyses documented in Chemical Profiles. pesticides allowed for use on the Refuge would be of relatively low risk to non-target organisms (refer to Table 5-3), due to their low toxicity or short-term persistence in the environment. Thus, no adverse effects to wildlife from pesticide application are anticipated.

The IPM Plan also addresses the potential future control of invasive aquatic species, including fish, invertebrates, and herpotofauna, and although not covered by the IPM Plan, Alternative B also addresses the potential need in the future to control and/or remove wild turkeys and feral pigs from the Refuge. Control of these organisms is proposed and deemed necessary to support the recovery and conservation of federally listed and MSCP-covered species present on the Refuge. The size of an infestation, its pervasiveness, its potential impact, and management difficulty will determine whether the goal is eradication or containment. For instance, the relatively confined populations of African clawed frog will be targeted for eradication. In contrast, the current goal for the ubiquitous mosquito fish and crayfish is containment via best management practices. Full control may be warranted if listed species such as arroyo toad or California red-legged frog are introduced or detected on the Refuge. Other non-native species, particularly invasive aquatic species, not currently described as target species, may also be considered for treatment if the species poses a threat to listed or MSCP-covered species.

Biologists at the Western Ecological Research Center, U.S. Geological Survey, Biological Resources Division have been investigating control methods for bass, bullfrogs, green sunfish, and crayfish in the Sweetwater River upstream of the Refuge within Sloane Canyon. Their control efforts have been under way for several years, and the results of these efforts will provide information regarding methodology, cost, and effectiveness. This information is expected to enhance the Refuge's efforts to manage aquatic invasive animals.

The most effective methods for eliminating largemouth bass and potentially other exotic fish species from Refuge wetland areas are water manipulation and fish pesticides (piscicides) such as rotenone, which effectively kills bass. However, prior to using pesticides to control invasive fish, a Chemical Profile must be prepared and the proposed pesticides approved for use on the

Refuge through the PUP process, as described <u>in the IPM Plan (Appendix D)</u>. Trapping or netting may work for some species but are ineffective on bass, as bass typically avoid active trapping methods. Gill nets and seines have been successful at removing bass in small bodies of water that support only a few bass. Other methods of control that have proved successful are electroshocking, spearing, and rod and reel fishing.

Although there is not a substantial need for the control of feral cats or dogs on the Refuge at present, control may be required in the future and, if so, it would be conducted in accordance with Service policy. At present, feral cat populations on the Refuge appear to be controlled by native predators. However, in many urban areas throughout the United States, including San Diego, people concerned for the welfare of cats and unaware of their impacts on wildlife support "colonies" of feral cats by regularly providing them with food. Sometimes such colonies are the focus of "trap, neuter, and release" programs to reduce proliferation of feral cats, but these programs leave cats in the wildlife habitat and are ineffective at reducing their impacts to wildlife. In the event that such a colony is established on the Refuge, the colony will be removed in coordination with an approved shelter facility operated by a cooperating local unit of government, a humane society, or a veterinary care facility.

Alternative B also proposes the potential for controlling brown-headed cowbirds should the need arise. The control of cowbird populations in San Diego County and various locations throughout the U.S. has proved to be an effective management tool used by local, State, and Federal agencies to reduce impacts to listed bird species from cowbird brood parasitism (Griffith and Griffith 2000, Kus and Whitfield 2005).

The Sweetwater Authority has for several years been implementing brown-headed cowbird control in the vicinity of the Sweetwater Reservoir in accordance with the following:

- Sweetwater Reservoir Habitat Management Program: USFWS Biological Opinion 1-6-93-F-42 and CDFG Memorandum of Understanding No. 2081-1994-088-5; and,
- Urban Runoff Diversion System Phase II (URDS II): USFWS Biological Opinion 1-6-95-F-41 and CDFG Addendum to Memorandum of Understanding 2081-1994-088-5.

Three traps are operated by the Sweetwater Authority from mid-March through mid-July using the equipment and methodology developed by Griffith Wildlife Biology (1994). One of these traps is located along the Sweetwater River within the Refuge. Cowbirds are not frequently observed during vireo monitoring. In 2011, the level of parasitism was well below the threshold at which parasitism would cause the local population of least Bell's vireos to decline. It is reasonable to assume that cowbird trapping conducted by Sweetwater Authority is effectively reducing the frequency of cowbird parasitism on vireos on the Refuge. However, if Sweetwater Authority's cowbird trapping program were to stop, the high edge to area ratio, proximity to urban areas, and proximity of the riparian habitat on the Refuge to livestock would once again make listed bird populations vulnerable to cowbird parasitism and associated declines. Should the Sweetwater Authority's trapping program be suspended, the Refuge could initiate short-term or intermittent cowbird control modeled after the current program but with only two traps, one at Bright Valley Farms and one at the lower end of the Sweetwater River near the Sweetwater Reservoir on Refuge land. A long-term, annual trapping program may not be necessary to achieve effective cowbird control. After cowbird populations have been reduced by trapping, trapping may be suspended. The determination of when to stop or reinitiate the trapping program would be made based on the result of annual monitoring.

If brown-headed cowbird control were to be implemented by the Refuge, it would occur in association with the following management efforts, which are intended to support listed and sensitive bird species:

- ongoing monitoring of listed bird species (including nest monitoring to document rates of parasitism);
- improving habitat quality to benefit specific listed species; and
- restricting public access in nesting areas to minimize the loss of vegetation and to reduce the potential for disturbance, particularly during the breeding season.

Alternative B does not include a proposal to eradicate feral pigs should they be identified on the Refuge, therefore, if feral pigs become established on the Refuge, there is the potential that the Refuge's native wildlife could be adversely affected. Negative impacts associated with feral pigs could include predation on or consumption of native animal species, direct or indirect competition with wildlife for food and habitat, disruption of natural food webs, and/or the transmission of diseases (CBI 2009). Pigs are also known to destroy nests and disturb or consume eggs and offspring of ground-nesting birds.

Studies have shown that pigs compete with native species for limited forage items (Ilse and Hellgren 1995, Laurance 1997). In one study, feral pigs were found to actively seek out and consume acorn hoards collected by small animals (Focardi et al. 2000). Their consumption of acorns, which can adversely affect oak regeneration, also indirectly impact the vertebrate and invertebrate species present in oak woodland habitat (Garrison and Standiford 1996).

# Public Use

<u>Hunting and Fishing</u>. The Refuge would remain closed to hunting and fishing under this alternative, therefore, no effects to wildlife resources from these uses would occur under Alternative B.

<u>Other Wildlife-dependent Recreational Uses</u>. The impacts to wildlife from activities related to wildlife observation, photography, environmental education, and interpretation, as proposed for the Refuge under Alternative B, would be similar to those described under Alternative A. However, because these uses would be confined primarily to the designated trail system, and the number of trails proposed to remain open under Alternative B would decrease over existing conditions, the potential for disturbance to wildlife would be reduced over time as some trails are closed and returned to native habitat.

<u>Trails</u>. Under Alternative B, a designated system of trails would be established on the Refuge that would result in a reduction in the total number of trails traversing the Refuge. One of the intents of this proposal is to reduce disturbance in and adjacent to sensitive habitat areas.

Refuge biologists would participate in the identification of specific trail alignments to assist in determining which areas can best support public use, while minimizing impacts to sensitive Refuge resources. Establishing appropriate trail alignments would include, but not be limited to, consideration of the proximity of trails to sensitive wildlife habitat such as riparian areas, wetlands, and habitats occupied by listed species and the effects of the alignment on habitat connectivity. The consolidation of trails throughout the Refuge would reduce the fragmentation of large interior blocks of habitat, maintaining undisturbed areas for breeding birds, as well as mule deer and other mammals that tend to avoid areas of frequent human use. Although disturbance to wildlife, as described for trails under Alternative A, cannot be

avoided, the proposal to establish a designated trail system that takes into account the needs of the Refuge's wildlife would benefit Refuge resources over current conditions. No dogs would be permitted on the Refuge under Alternative B; therefore, the disturbance to wildlife from the presence of dogs, as described under Alternative A, would be substantially reduced under Alternative B.

The construction of facilities to support Refuge visitors (e.g., parking lots, visitor contact station, information kiosks, interpretive sign, photography blind) as proposed under Alternative B would result in both temporary and long-term impacts to wildlife as a result of increased human activity in the affected areas. To minimize the adverse effects of these facilities on wildlife, project sites would be located outside of sensitive habitat areas to the extent feasible; adequate buffers would be provided between visitor facilities and sensitive habitat areas such as riparian corridors and occupied California gnatcatcher habitat; and facilities design would take into consideration the need to minimize noise, lighting, and human access into sensitive habitat areas. In addition, construction proposed near sensitive habitat areas would occur outside of the bird breeding season. The boundaries of all construction sites would be flagged and construction activities would be monitored to ensure that potential impacts to wildlife are minimized. High activity facilities (e.g., restrooms, parking lots, kiosks, the entrance to the visitor contact station) would be sited to provide adequate separation between users and potential riparian bird nesting areas to minimize long-term disturbance impacts.

<u>Research</u>. The potential effects to wildlife of permitting compatible research activities on the Refuge would be the same as those described under Alternative A.

#### **Refuge Operations**

The facilities proposed for construction on Rancho Jamul would occur in areas already experiencing moderate levels of human activity, therefore, the temporary increases in activity related to construction and the minor permanent increase in the level of human activity associated with the new facilities would have a limited effect on wildlife.

# 5.4.3 Alternative C

#### Wildlife and Habitat Management

Management actions under Alternative C are generally the same as those provided under Alternative B; therefore, the impacts and benefits to wildlife of implementing these actions would be the same as those described under Alternative B.

#### Pest Management

The potential effects to wildlife from the implementation of the IPM Plan would be the same under this alternative as those described previously for Alternative B.

### Public Use

<u>Hunting</u>. The proposal to implement a hunting program within the Refuge, as proposed under Alternative C, would result in direct and indirect impacts to wildlife. These impacts include the direct take of brush rabbits, desert cottontails, dove, and California quail from the McGinty Mountain and Las Montañas areas. In addition, southern mule deer would be hunted on a portion the McGinty Mountain area. In the Otay Mesa and Lakes area, the potential take of rabbits, upland game birds, and southern mule deer could occur. The number of individuals of each species taken annually by hunters would be regulated by CDFW hunting regulations and/or Refuge specific regulations that would be developed as part of a step-down hunt plan.

Hunting could also result in some direct and indirect adverse effects to other wildlife. Direct effects include occasional mortality, wounding, and disturbance of non-target species (DeLong 2002). Hunting can also alter the behavior (i.e., foraging time), population structure, and distribution patterns of wildlife (Owens 1977, White-Robinson 1982, Madsen 1985, Bartelt 1987, Cole and Knight 1990). Human disturbance associated with hunting includes loud noises, such as those produced by shotguns, and rapid movement. This disturbance, especially when repeated over time, can cause some wildlife species to change foraging habits, feed only at night, or relocate. These impacts can be reduced by providing adjacent non-hunting areas where hunting does not occur and where wildlife can feed and rest relatively undisturbed (Havera et al. 1992). Such areas would be provided to the west and south of the proposed 400-acre McGinty Mountain hunt area, to the south and southwest of the proposed 300-acre Las Montañas hunt area, and to the north of the 160-acre Otay Mesa and Lakes area. In addition, the remainder of the Otay-Sweetwater Unit would be closed to hunting, providing extensive sanctuary areas for wildlife.

Recreational hunting would remove individual target animals, but it not expected to negatively affect wildlife populations. This is because wildlife populations on refuges are managed to sustain the proposed hunting program and support other wildlife-dependent priority uses. To manage wildlife populations to support hunting, Refuge often adopt harvest regulations set by the State within Federal framework guidelines. The California Fish and Game Commission, in consultation with CDFW, annually reviews population numbers to establish season lengths and harvest levels. Refuges utilize this information, along with the results of on-site annual habitat management reviews conducted to evaluate wildlife population levels, habitat conditions, and visitor service activities, to establish Refuge-specific hunting regulations.

The hunting season and bag limits for those species proposed for hunting on the Refuge, as defined by CDFW for the 2013/2014 hunting season, are provided in Table 5-4.

Table 5-4 CDFW Hunting Seasons, Daily Bag Limits, and Possession Limits for 2013/2014					
Species	Season	Daily Bag Limit	Possession Limit		
California quail	General Season: Third Saturday in October extending through the last Sunday in January	10 quail per day in any combination of species per day	Double the daily bag limit		
	Archery Season: Third Saturday in October extending through the last Sunday in January	10 quail per day in any combination of species per day	Double the daily bag limit		
Band-tailed pigeon	Third Saturday in December extending for nine consecutive days	2 band-tailed pigeons per day	Double the daily bag limit		
Doves (mourning doves, white-winged doves, spotted doves, Eurasian collared-doves)	September 1 - 15 and from the second Saturday in November extending for 45 days	Mourning doves and white-winged doves: 10 doves per day in aggregate	Double the daily bag limit in aggregate		
		Spotted doves and Eurasian collared- doves: no limit	Spotted doves, Eurasian collared- doves: no possession limit		
Cottontail and brush rabbits	July 1 extending through the last Sunday in January	5 rabbit per day	Ten in possession		
Jackrabbit	Open all year	No limit	No limit		
Southern mule deer	General Season: Fourth Saturday in October extending for 30 consecutive days	1 buck, forked horn (See California Fish and Game Code, <u>subsection 351(a)</u> ) or better per tag	Same as bag limit		
	Archery Season: First Saturday in September and extend for 23 consecutive days.	One buck, forked horn or better per tag	Same as bag limit		
	San Diego Archery Either-Sex Deer Hunt: First Saturday in September and extend for 44 consecutive days, and reopen on the third Saturday in November and extend through December 31.	One either-sex deer (see California Fish and Game Code subsection 351(c)) per tag	Same as bag limit		
	San Diego Muzzleloading Rifle Either-Sex Deer Hunt) Third Saturday in December and extend through December 31.	One either-sex deer per tag	Same as bag limit		

Source: California Department of Fish and Wildlife, Regulations for the 2013-2014 Season

Specific bag limits may be lower for some hunt areas on the Refuge and hunting within the specified hunting seasons may be restricted to specific days of the week. Reserving some days during the week as no hunt days would provide rest periods for wildlife. This approach has been identified as an effective way to minimize hunting-related disturbance to wildlife (Fox and Madsen 1997).

The actual harvest levels of each of these species would be determined in consultation with CDFW, and hunting season and specific days in which hunting would be permitted on the Refuge would be defined during the development of a step-down hunt plan. To avoid adverse impacts to these species due to overharvesting, harvest levels would be determined based on existing knowledge of the populations of these species within the region and would be evaluated annually based on estimated annual take and estimated population size.

Resident game species are protected on refuges by both Federal and State laws and regulations to ensure that harvest rates do not negatively affect populations. The potential impacts of hunting on migratory birds and resident upland game birds are discussed and evaluated in documents prepared by CDFW in accordance with the California Environmental Quality Act (CDFG 2001, CDFG 2004a). This process results in periodically updated and publicly reviewed documents. Based on the findings of these documents, the State ensures that game animal hunting in California does not adversely affect its wildlife populations at an unacceptable level (CDFG 2004a).

The migratory bird conventions with Canada and Mexico define "game birds" as those species belonging to the following families: Anatidae (swans, geese, and ducks), Rallidae (rails, gallinules, and coots), Gruidae (cranes), Charadriidae (plovers and lapwings), Haematopodidae (oystercatchers), Recurvirostridae (stilts and avocets), Scolopacidae (sandpipers, phalaropes, and allies), and Columbidae (pigeons and doves). The Migratory Bird Treaty Act, which implements the conventions, grants the Secretary of the Interior the authority to establish hunting seasons for migratory game bird species. In actuality, the Service has determined that hunting is appropriate only for those species for which there is a long tradition of hunting and for which hunting is consistent with their population status and their long-term conservation. Although the Migratory Bird Treaty Act considers some 170 species to be "game birds," less than 60 species are typically hunted each year.

With the responsibility for managing and conserving migratory birds in the United States having been delegated to the Service, the Service develops migratory game bird hunting regulations by establishing the frameworks, or outside limits, for season lengths, bag limits, and areas for migratory game bird hunting. These limits are published annually in the *Federal Register*. In an effort to address the regional differences in hunting conditions, the Nation is administratively divided into four flyways for the primary purpose of managing migratory game birds. The San Diego NWR is located within the Pacific Flyway, and the species addressed within these regulations that is of interest to the Refuge is the mourning dove. NEPA considerations for these regulations are covered by the programmatic document "Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds (FSES 88–14)," filed with the Environmental Protection Agency on June 9, 1988.

In 2011, the Service issued the Final Frameworks for Early-Season Migratory Bird Hunting Regulations (76 FR 54052), which established the following framework for mourning doves for California during the 2011–2012 migratory bird hunting seasons: the season may not be more than 60 days, which may be split between two periods, September 1 through September 15 and

November 1 through January 15. The daily bag limit is ten mourning and white-winged doves in the aggregate.

CDFW has trustee responsibility for the conservation and management of deer, quail, and other wildlife, including rabbits, bobcat, badger, fox, and nongame mammals, in California. Section 1801 of the Fish and Game Code establishes the overall Wildlife Conservation Policy for CDFW, which includes the following relevant objectives: perpetuate all species of wildlife for their intrinsic and ecological values, as well as for their direct benefits to all persons; and maintain diversified recreational uses of wildlife, including the sport of hunting, as proper uses of certain designated species of wildlife, subject to regulations consistent with the maintenance of healthy, viable wildlife resources, the public safety, and a quality outdoor experience.

According to the Western Quail Conservation Plan (Zornes and Bishop 2009), breeding bird surveys for California quail within California from 1968 to 2003 indicated a generally stable population trend. Statewide, the take of California quail by hunters, as estimated by California's game-take hunter survey, declined from approximately 1,000,000 in 1992 to approximately 494,000 in 2004 (Zornes and Bishop 2009). A portion of this decline in take is attributed to a 15 percent drop of upland game bird hunters over the same period, as indicated by upland game bird stamp sales. In 2010, the estimated take was 453,773 (CDFG 2010), represent an eight percent decrease over 2004 estimates (accessed at https://www.dfg.ca.gov/wildlife/hunting/uplandgame/ reports/surveys.html, 2010 Game Take Hunter Survey Report). There was also a slight decrease (one percent) in the number of upland game bird hunters during the same period. Also contributing to these numbers is a reduction in the total area available for hunting due to the loss of suitable habitat associated with development.

A rough estimate of average, annual harvest during the 2002 through 2004 hunting seasons within Bird Conservation Region 22, which includes San Diego NWR, was 200,000 birds. The Western Quail Conservation Plan concludes that maintaining or enhancing the existing California quail population level in this region is likely to be achieved through the implementation of the recommendations for habitat acquisition and protection and restoration of natural fire regimes that are provided in the Coastal Scrub and Chaparral Conservation Plan (California Partners in Flight 2004). The management strategies proposed for the San Diego NWR, as well as those being implemented on adjacent CDFW Ecological Reserve land, BLM lands, and other preserved lands are consistent with the recommendations presented in the Coastal Scrub and Chaparral Conservation Plan. The protection of significance areas of undisturbed habitat on the Refuge to support California quail, along with ongoing monitoring of quail populations by CDFW and others, would ensure that no adverse effects to existing quail populations on the Refuge or adjoining parcels would occur as a result of opening a portion of the Refuge to hunting.

CDFW also implements a Deer Management Program throughout the State. As part of that program, biologists develop hunting regulations, provide expertise on habitat and population assessments, compile harvest information, conduct and direct research needs, monitor and estimate populations, and respond to various public inquiries related to deer in California. CDFW is currently developing a *Strategic Plan for California Deer* to effectively manage the State's deer population.

CDFW maintains annual Deer Kill Reports to track the take of deer throughout the State. The information included in these annual reports comes directly from returned deer tags (reported kill), but the report also includes estimated kill information, which is the reported kill number times a correction factor which is specific for each zone. This zone correction factor is an estimator of the non-reporting rates specific to each zone and takes into account those successful hunters that failed to submit the report card section of the deer tag. The estimated deer kill is considered a more realistic approximation of the actual deer harvest and is used primarily for population modeling and analysis.

In general, where hunting is permitted in the San Diego region (with some exceptions), the 2011 deer hunting season was split between an archery season (September 3, 2011, through September 25, 2011) and a general method season (October 22, 2011, through November 29, 2011). For the 2013/2014 season, the deer hunting season was further split as follows:

- Hunting for forked horn bucks by general method hunting from the fourth Saturday in October extending for 30 consecutive days and by archery hunting from the first Saturday in September extending for 23 consecutive days; and
- Hunting of either-sex deer by archery hunting from the first Saturday in September and extending for 44 consecutive days then reopened on the third Saturday in November and extend through December 31 and by muzzleloading from the third Saturday in December and extend through December 31.

The portion of the county that includes the Refuge is identified by CDFW in the hunting regulations as Zone D-16. In Zone D-16, some areas were only open to hunting on certain days during these periods. Within Zone D-16, 3,000 tags were available, and the take of one buck with a forked horn or better was permitted per tag. For the 2010 season, hunter success was approximately 12 percent, with an estimated total take for the area of 225 bucks. There were also several special hunts in 2011, including the San Diego antlerless deer hunt, a general method hunt in which 300 tags were available; a San Diego muzzleloading rifle hunt, allowing the take of a buck or doe, in which 80 tags were available; and a San Diego archery either sex hunt with a split season, in which 1,000 tags were available. In 2010, hunters involved in the San Diego antlerless deer hunt had a success rate of 20 percent. The success rate for the San Diego muzzle loading rifle hunt and San Diego archery either sex hunt was eight percent and six percent, respectively. CDFW also issues archery only tags, and there is no quota. Hunters with archery only tags may not possess a firearm or crossbow while hunting with this tag. In 2009, only five deer were taken in Zone D-16 by hunters with archery only tags; and statewide, an estimated 286 were taken with these tags. The CDFW recommends participation in the National Bowhunter Education Foundation's archery training course for all persons hunting with archery equipment.

CDFW evaluated the effects of deer hunting in 2004 and concluded the following:

Sport hunting is a controversial issue. A segment of the public has contended that the loss of a single animal by hunting is a significant impact by virtue of the mortality of the individual. Because the activity of hunting deer will result in the death of individual animals, specific safeguards are included in the proposed action. These safeguards include limited quotas, specified seasons, bag and possession limits, and herd monitoring, which should result in removing deer at a level that is consistent with individual herd performance. Therefore, the proposed actions have been designed to avoid significant adverse effects on the environment.

The removal of individual animals through hunting, together with other natural mortality, from any of the deer herds, should not significantly reduce herd size over the annual cycle. The proposed action is expected to result in maintaining the herd ratio objectives around

the approved management plan objectives. The production and survival of young animals within each herd should replace the animals removed by hunting.

Based on the State's analysis, harvesting deer per State regulations should not have a significant adverse impact on the statewide or local deer population.

To minimize hunting related disturbance to listed and sensitive species within the McGinty Mountain and Las Montañas management areas, hunting would not be permitted during the bird breeding season (April 1 through September 15). In addition to minimizing indirect impacts related to disturbance, this restriction would also avoid the potential for nest disturbance or loss due to off-trail activity associated with hunting. Further, to minimize disturbance to target and non-target species, when the step-down hunt plan is prepared, the following management practices would be considered for incorporation into the plan's discussion of hunting within portions of the McGinty Mountain and Las Montañas management areas:

- limit the number of hunters permitted in the area on a given day by implementing a reservation system;
- restrict the type of shot used in these areas to federally approved non-toxic shot;
- maintain large contiguous areas of the Refuge as closed to hunting and other uses to provide adequate sanctuaries for wildlife;
- limit firearms used for hunting to shotguns (prohibit the use of rifles);
- require completion of Refuge-sponsored training related to regulations and protocols for hunting on the Refuge as a prerequisite to applying for a reservation to hunt on the Refuge; and
- require completion of the National Bowhunter Education Foundation's archery training course as a prerequisite for obtaining a reservation to hunt deer on the Refuge.

Within the south coastal area of California, which includes the areas in and around the San Diego NWR (Zone D-16), estimates of the deer population from 1990 through 1996 indicate a fairly stable population with a moderate increase in 1993 and 1994. The estimated population in 1996 was just under 20,000. As part of the development of the step-down hunt plan, Refuge staff will also coordinate with CDFW staff to develop a deer population baseline for the Refuge and implement a long-term annual monitoring plan. Under this proposal, the direct take of deer would occur in the McGinty Mountain and Otay Mesa and Lakes areas.

The proposal to permit hunting on a portion of the Otay Mesa and Lakes area would represent an expansion of an existing hunting area managed on either side of the proposed designated hunt area by CDFW (Otay Mountain Ecological Reserve) and BLM (Otay Mountain Wilderness). Hunting would be permitted in accordance with CDFW's regulations for Ecological Reserves. Based on the habitats present within the area proposed for hunting and limited accessibility (i.e., no motorized vehicle access into the area) to this area, disturbance to wildlife from hunting is expected to be low. In addition, no other uses would be permitted in this area, providing Refuge wildlife with sanctuary areas outside of the designated hunting area. Refuge biologists would periodically monitor this area to ensure that hunting activities are no adversely affecting wildlife. If impacts were identified, steps would be taken to minimize such impacts, including but not limited to, amending the final hunt plan to adjust seasons, permitted hunt days, species to be taken, and/or daily bag limits. Based on the implementation of all of these measures, no significant impact to the local, regional, or statewide populations of deer, rabbits, quail, dove, or other wildlife permitted to be taken per CDFW regulations beyond the annual cycle is anticipated.

<u>Other Wildlife-dependent Recreational Uses</u>. The impacts to wildlife from activities related to wildlife observation, photography, environmental education, and interpretation, as proposed for the Refuge under Alternative C, would be similar to those described under Alternative A. However, because these uses would be confined primarily to the designated trail system, and the number of trails proposed to remain open under Alternative C would decrease over existing conditions, the potential for disturbance to wildlife would be reduced over time as some trails are closed and returned to native habitat.

<u>Trails</u>. A designated trail system, as described under Alternative B, is also proposed under Alternative C. However, under this alternative several additional trail routes would be included within the designated trail system (i.e., a trail up to the top of Mother Miguel Mountain, a trail in the Sweetwater River area that connects the western ridge top to the Sweetwater River Trail, an interpretive trail on Lot 707, an interpretive boardwalk trail in the vernal pool restoration area). The construction and use of these additional routes are not expected to increase the potential for adverse short or long-term effects to wildlife over those addressed under Alternative B. Further, the measures described under Alternative B to minimize potential adverse effects would also be implemented under Alternative C.

Some trails designated for hiking only in Alternative B would be designated for non-motorized multiple use under Alternative C. Increasing the number trails open to multiple use could result in some increase in mortality to reptiles and invertebrates due to trampling. This increase is not expected to be significant, and total mortality would be expected to be lower than existing conditions that support substantially more linear miles of trails being used for multiple use than would be available for use under Alternative C. To minimize the long-term effects of trail use on these species, trails would be periodically monitored for evidence of the direct loss of reptiles and invertebrates throughout the life of the CCP. If warranted by the results of this monitoring effort, one or more trails may be closed to reduce excessive loss of these organisms due to trail use.

One important difference between Alternative B and C is that dogs would be permitted on Refuge trails under Alternative C provided the dog is maintained on a six-foot or shorter leash and all dog waste is cleaned up and properly removed from the site. Dogs would also be permitted on the Refuge in association with hunting in designated hunt areas. In these cases, dogs must be maintained under verbal control and must be leashed when present outside of the designated hunting area. As discussed previously, dogs may affect wildlife in a number of ways: predation, harassment, disturbance, disease, nutrient supplementation by feces, and owners protecting their dogs from wildlife.

With respect to predation, dogs are carnivores and thus have an evolved proclivity to chase wildlife. While centuries of captivity may have, to some degree, reduced domestic dogs' tendency to chase wildlife, and regular feeding may reduce domestic dogs' carnivorous tendencies, some dogs in wildlands actively chase wildlife. Successful predation of wildlife by domestic dogs has been frequently documented, including killing animals ranging from cattle to insects. Domestic dogs are known to kill a wide range of animals of conservation concern, including taxa that occur on the Refuge such as lizards (Koenig et al. 2002) and ungulates, including deer (Lowry 1978, Fuller 1990). Dogs kill birds ranging from domestic fowl to nesting seabirds and fledgling passerines. Dogs are such a widely-recognized threat to wildlife

that USFWS regulations (Refuge Manual) allow Refuge personnel to shoot dogs that are chasing wildlife; 50 CFR 28.43 authorizes the disposal of dogs and cats observed in the act of killing, injuring, harassing, or molesting humans or wildlife.

Dog-walkers on the Refuge may also cause the loss of some species, as they may perceive wildlife (e.g., rattlesnakes, coyotes) as a threat to their dogs and may be more likely to kill snakes (including red diamondback rattlesnake, which is a California species of special concern) when they are protecting a dog than they would be if they were alone.

Harassment is intentional disturbance by dogs and is essentially unsuccessful predation. Harassment disrupts normal behavior for the wildlife—ranging from momentary increased vigilance to fleeing in an attempt to escape—and may result in injury, exhaustion, displacement from territory, suspension of foraging, suspension of thermoregulation, or suspension of parental care. Harassment by dogs certainly affects an animal's energetic balance, as it is forced to expend energy, or reduce foraging time, to avoid a predator.

Disturbance is likely the most prevalent deleterious effect of dogs in wildlife habitat but one of the more difficult to demonstrate, since it involves a change in behavior by the wildlife and not necessarily the dog. Disturbance, as addressed here, is a reaction by a wild animal to the perceived threat presented by a dog when the dog is not pursuing, or even necessarily aware of, the wild animal.

Animals have evolved the ability to differentiate potential predators from non-predators. Tinbergen (1951), Lorenz (1939), and Hinde (1954) have demonstrated that animals without previous exposure to predators exhibit anti-predator behaviors (e.g., crouching, alarm calls, mobbing) when confronted with a likeness of a predator and show such behaviors, to a lesser extent or not at all, when confronted with a likeness of an herbivore; this supports the contention that animals can not only tell predators from harmless animals but, to some degree, have an innate ability to do so. Many studies (Miller et al. 2001, Lord et al. 2001, Randler 2006, Lafferty 2001, Mallord et al. 2007, Forrest and Cassady St. Clair 2006, Antos et al. 2007, Sime 1999, Fernandez-Juricic and Telleria 2000, Mitchell et al. 1988) document the fact that dogs disturb wildlife in a variety of ways, habitats, and contexts. The disturbance need not even be visual. Randler (2006) found that broadcasting a barking dog increased vigilance in coots (Fulica atrata) more than did broadcast coot alarm calls or chaffinch (Fringilla coelebs) song. Refuge personnel have observed wildlife (e.g., shrikes, burrowing owls, Cooper's hawks, rabbits, coyotes, several chaparral/coastal sage scrub bird species) in the presence of dogs on many occasions. At the approach of a dog, animals frequently flush, run, stop foraging, take cover, or otherwise alter their normal behavior as the dog gets closer.

The limited research into the effect of dog disturbance to wildlife suggests that presence of dogs in wildlife conservation areas reduces abundance and diversity of wildlife. Banks and Bryant (2007) conducted a study showing that in the wildlife conservation areas they studied, bird abundance and diversity following the passage of a dog-walker were reduced by 41 percent and 35 percent, respectively, compared to control transects where no dog-walker or a lone pedestrian had passed. Humans walking alone, without dogs, also reduced abundance and diversity but by less than half the amount induced by dogs. They included areas where dogs are frequently walked and areas in which dog walking is prohibited to see whether there was a habituation effect (there was no significant habituation effect). They compared the effect of a single pedestrian, a pedestrian with a dog, and multiple pedestrians without a dog, to determine whether the observed reduction in bird diversity and abundance was due to the presence of two disturbers rather than one or the fact that one of them was a dog. Estimates

of bird abundance and diversity were not significantly different between a single human and two humans, without dogs, confirming that birds responded additively to presence of dogs. All of the trials were conducted using leashed dogs.

Lenth et al. (2008) also examined distribution of wildlife in conserved habitat that allowed dogs and other habitat areas that did not. They found that mule deer, rabbits, squirrels, and prairie dogs were less dense within 100, 50, 50, and 25 meters of trails, respectively, in areas visited by dogs than in areas where dogs were prohibited. They also observed that bobcat detections were less frequent in areas that allowed dogs.

Mallord et al. (2007) linked population response of a ground-nesting passerine bird—the woodlark (*Lullula arborea*)—to disturbance, primarily by off-leash domestic dogs. They found that density of woodlarks throughout a suitable habitat patch was lower for patches with higher levels of disturbance. They also used a logistic regression model to estimate colonization probability relative to disturbance levels and found that more frequently disturbed areas were less likely to be colonized, with the colonization probability falling under 50 percent when the disturbance rate exceeded eight disturbances per hour.

Off-leash dogs may be more likely to cause disturbance to wildlife than leashed dogs, because they cover more area, are free to go faster (which means they are perceived as more dangerous by wildlife, and they can disturb wildlife in a greater area in a given amount of time), can continue to chase wildlife that flees for a greater distance than the length of the leash, and, if sufficiently distant from their walkers, constitute two sources of disturbance (dog, walker) rather than one (dog and walker together). Off-leash dogs frequently leave the trail. Miller et al. (2001) found that all of the wildlife species they studied (white-tailed deer [Odocoileus virginianus], American robin [Turdus migratorius], vesper sparrow [Poocetes gramineus], and western meadowlark) showed longer flush distances, longer distances moved, and greater alert distances (for deer) when a disturbance (pedestrian, dog, or both) was off-trail as opposed to on-trail.

Compliance with the leash requirement currently in place on the Refuge is far from 100 percent but has not been quantified. When encountering off-leash dogs, Refuge staff inform or remind the public to leash their dog. Signs have been posted at major use areas informing the public that the Refuge is not a leash-free area and that leash regulations will be enforced; signs also offer information on where there are designated leash-free areas in proximity to the Refuge. Refuge law enforcement may also issue citations for non-compliance.

Dogs have the potential to transmit disease to wildlife (and vice-versa). Diseases that dogs can transmit to wildlife include:

- Parvovirus, which affects other canines and was the source for wolf pup mortality in Glacier National Park area in the early 1990s (canines that occur on the Refuge include grey fox and coyote);
- Canine distemper, which nearly wiped out the population of island fox (*Urocyon littoralis*) on Santa Catalina Island and was thought to have been introduced by a domestic dog (another outbreak of this disease, thought to have originated among domestic dogs, caused a large die-off of lions in the Serengeti National Park in Tanzania in the mid-1990s);
- Muscle cysts (*Sarcocystis* spp.), which can affect ungulates like deer and elk (mule deer occur on the Refuge);

- Leptospirosis, a bacterial disease that affects the kidneys and urinary tract of most species of mammals; and
- Parasites such as ticks, tapeworms, and fleas, which are well-known problems in dogs that can be passed to other wildlife.

Some of these pathogens are transmitted through feces that dogs leave on or beside the trail. In areas where dog feces are particularly abundant (e.g., at the end of Par Four Drive), they may have the potential to affect abundance and distribution of plants, including federally endangered species (i.e., San Diego ambrosia) by supplementing soil nutrients to the benefit of the ambrosia's competitors. In general, native coastal sage scrub plant species evolved in relatively nutrient-poor soils. Where supplemental nitrogen is provided by air pollution, it facilitates the rapid growth and proliferation of exotic annual weeds (Allen et al. 2005). Nitrogen supplementation by dog feces may have a similar effect perhaps more localized effect.

As stated previously, the threshold for significance of a deleterious effect on wildlife includes "a permanent loss . . . of occupied sensitive species habitat or the direct mortality of individuals of sensitive species as a result of a proposed action." It could be argued that a significant deleterious effect—the reduction in bird abundance and diversity that Banks and Bryant (2007) found correlated with dog use of an area—has already occurred on the Refuge due to the frequent presence of dogs on the more heavily visited areas of the Refuge (e.g., the "Interpretive loop"). However, only one short-duration observational study of public use at a portion of the Sweetwater River Trail has been conducted to assess the numbers of dogs (leashed and off-leash) present, and no studies have been conducted to detect changes in populations of bird species.

While the deleterious effect of allowing dogs on the Refuge is currently not quantified, it is reasonable to assume that a deleterious effect to wildlife, particularly with respect to bird abundance and diversity in areas where trails exist or are proposed, would continue under Alternative C. Some of these negative effects would be reduced as a result of the implementation of the designated trail system proposed under Alternative C, which would eliminate trails in many sensitive areas and provide larger areas of undisturbed native habitat.

Negative effects on wildlife would also be reduced by increased efforts of the Refuge to educate dog owners about the need to keep their dog leashed, stay on designated trails, and remove all dog waste. In addition, information about the potential threats to unleashed dogs (e.g., rattlesnakes, ticks) would be provided. If, based on monitoring and other field observations, it is determined that the presence of dogs on the Refuge is having a substantial effect on wildlife in one or more areas, specific trails or the entire Refuge could be closed to dogs without prior notice. Permission to bring dogs onto the Refuge could also be revoked at any time without notice if unleashed dogs or dog waste becomes a chronic problem on the Refuge.

The trail proposals described under Alternative C would provide greater benefits to wildlife than Alternative A but potentially less benefits than Alternative B.

<u>Research</u>. The potential effects to wildlife of permitting compatible research activities on the Refuge would be the same as those described under Alternative A.

# **Refuge Operations**

The facilities proposed for construction on Rancho Jamul would occur in areas already experiencing moderate levels of human activity, therefore, the temporary increases in activity related to construction and the minor permanent increase in the level of human activity associated with the new facilities would have a limited effect on wildlife.

# 5.4.4 Alternative D

# Wildlife and Habitat Management

Management actions under Alternative D are generally the same as those provided under Alternative B; therefore, the impacts to wildlife of implementing these actions would be similar to those described under Alternative B. Alternative D does however include a proposal to monitor for and control, when present, feral pigs on the Refuge in accordance with Appendix E.

The implementation of actions associated with feral pig control could result in disturbance to wildlife due to monitoring activity, as well as disturbance associated with the presence of marksmen and dogs, the discharge of firearms, and the deployment of helicopters into remote habitat areas. Non-target wildlife could be attracted to traps set up for corralling feral pigs. The traps most likely to be used on the Refuge are open-topped corral style traps, with deer being the most likely non-target wildlife species to be attracted to these traps. Because of the trap design, deer can easily escape by leaping over the perimeter fencing. Smaller wildlife would be able to escape through the paneling. These traps would be open and monitored for several days before setting. If large numbers of non-target wildlife are accessing the bait, the trap may be moved. Despite the features incorporated into the trap design to minimize adverse effects to non-target wildlife, it is possible, but unlikely, that non-target wildlife could be directly impacted by trapping efforts.

To minimize the potential for adverse effects to non-target wildlife:

- feral pig traps would be sited to minimize disturbance to sensitive habitat and the species it supports, and areas identified as sensitive bird nesting habitat would be avoided during the nesting season (March 1 through September 1);
- activities in areas supporting burrows or ground nesting species would be minimized;
- access to the trapping sites would be confined to the extent feasible to existing trails and roads;
- traps, and access to the traps, would not occur in riparian and other wetland habitats and would be sited to avoid any impacts to adjacent wetlands (e.g., ponds, vernal pools, tributary drainages);
- access into areas within the ordinary high water mark or within the bed and bank of any drainage would be minimized;
- traps would be sited so as not to impede the movement of any wildlife species; and
- if fencing is used to protect environmentally sensitive areas from feral pig damage, the fencing would be constructed with openings at ground level so as not to restrict the movement of small wildlife.

# Pest Management

The analysis of potential effects to wildlife from the implementation of the IPM Plan would be the same under this alternative as described previously for Alternative B.

# Public Use

<u>Hunting</u>. Under Alternative D, hunting would be permitted on approximately 160 acres within the Otay Mesa and Lakes area. The hunting program, which would be further refined during the preparation of a step-down hunt plan, would generally be conducted in accordance with State regulations for Ecological Reserve areas. The wildlife species that could be taken under this proposal are outlined in the Table 5-4. As stated under Alternative C, based on the habitats present within the area proposed for hunting and limited accessibility (i.e., no motorized vehicle access into the area) to this area, disturbance to wildlife from the proposed hunting program is expected to be low. In addition, no other uses would be permitted in this area, providing Refuge wildlife with sanctuary areas outside of the designated hunting area. Refuge biologists would periodically monitor this area to ensure that hunting activities are no adversely affecting wildlife. If impacts were identified, steps would be taken to minimize such impacts, including but not limited to, amending the hunt plan to adjust seasons, permitted hunt days, species to be taken, and/or daily bag limits. The implementation of these measures would avoid significant impacts to the local, regional, or statewide populations of deer, rabbits, quail, dove.

<u>Other Wildlife-dependent Recreational Uses</u>. The impacts to wildlife from activities related to wildlife observation, photography, environmental education, and interpretation, as proposed for the Refuge under Alternative D, would be similar to those described under Alternative A. However, because these uses would be confined primarily to the designated trail system, and the number of trails proposed to remain open under Alternative D would decrease over existing conditions, the potential for disturbance to wildlife would be reduced over time as some trails are closed and returned to native habitat.

<u>Trails</u>. Based on the similarity of the designated trail systems proposed under Alternatives D and C, the potential impacts to wildlife from trail use would be similar, although some reduction in the level of impact is likely under Alternative D due to the reduction in the number of trails proposed and the provision of additional pedestrian only trails.

The impacts associated with permitting dogs on the Refuge would be similar to those described under Alternative C; however, under Alternative D, dog walking would only be permitted on trails designated for multiple use. Therefore, no dogs would be permitted in the Las Montañas area under this alternative.

<u>Research</u>. The potential effects to wildlife of permitting compatible research activities on the Refuge would be the same as those described under Alternative A.

# **Refuge Operations**

The facilities proposed for construction on Rancho Jamul would occur in areas already experiencing moderate levels of human activity, therefore, the temporary increases in activity related to construction and the minor permanent increase in the level of human activity associated with the new facilities would have a limited effect on wildlife.

# 5.4.5 Modified Alternative D

# Wildlife and Habitat Management

<u>Management actions under modified Alternative D are generally the same as those provided</u> <u>under Alternative D; therefore, the impacts to wildlife of implementing these actions would be</u> <u>similar to those described under Alternative D.</u>

#### Pest Management

The analysis of potential effects to wildlife from the implementation of the IPM Plan would be the same under this alternative as described previously for Alternative B.

#### Public Use

<u>Hunting</u>. The hunting program proposed under modified Alternative D is the same as that proposed under Alternative D, therefore, the impacts to wildlife of implementing the proposed hunting program would be that same at that described under Alternative D.

Other Wildlife-dependent Recreational Uses and Trails. The impacts to wildlife from activities related to wildlife observation, photography, environmental education, and interpretation, as proposed for the Refuge under modified Alternative D, would be similar to those described under Alternative A. However, because these uses would be confined primarily to the designated trail system, with larger blocks of habitat protected from public use, disturbance to wildlife would be reduced over those described under Alternative D.

The impacts associated with permitting dogs on the Refuge would be similar to those described under Alternative C.

<u>Research</u>. The potential effects to wildlife of permitting compatible research activities on the Refuge would be the same as those described under Alternative A.

#### **Refuge Operations**

Impacts to wildlife from the implementation of the refuge operations included under modified Alternative D would be the same as those described under Alternative B.
# 5.5 Effects to Federally and State Listed Endangered and Threatened Species and Other Species of Concern

The direct and indirect effects to endangered and threatened species and other species of concern as a result of implementing the various alternatives are described in this section. An adverse effect to these species would be considered significant if:

- An action would result in the direct mortality or habitat loss, lowered reproductive success, or habitat fragmentation of a federally or State listed plant species.
- Permanent loss of occupied listed species habitat, substantial loss of foraging or nesting habitat for a listed or special status species, or the direct mortality of individuals of a listed species would occur as a result of a proposed action.

An indirect beneficial impact would occur if an action would result in the creation of substantial new areas of foraging, roosting, or nesting habitat for listed or special status wildlife species or substantial new areas of habitat appropriate to support listed or special status plant species.

Information about the listed species and other species of concern that are known to occur or have the potential to occur on the Refuge is provided in Chapter <u>4 of the Final CCP</u>.

# 5.5.1 Alternative A – No Action

#### Wildlife and Habitat Management

Activities related to surveying and monitoring of listed and sensitive species can result in temporary disturbance to listed species, particularly if implemented during the nesting season (e.g., least Bell's vireo, which nests from about March 15 to September 15; coastal California gnatcatcher, which nests from about February 15 to August 15). Disturbance to nesting birds can cause adult birds to momentarily leave the nest, putting chicks or eggs at risk of predation. To reduce the potential for disturbance, protocols, such as limiting the number and duration of visits to areas supporting nesting birds, are adhered to when monitoring of nesting birds is deemed necessary. Past experiences have demonstrated that when these protocols are followed, the benefits of the data provided as a result of monitoring outweigh the minor temporary adverse effects that occur during monitoring. There is also the potential for trampling of listed plants and butterfly larvae during surveys; therefore, only qualified individuals are permitted to survey sites when listed or sensitive species are most vulnerable to impacts from human activity.

Other activities such as restoration and enhancement, invasive species removal, trash cleanups, fencing, posting, and fuel break creation/maintenance are scheduled to occur outside of the nesting season to avoid impacts to listed and sensitive bird species. To avoid impacts to sensitive plant species, potential work areas are surveyed prior to implementing any of these activities in an effort to identify and, if necessary, flag areas supporting listed or sensitive plants. All activities are limited in areas known to support or have the potential to support sensitive butterfly species (i.e., Quino checkerspot, Hermes copper).

#### Pest Management

Herbicides currently used on the Refuge to control invasive, weedy species include products with the active ingredient glyphosate, fluazifop-P-butyl, and chlorsulfuron. All applications of these products are made consistent with label requirements and any conditions applied to product use as part of the PUP approval process.

Glyphosate, which is a non-selective herbicide, is described by the USEPA (1993) as "no more than slightly toxic to birds" and "practically non-toxic to fish, aquatic invertebrates, and honeybees." The effects of glyphosate on birds, mammals, fish and invertebrates are considered minimal (USEPA 1993); therefore, no significant adverse effects to listed and sensitive birds, mammals, or terrestrial invertebrates are anticipated. Surfactants, which may be mixed with glyphosate prior to application, may be highly toxic to aquatic organisms, including aquatic invertebrates. In addition, because this product is non-selective, drift during application can harm non-target plants, including listed and sensitive species. To avoid adverse effects to listed and sensitive plant species, as well as to San Diego fairy shrimp, care to avoid drift or runoff must therefore be taken during any application of this product.

Fusilade DX, with the active ingredient fluazifop-P-butyl, is a selective, post-emergent herbicide registered for the control of perennial and annual grass weeds. It is considered by the USEPA to be practically non-toxic to bird and mammal species but highly toxic to fish and aquatic invertebrates; and it has a very low potential for toxicity to honeybees. At unusually high application rates, fluazifop-p-butyl has been shown to inhibit fungal growth (Tu et al. 2001); however, there is no evidence of significant effects on fungal populations when applied at recommended field rates. As with glyphosate, care to avoid drift or runoff must be taken during any application of this product, particularly if used in the vicinity of vernal pool habitat that supports San Diego fairy shrimp. The potential for drift in the vicinity of native grasses and crytobotic crust should also be avoided.

Chlorsulfuron controls select broadleaf weeds and non-native grasses and is practically nontoxic to birds, mammals, fish, aquatic invertebrates, honeybees, and beetles. Toxicity to aquatic plants can, however, range from non-toxic to very highly toxic; therefore, drift and the potential for runoff into vernal pools following application should be avoided to ensure no adverse effects to sensitive vernal pool plant species will occur. This product also has the potential to affect non-target plant species; therefore, to avoid any adverse effects to listed and sensitive plant species, use of this product is limited to ground application only (i.e., spot treatment of specific plant), and use is limited to less than one acre per treated site.

Control and/or eradication of invasive aquatic organisms within the Sweetwater River and ponds of the Otay-Sweetwater Unit would benefit the recovery of listed and sensitive species such as arroyo toad, California red-legged frog, and southwestern pond turtle if one or more of these species were to be reestablished either intentionally or naturally on the Refuge.

#### Public Use

Impacts to listed and sensitive species from the implementation of the wildlife-dependent recreational uses currently occurring on the Refuge would be the same as those previously described for Refuge wildlife and vegetation.

Primary impacts to listed and sensitive species result from unauthorized off-trail activity, as well as trails that extend within or immediately adjacent to habitat essential to the recovery of listed species and the protection of sensitive species. Listed and sensitive species, such as the least Bell's vireo, coastal California gnatcatcher, Quino checkerspot butterfly, and Hermes copper butterfly, as well as other sensitive species described in <u>Chapter 4 of the Final CCP</u>, are all subject to disturbance and habitat fragmentation due to the extent of trails currently present on the Refuge. The presence of dogs on the trail also results in disturbance to sensitive wildlife, as described previously. Off-trail activity also has the potential to adversely affect listed and sensitive plant species, particularly San Diego ambrosia, which grows immediately adjacent to existing trails in the Sweetwater River area. To protect these species, fencing and signage have been installed in areas where sensitive species are known to occur in an effort to keep visitors on existing trails. Additional fencing, signage, and realignment of trails away from areas that support sensitive species would further reduce the potential for adverse effects. Listed vernal pool species on the Otay-Sweetwater Unit are protected by perimeter fencing, while the vernal pools on the Del Mar Mesa Vernal Pool Unit would remain subject to degradation by trail users under Alternative A.

# 5.5.2 Alternative B

#### Wildlife and Habitat Management

The expansion of monitoring and survey efforts on the Refuge would be conducted in accordance with the practices and protocols described under Alternative A; therefore, no significant adverse effects to listed and sensitive species are anticipated from these activities.

The other wildlife and habitat management actions proposed under Alternative B, including restoration and enhancement of native habitats and establishment of new populations of listed or sensitive species in appropriate locations within the Refuge, would be conducted outside of the nesting season to avoid disturbance and other potential impacts to nesting birds; would occur only after a survey of the affected site is conducted to ensure that no listed or sensitive species, particularly plants and invertebrates, would be impacted; and would incorporate BMPs to avoid indirect impacts related to off-site erosion and unnecessary ground disturbance that could encourage establishment of non-native invasive plants. The implementation of these measures would minimize the potential for any direct or indirect impacts to listed or sensitive species. Wildlife and habitat management actions included under Alternative B are intended to support native species and habitats and are therefore expected to result in beneficial effects to the listed and sensitive species present on the Refuge.

Alternative B does not include a proposal to eradicate feral pigs should they be identified on the Refuge. Therefore, if feral pigs become established on the Refuge, the listed and sensitive species conserved on the Refuge could be subject to the same adverse effects described above for habitat, vegetation, and wildlife.

#### Pest Management

Under Alternative B, the control of invasive non-native species would be implemented in accordance with the proposal included in the IPM Plan (Appendix D). All pesticides considered for use on the Refuge per the IPM Plan would require review and approval through the PUP process, and chemical profiles would be prepared to assess the potential effect of each pesticide on Refuge-specific species, including listed species. This assessment may result in the identification of product specific BMPs that must be implemented during application and/or requirements for application rates that are lower than those permitted on the product label.

As part of the IPM Plan, three additional herbicides have been evaluated for use on the Refuge. The products (presented in Table 5-2) include the active ingredients oryzalin,

triclopyr, and clethodim. With respect to listed species, oryzalin can pose a threat to endangered aquatic species in shallow water; therefore, the chemical profile for this product requires that use of this product be limited to one application per year at 1.5 pounds per year acre per year, that a minimum 25-foot buffer zone between all upland treatment sites and the high water mark of the nearest surface water resources be maintained, and that the oryzalin may not be applied to sites upslope to surface water resources with greater than a 10 degree slope. Triclopyr is also considered highly toxic to fish and aquatic invertebrates; therefore, the chemical profile for this product requires that a 25-foot treatment buffer zone from surface water resources must be maintained during application. The potential effects of these products on sensitive vernal pool species would be considered when evaluating potential methods for controlling non-native invasive weeds in proximity to vernal pool habitat.

None of these products poses a significant threat to birds. Although there is the potential for direct exposure to triclopyr through the consumption of the berries or fruits of treated plants, the USEPA considers this product to be only slightly toxic to birds. Additionally, this type of exposure on the Refuge is unlikely, as control of woody invasives is typically conducted by cutting the shrub or tree down and applying the herbicide to the cut stump.

Studies indicate that all of these products are practically non-toxic to non-toxic to honeybees. Information regarding effects to other terrestrial invertebrates is not available; therefore, care should be taken in applying these products in area that support listed or sensitive butterflies. Triclopyr has also been documented are inhibiting growth of some species of fungi (Tu et al. 2001), but use of this product in upland areas supporting crytobiotic crust is not proposed.

With respect to listed and sensitive plants, all of these products have some potential for damage to non-target plants. However, the implementation of the BMPs described previously in Effects to Water Quality and Effects to Air Quality, as well as the product specific BMPs included in the chemical profiles, would ensure that no adverse effects to listed or sensitive plant species would result from the use of herbicides on the Refuge.

#### Public Use

<u>Hunting and Fishing</u>. Under Alternative B, the Refuge would remain closed to hunting and fishing.

## Other Wildlife-dependent Recreational Uses.

Impacts to listed and sensitive species from activities related to wildlife observation, photography, environmental education, and interpretation would be similar to those previously described under Effects to Habitat and Vegetation Resources and Effects to Wildlife. As these uses would be confined primarily to the designated trail system, impacts would more likely be related to noise and disturbance in proximity to the trail, rather than trampling. However, off-trail activity, although not permitted, cannot be fully avoided. To minimize disturbance to sensitive bird species, future trail alignments or realignments would attempt to provide an adequate buffer (i.e., at least 100 feet) between the edge of known nesting areas and the trail tread.

Measures such as fencing and signage would be used in areas where the trail occurs in proximity to sensitive plant species or habitats with the potential to support sensitive butterfly species. Where off-trail activity is more likely to occur due to some feature such as a pond, viewpoint, large rock formation and this off-trail activity could impact sensitive habitat or species, one of several measures would be implemented: 1) realign the trail to provide access to the feature while avoiding sensitive species or habitat areas; 2) realign the trail away from the feature so it is not visible to trail users; or 3) provide fencing along the trail to encourage confining all activities to the designated trail. Appropriate trail alignments, along with measures implemented to discourage off-trial activity, would reduce the potential for significant adverse effects to listed and sensitive species from trail activities related to wildlife observation, photography, environmental education, and interpretation.

<u>Trails</u>. The discussion of impacts and measures to minimize impacts described above would also be applicable to the designated trail system proposed under Alternative B.

<u>Research</u>. The potential effects to sensitive species from the implementation of compatible research activities on the Refuge would be the same as those described under Effects to Habitat and Vegetation Resources and Effects to Wildlife.

#### **Refuge Operations**

Proposals related to the construction of parking lots, installation of a kiosk, development of a Refuge visitor contact station, and realignment of trails all have the potential to affect one or more listed or sensitive species. To avoid any adverse direct or indirect impacts to these species, the measures listed here will be implemented as part of all future construction projects proposed on the Refuge.

- 1. As part of the development of construction plans, specific site designs, or trail realignments, a survey of the potential project site will be conducted to identify the location of any listed, sensitive, or narrow endemic species. If listed species are present within the proposed project footprint, the project will be designed to avoid impacts to the species or an alternative site will be selected.
- 2. To protect all listed and sensitive avian species, vegetation clearing and construction will be performed generally outside of the nesting and breeding seasons. (For the purposes of implementation, the following general breeding season dates shall be used: January 15 to July 31 for raptor species; March 15 to September 15 for riparian species; and February 15 to August 15 for upland species.) It may be necessary to modify these dates to reflect the species known or expected to occur on a specific site.
- 3. Every effort will be made to avoid impacts to wetlands; where construction is necessary, such as the construction of a bridge, an evaluation of wetland avoidance options and the identification of specific measures to minimize any impacts will be conducted. For unavoidable impacts, adequate mitigation in the form of wetland creation and/or restoration will be provided.
- 4. Adequate habitat buffers will be provided when development is proposed in proximity to sensitive habitats such as riparian areas.
- 5. Trails will be aligned to avoid areas known to support sensitive plant and wildlife species.
- 6. Areas that support listed or sensitive species and/or sensitive habitat in or adjacent to work areas will be fenced and/or flagged prior to the initiation of any earthwork or construction.

- 7. A pre-construction meeting will be conducted involving all personnel, including contractors, who will be working on the site to review the practices to be followed to avoid impacts to sensitive resources.
- 8. Whenever possible, native plant species will be salvaged and relocated into suitable habitat.
- 9. Temporary impact areas will be revegetated with appropriate native plants to avoid erosion or sedimentation into areas supporting listed or sensitive species.
- 10. All planting stock will be inspected to ensure that it is free of pest species that may invade natural areas, including but not limited to Argentine ants (*Iridomyrmex humii*), fire ants (*Solenopsis invicta*), and other pests.
- 11. The use of outdoor lighting in association with new construction shall be limited to that needed for safety and security and would be fully shielded to avoid spillover of lighting into sensitive habitat areas.

In addition to the measures described previously, to minimize impacts associated with the implementation of various public uses on the Refuge, significant portions of the Refuge will be closed to public use to provide sanctuaries for listed and sensitive species. As a result, no significant adverse effects to listed or sensitive species are anticipated under Alternative B.

There is limited, if any, potential for impacts to listed or sensitive species as a result of constructing Refuge-related facilities at Rancho Jamul because the site is already developed and already supports a range of similar facilities.

#### 5.5.3 Alternative C

#### Wildlife and Habitat Management

The analysis of impacts to listed and sensitive species of implementing the wildlife and habitat management actions proposed under Alternative C, as well as the mitigation measures proposed to minimize these impacts, would be essentially the same as those described for Alternative B.

#### Pest Management

The analysis of impacts to listed and sensitive species from the implementation of an IPM Plan for the Refuge and the BMPs and other measures proposed to minimize these impacts would be essentially the same under Alternative C as those described for Alternative B.

#### <u>Public Use</u>

<u>Hunting</u>. The proposal to open portions of the McGinty Mountain, Las Montañas, and Otay Mesa and Lakes areas to hunting could result in impacts to listed and sensitive wildlife related to disturbance and trampling during off-trail activity by hunters and hunting dogs. The wildlife species present in this area that could be affected include coastal California gnatcatcher, the MSCP-covered bird species (refer to Table 4-7 in the Final CCP) that occur in southern mixed chaparral, oak woodland, and coastal sage scrub, and sensitive reptiles and the Hermes copper butterfly.

Sensitive plant species present in this area that could be directly or indirectly impacted by hunting include San Diego thornmint, Otay tarplant, and the MSCP-covered plant species listed in Table 4-7 that occur in coastal sage scrub, southern mixed chaparral, and oak woodland. Off-trail activity could result in disturbance to nesting gnatcatchers and other birds and potentially in the loss of one or more nests during the breeding season. The loss of gnatcatcher eggs or chicks would be considered a significant adverse effect; therefore, to avoid impacts to gnatcatchers, hunting would not be permitted in the McGinty Mountain and Las Montañas areas during the nesting season (February 15 to August 15). This measure would also avoid the potential for disturbance to other sensitive bird species during the nesting season.

Potential effects to sensitive plant species and disturbance to sensitive butterfly habitat can be minimized by excluding areas that support these species from the designated hunting area and/or noting areas to be avoided on a map provided to hunters or by posting or otherwise marking the areas to be avoided in the field.

The implementation of a hunting program on the Refuge would result in direct and indirect impacts to southern mule deer, a MSCP-covered species. To avoid adverse impacts to the region's mule deer population due to overharvesting, harvest levels would be determined based on existing knowledge of the populations of these species within the region and would be evaluated annually based on estimated annual take and estimated population size. As a result, no significant impact to the local or regional southern mule deer population is anticipated.

San Diego black-tailed jackrabbit, a California species of special concern but not covered by the MSCP, may also be present in the designated hunting areas. Hunting of jackrabbit would only be permitted in a portion of the Otay Mesa and Lakes area, a relatively small portion of the land between CDFW and BLM hunt areas; therefore, the potential for take on the Refuge is low. The remainder of this Refuge parcel would provide sanctuary for the species.

Jackrabbit hunting is not proposed for the designated hunting areas within the McGinty Mountain and Las Montañas areas, however, there is also a potential for the unintentional wounding or take of this species in the course of hunting desert cottontail and brush rabbits in these areas. To minimize this potential, the training session required prior to hunting on these portions of the Refuge would include a discussion on the need to verify the species of rabbit present prior to shooting.

Implementing the measures describe above would minimize impacts to sensitive species related to hunting.

#### Other Wildlife-dependent Recreational Uses.

As discussed under Alternative B, listed and sensitive species would be subject to direct and indirect impacts due to disturbance and potential trampling associated with wildlife observation, photography, environmental education, and interpretation. The measures presented under Alternative B to minimize these impacts would also be implemented under Alternative C.

<u>Trails</u>. The discussion of impacts and measures to minimize impacts related to trail use as described under Alternative B would also be applicable to Alternative C. However, unlike Alternative B, dog walking would be permitted on trails under Alternative C. The effects to listed and sensitive species of allowing dogs on the Refuge under Alternative C would be similar to those described under Effects to Wildlife for Alternative C.

<u>Research</u>. The potential effects to sensitive species from the implementation of compatible research activities on the Refuge would be the same as those described under Effects to Habitat and Vegetation Resources and Effects to Wildlife.

#### **Refuge Operations**

The impacts related to the proposals in Alternative C related to Refuge operations would be similar to those described previously under Alternative B. To avoid any adverse direct or indirect impacts to these species, the measures presented under Alternative B would also be implemented as part of all future construction projects proposed on the Refuge under Alternative C.

Alternative C includes several additional trail proposals including the construction of an interpretive boardwalk trail within the Shinohara vernal pool restoration site. This trail would facilitate guided interpretive walks through a portion of the site's vernal pool habitat. To ensure that no adverse effects to listed or sensitive species supported in the pools occur during or after construction, the following measures would be implemented:

- To minimize the extent of ground disturbance and protect the microhydrology of the site, construction techniques for the boardwalk would include pin foundations or other comparable system in which the posts holding up the boardwalk sit on the surface of the ground; and
- To avoid any unauthorized off-trail activity, use of the boardwalk would be limited to guided walks.

The implementation of these measures would ensure that no significant adverse impacts to listed and sensitive vernal pool species would occur.

There is limited, if any, potential for impacts to listed or sensitive species as a result of constructing Refuge-related facilities at Rancho Jamul because the site is already developed and already supports a range of similar facilities.

## 5.5.4 Alternative D

#### Wildlife and Habitat Management

The analysis of impacts to listed and sensitive species of implementing the wildlife and habitat management actions proposed under Alternative D, as well as the mitigation measures proposed to minimize these impacts, would be essentially the same as those described for Alternative B. Alternative D also includes a proposal to monitor for and control when present feral pigs on the Refuge in accordance with Appendix E.

As described previously, activities associated with monitoring, trapping, and lethally removing (shooting) feral pigs has the potential to result in adverse effects to vegetation, including listed and sensitive plant species due to trampling during monitoring or control efforts. Damage could also often during trap installation. To avoid such impacts, ground disturbance and vegetation removal would be minimized within any designated critical habitat, sensitive vegetation communities, or areas occupied or historically known to support listed or sensitive plant species (e.g., riparian habitat, vernal pools). In addition, using GIS data of the trapping locations, the Refuge biologist or other qualified biologist will conduct a vegetation survey at least one week prior to trap installation to determine presence or absence of sensitive

vegetation, and if necessary, the biologist will flag sensitive vegetation and notify trap installers about areas to avoid.

There is also the potential for impacts to sensitive and listed wildlife species (e.g., least Bell's vireo, California gnatcatcher, cactus wren, burrowing owl, bald eagles, orange-throated whiptail, San Diego horned lizard) due to disturbance from monitors, marksmen and their dogs, helicopters, and activities associated with the installation of traps. To avoid such impacts, mitigation measures and restrictions have been developed that will be implemented during all feral pig monitoring and control efforts. These measures and restrictions are presented here.

- Prior to implementing control or installing traps, the Refuge biologist will provide recommendations or restrictions for access within the affected area and/or recommendations for potential placement of traps within the site.
- Using GIS data of the trapping locations, the Refuge biologist or other qualified biologist will conduct a survey of the area at least one week prior to trap installation to determine presence or absence of sensitive wildlife, and if necessary, the biologist will flag sensitive habitat areas and notify trap installers about areas to avoid or of required setbacks from sensitive habitat areas.
- A qualified biologist shall visit the trapping sites periodically throughout the duration of the trapping project to ensure that all practicable measures are being employed to avoid incidental disturbance to listed species.
- Trapping and helicopter flights will be prohibited within 6,000 feet of known bald eagle or golden eagle nesting or wintering sites during the species' nesting or wintering seasons.
- Ground disturbing activities, including trap placement, would be minimized within known or suspected habitat for Quino checkerspot butterfly, as well as within areas supporting host plants for this species.

#### Pest Management

The analysis of impacts to listed and sensitive species from the implementation of an IPM Plan for the Refuge and the BMPs and other measures proposed to minimize these impacts would be essentially the same under Alternative D as those described for Alternative B.

## Public Use

<u>Hunting</u>. Under Alternative D, only a portion of the Otay Mesa and Lakes area would be opened to hunting, and the boundaries of that hunting area were delineated in a manner that would minimize the potential for adverse effects to listed and sensitive species. Access to the hunting area would be via adjacent hunting areas managed by CDFW and BLM.

Southern mule deer, an MSCP-covered species, would be impacted directly and indirectly from hunting. To avoid adverse impacts to mule deer due to overharvesting, harvest levels would be determined based on existing knowledge of the populations of the species within the region and would be evaluated annually based on estimated annual take and estimated population size. As a result, no significant impact to the local or regional southern mule deer population is anticipated.

Potential impacts to San Diego black-tailed jackrabbit would be similar to those described under Alternative C.

Other Wildlife-dependent Recreational Uses.

The analysis of impacts to listed and sensitive species from trail activities related to wildlife observation, photography, environmental education, and interpretation and the measures proposed to minimize these impacts would be essentially the same under Alternative D as described for Alternative B.

<u>Trails</u>. The discussion of impacts and measures to minimize impacts related to trail use as described under Alternative B would also be applicable to Alternative D. However, unlike Alternative B, dog walking would be permitted on all multiple use trails under Alternative D. The effects to listed and sensitive species of allowing dogs on the Refuge under Alternative D would be similar to those described under Effects to Wildlife for Alternative C.

<u>Research</u>. The potential effects to sensitive species from the implementation of compatible research activities on the Refuge would be the same as those described under Effects to Habitat and Vegetation Resources and Effects to Wildlife.

#### **Refuge Operations**

The impacts associated with proposals in Alternative D related to Refuge operations would be similar to those described previously under Alternative C. To avoid any adverse direct or indirect impacts to these species, the measures presented under Alternative C would also be implemented as part of all future construction projects proposed on the Refuge under Alternative D.

There is limited, if any, potential for impacts to listed or sensitive species as a result of constructing Refuge-related facilities at Rancho Jamul because the site is already developed and already supports a range of similar facilities.

## 5.5.5 Modified Alternative D

## Wildlife and Habitat Management

The analysis of impacts to listed and sensitive species of implementing the wildlife and habitat management actions proposed under modified Alternative D, as well as the mitigation measures proposed to minimize these impacts, would be essentially the same as those described for Alternative D.

## Pest Management

The analysis of impacts to listed and sensitive species from the implementation of an IPM Plan for the Refuge and the BMPs and other measures proposed to minimize these impacts would be essentially the same under modified Alternative D as those described for Alternative B.

## Public Use

Hunting. The potential for impacts to listed and sensitive species as a result of implementing the hunting program proposed under modified Alternative D would be the same as those described for Alternative D.

Other Wildlife-dependent Recreational Uses and Trails

The analysis of impacts to listed and sensitive species from wildlife observation, photography, environmental education, interpretation, and trail activities, as proposed under modified Alternative D, would be similar to the proposals included under Alternative D, and the measures proposed to minimize impacts to sensitive species under modified Alternative D would be essentially the same as those described for Alternative B. The potential for impacts to sensitive species would however be reduced under modified Alternative D because of the elimination of the proposals for a parking area and trail access near Model A Ford Lane and removal of the proposal for an interpretive trail near vernal pool habitat.

<u>Trails.</u> The discussion of impacts and measures to minimize impacts related to trail use and leashed dog walking, as described under Alternative D, would also be applicable to modified Alternative D.

<u>Research</u>. The potential effects to sensitive species from the implementation of compatible research activities on the Refuge would be the same as those described under Effects to Habitat and Vegetation Resources and Effects to Wildlife.

## **Refuge Operations**

<u>Impacts to sensitive species from the implementation of the refuge operation proposals in</u> <u>modified Alternative D would be similar to tho9se described under Alternative D.</u>

# 5.6 Effects to Cultural Resources

The NHPA establishes the Federal government's policy on historic preservation and the programs through which that policy is implemented. Relevant policies on historic preservation and associated programs, including the NRHP, were described in Chapter <u>4 of the Final CCP</u>. According to the NHPA, historic properties include "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places" (16 USC 470w(5)). The criteria used to evaluate eligibility are presented in Chapter <u>4 of the Final CCP</u>.

Section 106 (16 USC 470f) of the NHPA requires Federal agencies, prior to taking action, to take into account the effects of their undertaking on historic properties. Specific regulations regarding compliance with Section 106 state that although the tasks necessary to comply with Section 106 may be delegated to others, the Federal agency is ultimately responsible for ensuring that the process is completed according to statute. The four steps in the Section 106 process are:

- Identify and evaluate historic properties;
- Assess adverse effects of the project on historic properties;
- Resolve any adverse effects of the project on historic properties in consultation with the SHPO/Tribal Historic Preservation Officer, and other interested parties, resulting in a Memorandum of Agreement (MOA); and
- Proceed in accordance with the MOA.

An undertaking that impacts cultural resources would be considered adverse if the cultural resource is listed in or eligible for listing in the NRHP, or is identified as an Indian trust resource or a sacred site. In general, an adverse effect may occur if a cultural resource would be physically damaged or altered, isolated from the context considered significant, or affected by project elements that would be out of character with the significant property or its setting. Title 36 CFR Part 800 defines effects and adverse effects on historic resources as follows:

<u>Section 800.5(1)</u> Criteria of Adverse Effects. An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the NRHP. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative.

<u>Section 800.5(2)</u> Examples of Adverse Effects. Adverse effects on historic properties include but are not limited to the following:

- (i) Physical destruction, damage, or alteration of all or part of the property;
- (ii) Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR part 68) and applicable guidelines;
- (iii) Removal of the property from its historic location;

- (iv) Change of the character of the property's use or of physical features within the property's setting that contributes to its historic significance;
- (v) Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;
- (vi) Neglect of a property that causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and
- (vii) Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

## 5.6.1 Alternatives A, B, C, D, and Modified D

All of the alternatives include proposals that require ground-disturbing activities; therefore, the implementation of any of the alternatives has the potential to adversely affect cultural resources. Alternatives D and Modified D include a proposal to monitor and, if necessary, control feral pigs in accordance with a Feral Pig Monitoring and Eradication Plan (Appendix E). Ensuring a feral pig population does not become established on the Refuge would avoid the potential for impacts to cultural resources associated with pig rooting and digging, impacts that have occurred elsewhere in the Region. The siting and construction of temporary traps, such as corral traps, could however result in impacts to cultural resources; therefore, these actions would be subject to preconstruction cultural resource surveys and adherence to Federal regulations and Service policies regarding the protection of cultural resources.

To determine if a proposed action could adversely affect a cultural resource, it is necessary to conduct a survey of the Area of Potential Effects (APE) or, if a survey has been previously conducted, to review the results of that survey and determine if any resources identified are eligible for inclusion in the NRHP. The APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties. It is not necessary to know that the area in question contains historic properties, or even to suspect that such properties exist, in order to determine the APE. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking. In addition, the APE is not always a contiguous area; there may be multiple alternative project sites or multiple areas in which changes are anticipated.

A number of actions on the ground are proposed to implement the CCP. Each action would have its own project-specific APE. As described in Chapter <u>4 of the Final CCP</u>, investigations, surveys and research have previously been conducted for various portions of the APE, and cultural resources have been identified; however, there are also large areas of the Refuge that have not been previously surveyed.

The potential for archaeological resources to be present within a specific portion of the Refuge varies depending upon the topography, soil types, proximity to water, proximity to food resources, and many other factors. Overall, the potential for yet undiscovered buried deposits to be present on the Refuge is considered high.

Surveys of those previously unsurveyed areas and determinations of eligibility for any features that have not yet been evaluated would be required prior to the implementation of any ground-disturbing activities necessary to implement wildlife and habitat management, public use, or Refuge operations actions or activities. The potential effect of these activities on cultural resources

must be reviewed in accordance with Section 106 and the procedures established by the Service's Cultural Resources Program to ensure that no adverse effects to known or unknown cultural resources occur as a result of Refuge activities.

To avoid adverse effects to cultural resources under any of the alternatives, when a project is first being considered for implementation that will require ground disturbance, Refuge staff will submit a Request for Cultural Resource Compliance to the Service's Cultural Resources Program. This request is to be submitted as early in the planning process as possible. The Request will include a map, indicating the APE for the project site and any associated access requirements that may involve grading, along with a detailed project description. Based on this information, Cultural Resource staff will determine the appropriate measures to be implemented to protect cultural resources. For example, for projects involving ground disturbance that are determined to be located in an area of sensitivity for an archaeological resource, an archaeological monitor, meeting the Secretary of the Interior's Guidelines, <u>and a qualified Kumeyaay monitor</u> would be present during grading, digging, coring, or any other activity that would affect subsurface materials.

If any cultural resources are discovered during excavation, all earthwork on the site would be halted and the Regional Historic Preservation Officer would be contacted to review the materials and recommend a treatment that is consistent with applicable laws and policies. The treatment plan would likely require the boundaries of the site to be defined before excavation could be reinitiated in an area well away from the discovered resource. The site would also be recorded and evaluated for eligibility to the NRHP. Once this work is completed, additional measures may be required depending upon the results of the eligibility determination. If any site is encountered that is determined to be eligible to the NRHP, the Service would consult with SHPO, federally recognized tribes, and interested parties.

When archaeological resources are encountered, the Refuge will comply with Federal regulations regarding curation (36 CFR 79). Specifically, the Refuge will ensure proper care of federally owned and administered archaeological collections, including ensuring that significant prehistoric and historic artifacts, and associated records, are deposited in an institution with adequate long-term curatorial capabilities that can provide professional, systematic, and accountable curatorial services on a long-term basis.

To identify and preserve traditional cultural properties and sacred sites and to determine the level of confidentiality necessary to protect them, the Refuge would work with interested tribal groups to establish government-to-government relationships that would ensure meaningful consultation with tribal governments during the planning phase of projects. The Refuge Complex has initiated discussions with interested tribal groups to create a Memorandum of Understanding (MOU) to implement the inadvertent discovery clause of NAGPRA. Development of this MOU would involve identifying the Native American tribes, groups, and direct lineal descendants that may be affiliated with these Refuge lands, initiating consultation with the affiliated parties, developing procedures to follow for intentional and inadvertent discoveries, and identifying the persons to contact for the purposes of NAGPRA.

Implementation of the procedures described is expected to avoid any adverse effects to cultural resources.

# 5.7 Effects to the Social and Economic Environment

This section examines the effects of the three management alternatives to the social and economic environment in which the Refuge is located, including effects related to land use, recreational opportunities, traffic circulation/parking, public utilities/easements, economics/employment, and environmental justice.

With regard to land use, this section analyzes the potential land use conflicts between the habitat management and public use proposals presented in each alternative and the existing and planned land uses in the immediate vicinity of the Refuge. Adverse effects related to land use would be considered significant if:

- Substantial incompatibility between proposed uses or activities and adjacent existing uses and uses proposed in approved general plans would occur.
- Changes in use or the intensity of use are proposed where the resulting activity or use pattern would create substantial increases in noise, traffic, public safety, or similar environmental impacts that would alter community character or conflict with existing uses in the area.

With regard to recreational opportunities, this section analyzes the effects of the various alternatives on existing recreational uses within and surrounding the Refuge. Adverse effects related to recreational opportunities would be considered significant if:

• Substantial loss of regional recreational opportunities occurs as a result of the proposed action.

With regard to traffic circulation, this section analyzes the effects of the various alternatives on the existing and planned traffic facilities in the vicinity of the proposed action. Adverse effects would be considered significant if:

- A project would add a substantial amount of traffic to a congested freeway segment, interchange, or freeway ramp.
- A project would increase traffic hazards to motor vehicles, bicyclists, or pedestrians due to proposed non-standard design features (e.g., poor sight distance, proposed driveway onto an access-restricted roadway).

With regard to parking, this section analyzes the effects of the various alternatives on the availability of parking within the vicinity of the project. Adverse effects would be considered significant if:

• The need for parking generated by a proposed action would substantially reduce the availability of parking in an adjacent residential or commercial area.

With regard to public utilities/easements, this section analyzes the potential effects of the various management alternatives on existing public utilities and easements in the immediate vicinity of the Refuge. Adverse effects to public utilities and easements would be considered significant if:

• Direct or indirect damage to utilities, utility service, or other public facilities would occur as a result of a proposed action.

• Disruption of access to a public utility or other facility would occur during implementation of a proposed action.

With regard to economics and employment, this section evaluates the effect of implementing the various alternatives on the regional economy and employment level. Economic or social changes resulting from an action are considered to produce significant effects if they result in a substantial adverse physical change in the environment (e.g., urban blight).

With regard to environmental justice, this section evaluates the potential for adverse human health or environmental effects to minority populations or low-income populations living in the vicinity of the Refuge as a result of implementing the various actions proposed in each alternative. Impacts related to environmental justice would be considered significant if:

• A proposed action would result in disproportionate adverse human health impacts or environmental effects to low-income or minority populations.

# 5.7.1 Effects to Land Use

#### 5.7.1.1 Alternative A – No Action

Under Alternative A, no changes to the current management practices are proposed. The activities occurring on the lands within the Refuge would be consistent with the activities occurring on other open space and conserved lands within the region. Actions related to maintaining the ecosystem functions and extant populations of MSCP-covered species would also continue, along with monitoring per current protocols.

Efforts would continue to be made to minimize impacts to sensitive habitat and species as a result of unauthorized off-trail activities, and some changes would occur to the current trail system; however, a designated system of trails would not be developed. As a result, it will be more difficult under this alternative to manage trail activities. Instances of trail users crossing private lands to access trails on the Refuge could continue, although efforts would continue to be made to close trails that cannot be accessed from public land or the public right-of-way.

Acquisition of lands from willing sellers within the approved Refuge boundary would continue per available funding under any of the alternatives. The effects of acquisition on the land use proposals with the region were addressed in the MSCP Program EIR/EIS (City of San Diego 1997), as well as the EA and Land Protection Plan for the Otay-Sweetwater Unit (USFWS 1997a). As described previously in this document, the MSCP was implemented to support a balance between preserving listed and sensitive species and accommodating development within the San Diego region. The lands acquired for the San Diego NWR represent the Federal government's contribution to the implementation of the MSCP.

Continued acquisition within the approved Refuge boundary would not adversely affect vacant land sales or values, nor would it be expected to adversely affect adjacent residential parcels. When the Refuge boundary was approved in 1997, many landowners stated that the proposed Refuge would ensure that their views of open space would be maintained and thereby enhance the value of their properties (USFWS 1997a).

An issue of concern for some residents located adjacent to the Refuge is the potential for adverse effects related to wildland fire. Where necessary, the Refuge maintains fire breaks to reduce the potential for the spread of wildfire into developed area. This, in combination with the

requirements of local jurisdictions for residents to maintain brush management areas around the perimeter of private parcels, helps reduce the potential for the spread of fire into developed areas. The Service also maintains two fire engine crews in the vicinity of the Otay-Sweetwater Unit during the fire season. To reduce the risk for unintentional ignition of fires on the Refuge, smoking and campfires are prohibited. These measures reduce but do not eliminate the effects of wildland fires on Refuge lands and adjacent properties.

The continuation of current management actions under Alternative A would be consistent with the objectives of the San Diego MSCP, including the objective to maintain a workable balance between preservation of natural resources and regional growth, with the Refuge providing significant acreage of preserved habitat. The Refuge also contributes to the MSCP objective to provide a general public benefit through the provision of access for passive recreation. The acquisition of lands for inclusion in the San Diego NWR that support listed and sensitive species and a range of sensitive habitats represents one of the Federal government's contribution to the preserve assembly, consistent with the MSCP implementation strategy.

Overall, the implementation of the actions proposed under Alternative A would not result in significant adverse effects related to land use.

# 5.7.1.2 Alternative B

The effects to surrounding land uses of implementing Alternative B would be similar to Alternative A. Actions proposed under Alternative B, such as expanding current monitoring of listed and sensitive species, restoring habitat, fencing and posting Refuge boundaries, and controlling invasive species, would have little, if any, effect on adjacent properties, <u>but would further support</u> the objectives and implementation strategy of the San Diego MSCP.

The establishment of a designated trail system would reduce the potential for access onto the Refuge through private property. Under this alternative, dogs would not be permitted on the Refuge, which would represent a change from current conditions; however, there are significant areas of open space in the vicinity of the Refuge where dogs are permitted. <u>Developing a designated trail system within the Refuge would also enable Refuge staff to better protect lands conserved to support MSCP-covered species and habitats, as off-trail activity would be expected to decrease as users will better understand where they are permitted to travel within the Refuge. <u>Off-trail use would also be addressed through expansion of the volunteer trail patrol and inclusion of trail users in trail construction and maintenance</u>. Therefore, this proposal would not represent a significant adverse effect with respect to land use.</u>

Facilities proposed for development to support Refuge operations, such as a Refuge visitor contact station, and trail parking areas within the Las Montañas and Sweetwater River, and McGinty Mountain areas, would be located on sites within the Refuge that are generally situated well away from existing development. Additionally, in the all cases except the proposed north McGinty Mountain parking area, these facilities would be surrounded by Refuge property and/or abut a major street and no adverse effects to existing or future development are anticipated. With respect to the north McGinty Mountain parking lot proposal, the facility would be small and <u>could therefore result in unanticipated impacts to the surrounding area. Such impacts include attracting too many users that could result in illegal parking along the side of the existing narrow dirt road or parking on Model A Ford Lane, a private road. The effects of too many users trying to park in this area could represent a significant impacts related to land use and traffic safety.</u>

To avoid any adverse effects to adjacent private property, the designated trail corridors were laid out in an effort to minimize the potential that public access onto the trail system would be taken through private property. All access points onto the Refuge area designed to take access from the public right-of-way or from the existing county regional trail system. Adequate separation is provided between the proposed trail corridors and adjacent private lands, therefore, potential issues related to land use compatibility have been avoided. The specific trail alignments within the proposed trail corridors would be determined during step-down trail planning, which would begin upon approval of the Final CCP.

Other proposals, including the construction of barracks for seasonal staff, development of a greenhouse/native plant nursery to facilitate Refuge restoration projects, and relocation of a storage facility, would occur on Rancho Jamul, a State of California-owned parcel that is well removed from any private property. As a result, no adverse effects to land use are anticipated from these proposals.

# 5.7.1.3 Alternative C

Alternative C includes a limited hunting program that would allow seasonal hunting on a portion of the McGinty Mountain area and the southern portion of the Las Montañas area. Year-round hunting would be permitted on a portion of the Otay Mesa and Lakes area. The proposal to open these areas to hunting would represent a change in use over current conditions; however, an adequate buffer would be provided between the Refuge property line and adjacent parcels to ensure that no significant adverse effects to adjacent uses would occur. In addition, in the seasonal hunt areas, hunting would be conducted using a reservation system to limit the number of hunters present in the area at any one time. The use of rifles would be developed to further describe the details of the hunting program and the facilities (e.g., on-Refuge parking, restroom) that would be provided to accommodate this use. Implementing these measures would reduce the potential for adverse effects to adjacent land uses.

The majority of the landowners in proximity to the area designated for hunting in the Otay Mesa and Lakes area are public agencies, with hunting permitted on both CDFW and BLM lands that abut the area. No residential uses occur in proximity to this area. Therefore, no adverse effects related to land use compatibility are anticipated.

Land use effects related to <u>consistency with the objectives and implementation strategy of the</u> <u>MSCP and</u> the designated trail system and proposed refuge facilities would be the same under Alternative C as described under Alternative B.

## 5.7.1.4 Alternative D

The effects to land use of implementing Alternative D would be similar to Alternative C. The primary difference between the two alternatives with respect to land use is that under Alternative D, hunting is only proposed within the Otay Mesa and Lakes area.

## 5.7.1.5 Modified Alternative D

<u>The effects to land use of implementing modified Alternative D would be similar to Alternative D, in most regards. However, the potential effects to land use in the vicinity of McGinty Mountain from implementing modified Alternative D would be reduce over those proposed under Alternatives B, C, or D, as no parking area would be developed in the vicinity of Model A Ford Lane of Sloane Canyon Road. In addition, the designated trail system designed for the area under modified Alternative D takes into consideration the need to align trails in a manner that does not</u>

adversely affect adjacent residents, nor does it proposed trail connections were no legal access is <u>currently available.</u>

The trail plan proposed in this alternative was designed after significant on-site evaluation of existing conditions, including the presence of MSCP-covered species and their associated habitats. As designed, the public will have the opportunity to observe and appreciate the various habitats and species being conserved on the Refuge. As described under Alternative B, the establishment of a designated trail system will reduce off-trail activity, and provide opportunities for interpretation of the purposes for the preserved lands not just within the Refuge, but throughout San Diego County. The combination of public use and preservation of large blocks of undisturbed habitat, as proposed under this alternative, is consistent with goals of the San Diego MSCP.

# 5.7.2 Effects to Recreational Opportunities

# 5.7.2.1 Alternatives A, B, C, D, and Modified Alternative D

None of the alternatives evaluated for implementation on the San Diego NWR would result in a significant reduction in the availability of recreational opportunities throughout the region. All of the alternatives would provide some level of trail use, and all would accommodate the county's Sweetwater River Trail, a regional trail that is proposed to provide access to the California Riding and Hiking Trail. Although hunting is not proposed under Alternatives A or B, there are other opportunities for hunting in the county; therefore, no significance adverse effects related to hunting would result if either alternative were to be selected as the preferred alternative.

With respect to the continued acquisition of properties from willing sellers per the approved Refuge acquisition boundary, no properties considered for acquisition are proposed for development as a public park. Therefore, no significant adverse effects to planned recreational opportunities are anticipated.

# 5.7.3 Effects to Traffic Circulation and Parking

# 5.7.3.1 Alternative A – No Action

Under Alternative A, no changes to the current management practices or authorized public uses would occur. Implementing the various wildlife and habitat management activities and other Refuge operations actions would have little impact on current and future traffic volumes on the roads surrounding the Refuge. The public uses on the Refuge generate a moderate, although not quantified, number of trips that generally occur outside of peak traffic hours. These trips do not result in direct impacts to traffic circulation in the area, nor do they represent a cumulatively significant adverse effect to traffic circulation.

Public access to the Refuge is currently available from Jamul Drive, where the Refuge maintains a parking lot that provides access to trails on McGinty Mountain. This lot is of adequate size to accommodate current use. To access the trail system to the west of Par Four Drive requires that the public park on residential streets near the trailhead. The highest use periods occur on the weekends. This situation can affect existing residents, particularly those who live on streets immediately adjacent to the trailhead. To ensure that significant adverse effects related to loss of on-street parking availability for residents, Refuge events involving more than a few cars should not be staged from this location.

Access to the Sweetwater River area is available from Sweetwater Regional Park and from a small parking area off Highway 94 that is maintained by the County of San Diego. The county's parking lot is heavily used by visitors using the county's Sweetwater River Trail, as well as by visitors interested in observing the resources supported on the Refuge. Use of this parking lot is highest on the weekends.

If existing uses are maintained at current levels, no significant adverse effects related to available on or off-street parking are anticipated, provided Refuge events are planned in a manner that takes into account parking availability at particular locations throughout the Refuge.

# 5.7.3.2 Alternative B

Expansion of the current wildlife and habitat management activities and other Refuge operations actions proposed under Alternative B would not result in a significant increase in the number of vehicle trip generated by the Refuge. Therefore, there would be little impact on current and future traffic volumes on the roads surrounding the Refuge.

The proposal to construct a visitor staging area, visitor contact station, and restrooms along the south side of Highway 94 to the west of Millar Ranch Road would also require coordination with Caltrans, as well as an encroachment permit to obtain access from Highway 94 to the site. A traffic study would be required, as part of future site and engineering design, to determine how many trips would be generated from this site following the development of the proposed facilities. Because the majority of trips would occur during non-peak hours, no significant contribution to traffic flow on Highway 94 during peak hours is anticipated. However, because this roadway operates at LOS E and F, any contribution of traffic onto Highway 94 from Millar Ranch Road would require the implementation of measures to avoid safety issues and/or impacts to overall traffic flow. Such measures could include the installation of a traffic signal at this intersection. Other potential design features may include improvements to existing acceleration and deceleration lanes, the provision of a center turning lane, and/or roadway widening to add shoulders. Such measures would be developed in coordination with Caltrans to ensure that no significant adverse effects related to traffic circulation along Highway 94 would occur.

The construction of a new parking lot in the McGinty Mountain area off of Sloane Canyon Road, just to the north of Model A Ford Lane, could result in adverse effects to traffic circulation. Sloane Canyon Road in this area is a narrow dirt road with little room for passing. Because of the limited number of parking spaces that would be available, there would be potentially a higher demand for parking than the lot can accommodate. As a result, vehicles are likely to be parked illegally along Sloane Canyon Road. This previously unanticipated result would have negative effects on the local residents who use the roadway to access their homes, and could reduce access for emergency vehicles should they be required to pass this area.

## 5.7.3.3 Alternative C

The types of wildlife-dependent recreational uses permitted on the Refuge would be expanded under this alternative to include hunting. The hunting program would include three relatively small sites within the Refuge, and hunting on two of these sites would be permitted by reservation only, while the third site would abut two much larger hunting areas. Therefore, the new trips generated by this proposal would be minimal (less than 30 peak hour trips per day). Due to the lack of access to the public right-of-way onto the southern parcel of the Otay Mesa and Lakes area, no onsite parking is proposed to accommodate hunting on this parcel. Access to this area would be via the adjacent CDFW and BLM parcels. Although the need for parking to accommodate this use would be minimal, there is currently no parking available in the vicinity of the Las Montañas area; therefore, before hunting, or any other public use, can be accommodated at this location, an on-Refuge parking area would have to be developed. <u>Construction of the future parking area, should it be proposed off Highway 94, would require funding for planning and construction. A traffic study would also be required to analyze the effects to future users, as well as the effects to those traveling on Highway 94, as a result of adding a driveway or intersection along this segment of Highway 94. The analysis would include an evaluation of existing accident rates along this road segment, proposed intersection geometrics, proximity of adjacent driveways, sight distance, and other factors. Approval of the project design, as well as an encroachment permit, would be required from Caltrans. Potential design features may include limited ingress and egress, such as right turns in and out only, installation of a traffic signal, and/or road improvements (e.g., acceleration and deceleration lanes, provision of turnouts, roadway widening to add shoulders). Such measures would be coordinated with Caltrans early in the design process and would avoid any significant adverse effects to traffic circulation along Highway 94.</u>

The impacts to traffic circulation and parking from implementing the visitor services facilities proposed under Alternative C would be similar to those described in Alternatives A and B.

# 5.7.3.4 Alternative D

The impacts to traffic circulation and parking as a result of implementing Alternative D would be similar to those described in Alternatives A, B, and C.

# 5.7.3.5 Modified Alternative D

<u>The impacts to traffic circulation and parking as a result of implementing modified Alternative D</u> would be less than those described in Alternatives B, C, and D, because the potential for impacts related to a parking area near Model A Ford Lane off Sloane Canyon Road would not be realized under this alternative.

# 5.7.4 Effects to Public Utilities and Easements

## 5.7.4.1 Alternatives A, B, C, D, and Modified Alternative D

The effects to public utilities and public utility easements as a result of the Refuge management and public use proposals included within any of the alternatives would be less than significant. No changes to the existing easements on the Refuge are proposed, and no facilities are proposed that would obstruct or otherwise adversely affect access over existing easements and access roads maintained on the Refuge by SDG&E, AT&T, Otay Water District, and Sweetwater Authority, nor are any proposals included in the alternatives that would affect the facilities maintained within these easements. Any construction proposed on the Refuge that could temporarily affect one or more of these easements would be coordinated with the appropriate utilities during the project design phase to avoid any temporary access conflicts.

In addition, the CCP does not preclude the potential for the extension of utility easements through the Refuge; however, any such proposals would require evaluation of potential impacts to the environment, including sensitive Refuge resources, in accordance with NEPA and—because of the presence of listed species on the Refuge—consultation under the Endangered Species Act would also be required. All proposals for a right-of-way on or over lands included within the National Wildlife Refuge System would also have to comply with the Rights-of-Way General Regulations included in Title 50, Part 29, Subpart B of the Code of Federal Regulations. Section 29.21 includes the procedures for filing applications and the terms and conditions under which rights-of-way over and across the lands administered by the Service may be granted. No right-of-way will be approved unless it is determined by the Regional Director to be compatible with the purposes for which the Refuge was established. More information about compatibility and the Service's Compatibility Policy is provided in Chapter 1.

# 5.7.5 Effects to Economics and Employment

#### 5.7.5.1 Alternative A – No Action

Under Alternative A, the Refuge would continue to maintain its existing staffing levels (i.e., one full-time permanent Refuge Manager, one full-time wildlife biologist, and one full-time Refuge Operations Specialist). Therefore, the effects to economics and employment at the local and regional level of implementing Alternative A would be negligible.

The Refuge currently provides recreational opportunities for an estimated 16,000 to 22,000 visitors annually, including naturalists, students, hikers, dog walkers, mountain bikers, and equestrians. Unfortunately, there is no estimate of how many of these visitors may be from out of the area. Even with the majority of the visitors coming from the local area, there is a small benefit to the economy from these uses. The economic benefits of outdoor recreation are well understood and have been documented in publications such as *Banking on Nature: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation* (Carver and Caudill 2013). Benefits from the visitation experienced on the Refuge come in the form of retail expenditures, which in turn generate additional revenues and jobs.

Under any of the alternatives, lands within the Refuge acquisition boundary (refer to Figure 1-2) would continue to be considered for acquisition based on the availability of funding and habitat and species protection priorities. The approved acquisition boundary gives the Service the authority to acquire properties from willing sellers. As required by law, the Service would offer fair-market value for real property and interests therein. The fair-market value is based upon approved appraisals conducted by professional appraisers in conformance with policies outlined in the *Uniform Appraisal Standards for Federal Land Acquisition*. The appraisal process requires that all impacts upon value be considered.

#### 5.7.5.2 Alternative B

Alternative B includes proposals to expand the current staffing levels on the Refuge, which would have a greater benefit in terms of economics and employment than does Alternative A; however, in the context of the regional economy, this increase would be negligible. Additional economic benefits to the local and regional economy would also result from construction jobs and the purchase of materials to implement the various facilities proposed to accommodate Refuge operations and visitor services. The jobs created from these projects would be temporary but would still be considered an important contribution to the overall regional effort to create jobs, particularly in the construction industry.

Visitation on the Refuge would be expected to increase as the visitor services proposals included in Alternative B are implemented. Once access to the Refuge is improved, particularly within the Sweetwater River area, visitation by hikers, mountain bikers, and equestrians is expected to increase. The Refuge would also have better opportunities for conducting events related to wildlife observation, interpretation, and environmental education.

# 5.7.5.3 Alternative C

The benefits to the economy and employment would be similar to those described for Alternative B. The primary difference in terms of economics is that a hunting program is proposed under Alternative C, and a hunting program on the Refuge would generate economic benefits of its own. Statewide, California hunters spent an estimated 1,033,989 days and contributed \$27.1 million to local economies in pursuit of resident game birds alone during the 2002 hunting season (USFW Service and U.S. Bureau of the Census 1993; CDFG 2002). Although the exact figure is unknown, CDFW has concluded that approximately 100,000 hunters buy hunting licenses solely for the purpose of hunting resident game birds. In 2004, this number of licenses generated about \$3.77 million in revenue for CDFW (\$31.25 license + \$6.50 upland game bird stamp x 100,000) (CDFG 2004b).

# 5.7.5.4 Alternative D

The benefits to the economy and employment would be slightly less under Alternative D than those described for Alternative C based on the smaller scale of the Refuge hunting program proposed under Alternative D.

# 5.7.5.5 Modified Alternative D

<u>The benefits to the economy and employment would be slightly less under modified Alternative D</u> than those described for Alternative C based on the smaller scale of the Refuge hunting program proposed under modified Alternative D.

# 5.7.6 Effects to Environmental Justice

# 5.7.6.1 Alternatives A, B, C, D, and Modified Alternative D

The goal of environmental justice in the United States is to afford the same degree of protection from environmental and health hazards to all individuals and communities throughout the nation. Environmental justice is defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

The mission of the Service is working with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people. The environmental justice strategy of the Service extends this mission by seeking to ensure that all segments of the human population have equal access to America's fish and wildlife resources, as well as equal access to information that will enable them to participate meaningfully in activities and policy shaping.

The Refuge occurs at the urban interface with rural development to the north and east and urban development to the south and west. Both the communities of Spring Valley and El Cajon support larger populations of lower income households than the other communities in the immediate vicinity of the Refuge. The programs and public uses proposed on the Refuge under any of the alternatives would be equally accessible to all visitors. All of the designated access points onto the Refuge under any alternative would occur from other public lands or public rights-of-way. Access is not permitted via private properties or gated communities, to avoid providing some members of the community with access that would not be available to all. Within the spirit and intent of Executive Order 12898, no minority or low-income populations would be impacted by any Service action proposed in this CCP, and equal access to Refuge resources or Refuge programs under any alternative would be afforded to all visitors.

# 5.8 Unavoidable Adverse Impacts

All actions that take place within the natural environment are likely to result in some unavoidable adverse impacts. As described in the proceeding sections, even species monitoring can result in short term impacts that are unavoidable. Within each of the management alternatives for the San Diego NWR, measures are proposed to minimize to the extent practical any adverse impacts to the environment. Appropriate mitigation measures (e.g., BMPs, seasonal restrictions, buffers, fencing, use restrictions) would be incorporated into the scope of future construction projects and refuge programs and monitoring of the Refuge's resources would be conducted as part of any proposed management action to enable Refuge staff to identify and analyze management results and adapt management policies should any unforeseen problems arise.

# 5.9 Irreversible and Irretrievable Commitments of Resources

Most management actions identified in this document would require a commitment of funds that would then be unavailable for use on other Service projects. At some point, commitment of funds to these projects would be irreversible, and once used, these funds would be irretrievable. Nonrenewable or non-recyclable resources committed to projects identified in the CCP would also represent irreversible and irretrievable commitments of resources, such as fuel for Refuge vehicles and construction equipment; electricity for office and maintenance operations; supplies used in management or maintenance activities (e.g., herbicide, fencing, building material, signs); and construction materials needed for new facilities, trails, and parking areas.

# 5.10 Short-term Uses versus Long-term Productivity

An important goal of the System is to maintain the long-term ecological productivity and integrity of the biological resources on refuges. This system-wide goal is the foundation for the goals presented in the CCP. The implementation of Alternative D, the proposed action, would include increased management of wildlife and habitats and development of visitor service activities and facilities. The resulting long-term productivity would include increased protection and survival of listed and MSCP-covered species, as well as a myriad of other native plant and animal species. The public would also gain through long-term opportunities for wildlife-dependent recreational activities.

# 5.11 Cumulative Effects

Cumulative effects (impacts) are those effects on the environment resulting from incremental consequences of the Service's proposed actions when added to other past, present, and reasonably foreseeable future actions, regardless of who undertakes these actions. Cumulative effects can be the result of individually minor impacts, which can become significant when added over time.

Accurately summarizing cumulative effects is difficult in that while one action increases or improves a resource in an area, other unrelated actions may decrease or degrade that resource in another area. As stated in the Service Manual (550 FW 1), in an EA, a cumulative impact assessment should be conducted if it is determined necessary through scoping to make a determination of significance of the proposed action. When a cumulative effects analysis is included in an EA, the analysis need only be sufficient for the decision maker to reach a conclusion on the significance of the impact in order to determine if the preparation of an EIS is required.

In conducting the analysis of cumulative effects, the interaction of activities on the San Diego NWR with other actions occurring over a larger spatial reference and a temporal reference of about 15 years (the intended life of the CCP) has been considered. The cumulative impact analysis prepared for the County of San Diego General Plan Update (County of San Diego 2011) was used as the basis of this analysis, as it includes consideration of recently approved, currently proposed, and reasonably foreseeable future projects within the region. This cumulative effects analysis focuses on the physical environment, wildlife and habitat, the effects of upland game and bird hunting, cultural resources, and social and economic resources.

# 5.11.1 Cumulative Effects to the Physical Environment

The projects considered in the county's cumulative effects analysis range from new development and redevelopment to habitat restoration and conservation. The development and redevelopment projects would result in modifications to existing community character and visual quality within the area immediately surrounding the different project sites. The projects within the San Diego region therefore have the potential to result in a cumulative impact to visual quality if, in combination, they would:

- result in the obstruction, interruption, or detraction from a scenic vista;
- result in the removal or substantial adverse change of one or more features that contribute to the valued visual character or image of a neighborhood, community, State scenic highway, or localized area; and/or
- substantially degrade the existing visual character or quality of the site and its surroundings by introducing features that would detract from or contrast with the existing visual character and/or quality of a neighborhood, community, or localized area.

All of these impacts can be mitigated to below a level of significance through adherence to General Plan policies and proposed mitigation measures. Such measures include the integration of natural features into project design; providing contiguous open space areas that protect wildlife habitat and corridors, preserving scenic vistas, and connecting existing or planned recreational opportunities; implementing projects that conform to the natural topography; respecting and conserving unique natural features; avoiding sensitive or intact environmental resources and hazard; protecting scenic resources; and siting and designing projects to minimize visual impacts and preserve unique or special visual features.

Construction and management projects proposed for the Refuge under any of the action alternatives would also implement the intent of these policies, along with measures to minimize adverse effects to the existing visual quality of the area, particularly those areas of the Refuge visible from the public right-of-way. Therefore, the CCP would not contribute cumulatively to any significant adverse effects related to community character or visual quality.

Projects located in the San Diego region would have the potential to result in a cumulative impact to air quality plans if, in combination, they would conflict with or obstruct implementation of regional air quality standards. However, projects, such as those addressed in the various alternatives presented in the draft CCP for the San Diego NWR, that are consistent with regional planning documents (on which the regional air quality standards are based), would not conflict with or obstruct the implementation of regional air quality standards. Therefore, no cumulative effects related to the implementation of regional air quality standards are anticipated as a result of the implementing the San Diego NWR CCP under any of the proposed alternatives. The County of San Diego (2011), in the General Plan Update EIR, identified significant, unavoidable cumulative impacts associated with nonattainment criteria pollutants (i.e.,  $O_3$ ,  $PM_{10}$ ,  $PM_{2.5}$ ). Although the implementation of any of the alternatives presented in the draft CCP would result in a slight increase in vehicle emissions and the potential for temporary impacts related to particulate emissions during construction projects, the overall contribution to the region would be nominal and would therefore not contribute cumulatively to significant air quality impacts.

With respect to water quality, cumulative projects would result in multiple developments that would potentially alter existing drainage patterns in a manner that would result in substantial erosion or siltation. This increase has the potential to result in a significant cumulative erosion and siltation impact. Implementing any of the alternatives presented in the draft the CCP, including the proposal to control of feral pigs, as presented in Alternative D, would involve some disturbance of native soils that could result in temporary increases in turbidity in adjacent waterways. However, through the implementation of best management practices, these temporary impacts would be expected to be minimal. Where projects involve habitat restoration, there could be long-term incremental benefits to downstream water quality due to the natural filtering process provided by native vegetation. If feral pigs become established on the Refuge, this population would create impacts to water quality that would contribute to the cumulative adverse effects pigs are currently on having on regional water quality.

Urbanization and growth within the San Diego region, as well as the conservation of lands to protect sensitive resources, have the potential to result in land uses that are incompatible with mining and resource recovery and therefore result in a cumulative loss of available resources. When incompatible uses are established within the region in areas that support mineral resources such as aggregate material, there is a reasonably foreseeable loss of mineral resources, representing a cumulative impact related to mineral resource availability.

Within the exception of potential future acquisitions within the Refuge acquisition boundary, the projects and management actions described in the action alternatives would have no effect on existing or future sand, gravel, and rock mining operations outside the Refuge. The 33 acres of Refuge land that are designated as MRZ-2 are located immediately upstream of the Sweetwater Reservoir, making it unlikely that these deposits would be available for mining, even if they were not located within the Refuge. In addition, some of the lands not yet acquired within the Refuge acquisition boundary are classified as MRZ-3. These lands represent less than three percent of the total area within the county that are classified as MRZ-3. Therefore, the management of the Refuge's existing lands and the potential for future acquisitions within the Refuge acquisition boundary would not represent a significant cumulative impact related to mineral resource availability.

# 5.11.2 Cumulative Effects to Biological Resources

The projects identified in the General Plan Update have the potential to result in impacts to special status plant and wildlife species and their habitat, direct and indirect loss or degradation of riparian habitat and other sensitive natural communities, and loss or disruption of wildlife movement corridors and nursery sites. The purpose of the San Diego NWR is to conserve listed and sensitive species and their habitats, and all of the actions and uses proposed on the Refuge must be compatible with this purpose. Therefore, the implementation of any of the alternatives described in the draft CCP would not contribute to regionally significant cumulative impacts to biological resources.

Although hunting has not occurred on the Refuge since it was established, hunting has traditionally occurred in California on private lands, State-owned conservation properties, and

federally owned public lands located near the Refuge. Within the State, there is a long history of hunters investing significant resources into the betterment of many of California's habitats. The interest generated by these programs has resulted in the formation of numerous local sportsmen's organizations dedicated to the protection and improvement of wildlife habitat. Moreover, organizations, such as Ducks Unlimited, California Waterfowl Association, National Wild Turkey Federation, Quail Unlimited, Pheasants Forever, and California Deer Association, invest resources to benefit many types of wildlife.

Wildlife populations are currently hunted on both private and public lands in San Diego County. Public lands open to various forms of hunting include Barrett Reservoir, portions of the Cleveland National Forest, BLM properties in McCain Valley and the Border Mountains of western San Diego County, and CDFW lands at Hollenbeck Canyon Wildlife Area, San Felipe Valley Wildlife Area, Boden Canyon Ecological Reserve, Otay Mountain Ecological Reserve, Rancho Jamul Ecological Reserve, and Walker Canyon Ecological Reserve. Hunting is a highly regulated activity and generally takes place at specific times and seasons (e.g., dawn, fall, and winter) when the game animal is less vulnerable (e.g., non-breeding season).

Alternatives C and D both include proposals to open portions of the San Diego NWR to hunting in accordance with refuge-specific regulations. The areas proposed for hunting on the Refuge under either alternative represent only a portion of the lands preserved within the Refuge to protect wildlife. Those portions of the Refuge that would not be available for hunting include high-quality habitat with a diversity of vegetation types providing wildlife with breeding habitat; escape cover that offers safety from predators, including humans; shelter from weather-related elements; resting areas; and water. Although hunting directly affects individual animals, the amount of harvest would not be expected to have a measurable effect on Refuge wildlife population levels. In addition, hunting is monitored, regulated, and designed to ensure that harvest does not reduce populations to unsustainable levels. Moreover, the amount of hunting on the Refuge would not be expected to increase significantly in the future.

In California, 38 Refuges provide more than 471,526 acres of habitat for wildlife. Fourteen refuges are closed to the public, 18 refuges currently allow waterfowl hunting, nine allow pheasant hunting, and Clear Lake Refuge allows pronghorn hunting. Sacramento River Refuge is the only refuge in California that currently allows deer, quail, turkey, and dove hunting opportunities, in addition to waterfowl and pheasant hunting. Hunting on the San Diego NWR would have little, if any, effect on wildlife species within California. Opening the Refuge to hunting would benefit hunters in California, although it would be a relatively small benefit considering the limited area of the Refuge that could be opened for hunting (i.e., 860 acres on three areas of the Refuge under Alternative C, 160 acres in one area under Alternative D). The number of hunters expected on the San Diego NWR would be low due to the limited area allocated for hunting, and number of hunters on the Refuge would be controlled through a reservation system. The number of hunters present on the Refuge is expected to remain relatively stable over the life of the CCP. In addition, hunting would be monitored, regulated, and designed to ensure that harvest does not reduce populations to unsustainable levels. Hunters would be required to report harvest on the kill record portion of their registration permit. Field checks by Refuge law enforcement officers would be planned, conducted, and coordinated with staff and other agencies to maintain compliance with regulations. A step-down hunting plan would be prepared and provided for public review and comment upon approval of the CCP. The plan would describe management actions and address the need for changes to the hunt program if negative impacts are observed on the Refuge during monitoring.

Based on the analysis presented earlier in this chapter, the Service has concluded that there would be no significant cumulative impacts on the region's wildlife populations, either hunted or nonhunted species, as a result of implementing any of the alternatives presented in the draft CCP. Although mortality would occur to some wildlife under the Refuge's hunt program, the analysis presented previously supports the conclusion that there would be no adverse population level impacts to hunted or non-hunted wildlife species, even when added to other hunt programs regionally or nationally. The Service has also concluded that the proposed action would not cumulatively impact the Refuge environment or programs. This determination was based upon a careful analysis of potential environmental impacts of hunting on the Refuge together with other projects and/or actions. Some wildlife disturbance would occur during the hunting seasons. Proper zoning and regulations will be designated during the development of the step-down hunting plan to minimize the potential for negative impacts to all wildlife populations using the Refuge, including listed and sensitive species, as well as species to be hunted.

All alternatives would provide long-term benefits for native wildlife species and habitats within the area. The protection of wildlife habitats within the Refuge represents a benefit to the long-term conservation of threatened and endangered species and other native wildlife species. Alternatives B and C would provide greater benefits than would Alternative A due to the increased amount of habitat restoration that would take place. However, the benefits derived from Alternatives B, C, and D would restore and protect only a fraction of the habitat that has been lost in the region. The proposal to monitor for and control feral pigs that is included in Alternative D would provide additional benefits, should pigs expand their range onto Refuge lands.

Feral pig activity is expected to contribute to the impacts caused by other non-native plant and animal species, along with trampling and disturbance from recreational uses and unauthorized motorized use, to biological resources on conserved lands in the San Diego region. Implementing feral pig monitoring and eradication on the Refuge, as proposed under Alternative D, would contribute to the reduction or elimination of feral pigs as a stressor to native vegetation and wildlife.

# 5.11.3 Cumulative Effects to Cultural Resources

Adherence to the policies and regulations pertaining to the protection of cultural resources would avoid or mitigate any significant adverse effects as a result of implementing the projects defined by the County General Plan Update; therefore, significant cumulative impacts to cultural resources are not anticipated. The projects proposed on the Refuge under any of the alternatives would also be implemented consistent with all Federal regulations and policies; therefore, these projects would not result in any cumulatively significant adverse effects to cultural resources.

Feral pig activity has resulted in damage to cultural resources in the region, therefore, not implementing a pig control plan on the Refuge, should a pig population become established, could increase the potential for cumulative adverse effects to cultural resources from pig foraging activities.

# 5.11.4 Cumulative Effects to the Social and Economic Environment

The implementation of any of the alternatives presented in the draft CCP would not result in any significant adverse effects related to land use; therefore, no significant cumulative land use effects are anticipated.

The projects described in the county's Updated General Plan, would have a potentially significant impact to unincorporated county traffic and LOS standards; adjacent cities traffic and LOS standards; transportation hazards; emergency access; parking capacity; and alternative transportation. Some measures have been identified to reduce these effects; however, these

measures do not adequately reduce the cumulative effects of the projects to below a level of significance. The proposals included within the CCP under any of the action alternatives would result in minor increases in trips to and from the Refuge; however, from a regional prospective, the number of trips to be generated is nominal. Effects to specific intersections would be mitigated to below a level of significance through various traffic improvements during project construction. Therefore, the CCP would not contribute to significant adverse effects related to traffic.

The projects described in the General Plan Update would result in potentially significant cumulative impacts related to adequate water supply, sufficient landfill capacity, and energy. Although the implementation of the CCP under any of the action alternatives would result in slight increases in the amount of water and energy used and waste accumulated, the increase would be nominal and would not represent a measurable increase as compared to the region as a whole, therefore, the implementation of the CCP would not represent a significant cumulative effect with respect to water and energy availability and landfill capacity.

None of the action alternatives described in the CCP would have an effect on issues related to environmental justice; therefore, the implementation of the CCP would not contribute to any impacts related to environmental justice that may result from other projects in the immediate vicinity of the Refuge or the San Diego region.

# 5.12 Selected Action

Following a comprehensive review and analysis of the four management alternatives evaluated for San Diego NWR, as presented in the draft CCP/EA (USFWS 2014), and considering all public comments and our responses to them, the Service has determined that the analysis in the EA is sufficient to support selection of a modified Alternative D for implementation. The proposed modifications include removal of the proposal for a vernal pool interpretive trail on the Refuge, and removal of the parking lot/trail staging area and associated trail access route proposed off Sloane Canyon Road in the vicinity of Model A Ford Lane. In addition, a trail would be constructed on Lot 707, but it will not be developed as an interpretive trail. A designated trail system, which takes into consideration that comments received during the public comment period, has been included in the Final CCP, therefore, completion of a step-down trail plan will not be necessary; however, some areas of the Refuge will require future trail planning once legal access to specific areas has been acquired. Finally, additional strategies have been added to Chapter 3 (Refuge Management) of the Final CCP in response to public comments. These strategies address wildlife and habitat management, cultural resource protection, and protection of water quality.

# 5.13 Summary of Effects

Provided in Table 5-5 is A summary of the potential effects associated with each of the alternatives evaluated for the San Diego NWR is presented below.

## 5.13.1 Physical Environment

#### Topography

<u>Alternative A</u> - Proposed actions would involve minimal changes to the existing landform; therefore, no adverse effects to the Refuge's topographic character are anticipated.

<u>Alternative B</u> - Wildlife and habitat management proposals would have no effect on the existing landform. Several public use projects (e.g., parking lots, kiosk installations, visitor contact station) are proposed that would involve grading and other site preparation activities, however, the majority of these project sites are relatively level requiring little change to the existing landform. Development of a sustainable trail system and closure of existing pathways that <u>currently</u> follow the fall line would reduce existing and minimize the potential for future impacts to the natural landform. The parking lot off Sloane Canyon Road would alter the existing topography to achieve a flat pad.

<u>Alternative C</u> - Although some additional trails and the construction of a refuge office in the Sweetwater River management area are proposed under Alternative C, these projects and public use proposals would have impacts similar to those described under Alternative B. Sustainable trail practices would be followed in the construction of any new trails.

<u>Alternative D</u> - Similar to Alternative C.

Modified Alternative D - Similar to Alternative C.

## Visual Quality

<u>Alternative A</u> - Removing of invasive plants can change the appearance of an area, particularly wetland areas, until the native vegetation is restored. These actions, although resulting in minor temporary changes to the visual appearance of the site, would no longer be apparent once the native vegetation is restored. Removal of trash and other debris from Refuge lands improves the visual quality of the area. No actions occur on the Refuge that would block public views.

<u>Alternative B</u> - Invasive plant control would be expanded, but the effects of these actions to visual quality would continue to be temporary and minor. Revegetating unwanted trails would reduce the overall appearance of disturbed pathways throughout the Refuge. Parking lots, visitor contact stations, information kiosks, and interpretive signs would be sited and designed to protect views into the natural areas of the Refuge from adjacent public areas. Measures are proposed to minimize the visibility of Refuge facilities from adjacent areas.

<u>Alternative C</u> - Same as Alternative B.

<u>Alternative D</u> - Similar to Alternative B. In addition, feral pig control would provide potential benefits by minimizing impacts associated with pig rooting and conservation measures would be implemented to minimize visual impacts along trails related to the temporary construction of corral traps used in pig control.

#### <u>Modified Alternative D</u> - <u>Similar to Alternative D</u>.

#### Geology, Soils, and Geological Hazards

<u>Alternative A</u> - Wildlife and habitat management activities would not result in adverse effects to geology or soils. None of the management activities proposed under Alternative A would trigger or accelerate substantial slope instability, subsidence, or ground failure. Erosion associated with water flow down user-created fall line trails would continue until the subject trails are closed and/or rehabilitated. BMPs are implemented for all projects that involve grading or ground disturbance. Some areas on the Refuge are subject to rock fall hazards.

<u>Alternative B</u> - No adverse effects related to geology and soils would result for the expanded wildlife and habitat management activities. The construction of the proposed public use facilities could result in increased erosion during construction. To minimize the potential for such impacts, the implementation of site specific BMPs are proposed. Construction projects of an acre or more in size would be required to implement conditions outlined in a SWPPP.

Periodic monitoring of potential rock fall areas would occur and susceptible areas would be subject to closure to avoid impacts to trail users.

Alternative C - Same as Alternative B.

<u>Alternative D</u> - Similar to Alternative B. In addition, feral pig control would provide potential benefits by minimizing impacts to soils associated with pig rooting, while conservation measures would be implemented to minimize erosion impacts associated with the construction of temporary corral traps used in pig control.

Modified Alternative D - Similar to Alternative D.

#### Paleontological Resources

<u>Alternative A</u> - No adverse effects to paleontological resources are anticipated. Prohibitions on collecting paleontological resources would be enforced.

<u>Alternative B</u> - Although there is the potential for paleontological resources to be present within the Sweetwater River and San Miguel Mountain areas of the Otay-Sweetwater Unit and within the Del Mar Mesa Vernal Pool Unit, no significant excavation is proposed in these areas. Prohibitions on collecting would be enforced.

<u>Alternative C</u> - Same as Alternative B.

<u>Alternative D</u> - Same as Alternative B.

Modified Alternative D - Same as Alternative B.

#### Mineral Resources

<u>Alternative A</u> - Aggregate resources are present or are likely to be present within portions of the Otay-Sweetwater Unit. These resources would not be available for extraction due to the presence of listed species. No actions are proposed that would result in the irrevocable loss of these resources.

Alternative B - Same as Alternative A.

<u>Alternative C</u> - Same as Alternative A.

<u>Alternative D</u> - Same as Alternative A.

Modified Alternative D - Same as Alternative A.

#### Agricultural Resources

<u>Alternative A</u> - Some portions of the Refuge are designated as Farmland of Local Importance, these areas are relatively small and have no access to waterlines or well water.

<u>Alternative B</u> - No actions are proposed that would result in the irrevocable loss of Farmland of Local Importance.

<u>Alternative C</u> - Same as Alternative B.

<u>Alternative D</u> - Same as Alternative B.

<u>Modified Alternative D</u> - <u>Same as Alternative B</u>.

#### **Hydrology**

<u>Alternative A</u> - The management activities occurring on the Refuge have limited effect on the natural flows within the Sweetwater River, Steele Canyon Creek, and other drainages on the Refuge. In addition, these activities have little influence over natural stormwater flow and velocities.

<u>Alternative B</u> - To ensure that bridges and other public facility structures do no impact water flows, particularly during flood events, the siting, structural design, and elevation of a proposed structure would take into consideration the hydrology and flood flow elevation of the affected stream or river. New parking areas would be designed to avoid any obstructions to both seasonal low flow volumes and higher stormwater flows.

<u>Alternative C</u> - Same as Alternative B.

<u>Alternative D</u> - Same as Alternative B.

Modified Alternative D - Same as Alternative B.

#### Water Quality

<u>Alternative A</u> - BMPs are implemented to reduce the potential for pollutants and excessive siltation to enter wetlands and storm drains. All pesticide use is approved via the Service's PUPS to ensure that only those products that pose the lowest toxicity-related threat to non-target species are applied.

<u>Alternative B</u> - BMPs for pesticide use would be implemented per the IPM Plan. In addition, a variety of BMPs would be implemented during grading for various public use facilities including trails, parking lots, and buildings. For projects involving an acre or more of land, short and long-term BMPs and monitoring during construction would be required under a Water Board approved SWPPP.

<u>Alternative C</u> - Same as Alternative B

<u>Alternative D</u> - Similar to Alternative B. In addition, feral pig control would provide potential benefits associated with protecting water quality and minimizing erosion should feral pigs expand their range and enter the Refuge.

Modified Alternative D - Same as Alternative D.

#### **Climate Change**

<u>Alternative A</u> - The actual effects to Refuge resources as a result climate change are difficult to predict. Under Alternative A, management would continue as currently implemented.

<u>Alternative B</u> - Future management actions, as proposed in Alternative B, would attempt to measure and address the effects of climate change on Refuge resources through monitoring and adaptive management.

<u>Alternative C</u> - Same as Alternative B.

<u>Alternative D</u> - Same as Alternative B.

Modified Alternative D - Same as Alternative B.

#### Air Quality

<u>Alternative A</u> - Proper maintenance of vehicles, minimizing the generation of fugitive dust during refuge operations, and implementing BMPs when applying herbicides reduces the effects of Refuge operations on air quality to below a level of significance.

<u>Alternative B</u> - Incorporation of BMPs to reduce emissions and fugitive dust during grading and construction of public use facilities would minimize air quality impacts. In addition, BMPs to reduce the effects of herbicide application on air quality would be implemented per the requirements of the IPM Plan and Chemical Profiles.

<u>Alternative C</u> - Same as Alternative B.

<u>Alternative D</u> - Same as Alternative B.

<u>Modified Alternative D</u> - <u>Same as Alternative B.</u>

#### **Greenhouse Gas Emissions**

<u>Alternative A</u> - GHG emissions associated with Refuge management and operations would not represent a significant direct or indirect impact on the environment.

<u>Alternative B</u> - Same as Alternative A.

<u>Alternative C</u> - Same as Alternative A.

<u>Alternative D</u> - Same as Alternative A.

<u>Modified Alternative D</u> - <u>Same as Alternative A</u>.

#### **Contaminants**

<u>Alternative A</u> - Refuge staff would continue to work with the Service's Contaminants Program to evaluate potential sources of contaminants.

<u>Alternative B</u> - Same as Alternative A.

<u>Alternative C</u> - Same as Alternative A.

<u>Alternative D</u> - Same as Alternative A.

<u>Modified Alternative D</u> - <u>Same as Alternative A</u>.

#### Habitat/Vegetation Resources

<u>Alternative A</u> - Current wildlife and habitat management activities have the potential to produce temporary impacts to native habitat due to trampling or minor vegetation clearing. These impacts, which are limited in scope, would not be considered significant. The primary impacts to the Refuge's native vegetation are from public use (e.g., the expanding user-created trail system, off-trail activities), which result in the loss or trampling of vegetation (particularly shrub species), soil compaction, and general degradation of habitat quality.

<u>Alternative B</u> - A number of restoration and enhancement proposals are included under this alternative that would improve overall habitat quality. The implementation of an IPM Plan would ensure that no adverse effects to vegetation would occur as a result of the use of approved herbicides. The establishment of a designated trail system and the closure of those trails that impact sensitive habitat areas would better protect existing native vegetation and habitat quality.

<u>Alternative C</u> - Same as Alternative B.

<u>Alternative D</u> - Similar to Alternative B. In addition, feral pig control would provide potential benefits by minimizing the extent of damage to vegetation and habitat quality that could occur if pigs move onto Refuge lands. Conservation measures would be implemented as part of the feral pig control plan to minimize impacts to vegetation.

<u>Modified Alternative D - Similar to Alternative B, but under this alternative, no access to</u> vernal pool habitat is proposed, which would provide added protection to this sensitive habitat. <u>In addition, impacts to habitat and sensitive vegetation near Sloane Canyon Road would be</u> avoided by eliminating the need for grading in this area.

#### <u>Wildlife</u>

<u>Alternative A</u> - Measures to minimize disturbance to wildlife such as timing activities to avoid the bird breeding season and avoiding potential butterfly habitat at appropriate seasons would minimize impacts to wildlife from Refuge management activities. Unauthorized off trail activity and the presence of dogs on the Refuge can result in deleterious effects to wildlife.

<u>Alternative B</u> - Actions to benefit wildlife would be expanded and the measures to avoid impacts from management activities would continue to be implemented. A designated trail system would direct activities away from sensitive habitat areas in an effort to reduce impacts related to disturbance. Dogs would be prohibited on the Refuge. Public use facilities would be

sited to minimize the loss of sensitive habitat and buffers would be provided between sensitive habitats and public use areas.

<u>Alternative C</u> - The potential effects to wildlife would be similar to Alternative B with two exceptions: leashed dogs would be permitted on designated trails and hunting would be permitted in portions of the Refuge. Hunting would result in some direct and indirect adverse effects to hunted species as well as other wildlife. To minimize the effects of hunting and other public uses on the Refuge, large areas of habitat outside of the proposed hunt areas that support listed and sensitive species would be closed to all public access.

<u>Alternative D</u> - Similar to Alternative C, but under Alternative D, a smaller hunting area (a portion of the Otay Mesa and Lakes area) is proposed and leashed dogs would only be permitted on trails designated for multiple use. Feral pig control would provide potential benefits by minimizing conflicts between native wildlife and feral pigs should they move onto the Refuge. Conservation measures would be implemented to minimize impacts to wildlife due to pig control.

#### Modified Alternative D - Same as Alternative D.

#### Federal and State Listed Species and other Species of Concern

<u>Alternative A</u> - Impacts to listed and sensitive species would be similar to the impacts described under Alternative A for vegetation and wildlife.

<u>Alternative B</u> - Impacts to listed and sensitive species would be similar to the impacts described under Alternative B for vegetation and wildlife.

<u>Alternative C</u> - Impacts to listed and sensitive species would be similar to the impacts described under Alternative C for vegetation and wildlife.

<u>Alternative D</u> - Impacts to listed and sensitive species would be similar to the impacts described under Alternative D for vegetation and wildlife.

<u>Modified Alternative D</u> - <u>The potential for adverse effects would be reduced from those</u> described under Alternative B, C, and D.

#### Historical and Archaeological Resources

<u>Alternative A</u> - Adherence to existing regulations/policies would minimize the potential for impacts to cultural resources.

<u>Alternative B</u> - Same as Alternative A.

<u>Alternative C</u> - Same as Alternative A.

<u>Alternative D</u> - Same as Alternative A.

Modified Alternative D - Same as Alternative A.

#### **Recreational Opportunities**

<u>Alternative A</u> - Wildlife-dependent recreational uses would be provided. The County's Sweetwater River Regional Trail would be accommodated, and Refuge proposals would not conflict with other recreational opportunities.

<u>Alternative B</u> - Same as Alternative A.

<u>Alternative C</u> - Same as Alternative A.

<u>Alternative D</u> - <u>Same as Alternative A</u>.

Modified Alternative D - Same as Alternative A.

#### Land Use

<u>Alternative A</u> - Uses and activities occurring on the Refuge do not result in any adverse effects to adjacent development and the Refuge is managed consistent with the San Diego MSCP.

<u>Alternative B</u> - Expansion of wildlife and habitat management activities and expanded opportunities for wildlife dependent recreational use would have no effect on existing or planned land uses in the vicinity of the Refuge.

<u>Alternative C</u> - Similar in most ways to Alternative B, but under Alternative C, portions of the Refuge would be opened to hunting in accordance with a Refuge hunt plan that would be developed after the CCP is approved. Designated hunting areas would provide separation from adjacent private property and residential use and hunt days and species to be taken would vary by location.

<u>Alternative D</u> - Similar to Alternative C, but only a portion of the Otay Mesa and Lakes area would be opened to hunting. No land use issues are anticipated as the lands surrounding the hunt area are publicly owned and hunting is currently permitted on the adjoining BLM and CDFW properties.

<u>Modified Alternative D</u> - <u>The potential for adverse effects would be reduced from those</u> described under Alternative B, C, and D.

#### **Traffic Circulation and Parking**

<u>Alternative A</u> - No impacts to the regional transportation system are anticipated. Opportunities for parking on the Refuge to access existing trails are currently limited.

<u>Alternative B</u> - Additional parking areas are proposed to accommodate trail users, however, the small parking area proposed near Model A Ford Lane in the McGinty Mountain area could result in traffic safety impacts and unsafe parking along the roadway.

<u>Alternative C</u> - Same as Alternative B.

<u>Alternative D</u> - Same as Alternative B.

<u>Modified Alternative D</u> - <u>The potential for adverse effects would be reduced from those</u> described under Alternative B, C, and D.
### **Public Utilities and Easements**

<u>Alternative A</u> - No adverse effects to public utilities and easements are anticipated.

<u>Alternative B</u> - Same as Alternative A.

<u>Alternative C</u> - Same as Alternative A.

<u>Alternative D</u> - Same as Alternative A.

<u>Modified Alternative D</u> - <u>Same as Alternative A</u>.

### **Economics and Employment**

<u>Alternative A</u> - The Refuge provides minor economic benefits related to visitation.

<u>Alternative B</u> - Same as Alternative A.

<u>Alternative C</u> - The proposed hunting program would provide additional economic benefit to the region.

<u>Alternative D</u> - The economic benefits from hunting would be greater than Alternatives A and B, but less than C.

Modified Alternative D - Same as Alternative D.

### **Environmental Justice**

<u>Alternative A</u> - No disproportionate adverse impacts on minority or low-income residents have been identified.

<u>Alternative B</u> - Same as Alternative A.

<u>Alternative C</u> - Same as Alternative A.

<u>Alternative D</u> - Same as Alternative A.

Modified Alternative D - Same as Alternative A.

# 6 Implementation

The discussion of plan implementation is presented in Chapter 5 (Plan Implementation) of the Final CCP.

Page Intentionally Left Blank

## 7 References Cited

- Ackerly, David D. 2012. Future Climate Scenarios for California: Freezing Isoclines, Novel Climates, and Climatic Resilience of California's Protected Areas. California Energy Commission. Publication number: CEC-500-2012-022.
- AECOM. 2010. City of San Diego Vernal Pool and Quino Habitat Restoration Project Implementation Report. Prepared for the City of San Diego. January.
- Ahlborn, G. 2005. Gray Fox, In Life history accounts for species in the California Wildlife Habitat Relationships (CWHR) System. Originally published in: Zeiner, D. C., W. F. Laudenslayer, Jr., K. E. Mayer, and M. White, eds. 1988-1990. California's Wildlife. Vol. I-III. California Department of Fish and Game, Sacramento, California. Available at <u>http://www.dfg.ca.gov/biogeodata/cwhr/</u>cawildlife.aspx.
- Allen, E. B., P. E. Padgett, A. Bytnerowicz, and R. Minnich. 1998. Nitrogen deposition effects on coastal sage vegetation of southern California. Pages 131–139. *In* Bytnerowicz A., Arbaugh M. J., Schilling S. L., eds. Proceedings of the International Symposium on Air Pollution and Climate Change Effects on Forest Ecosystems, February 5–9, 1996, Riverside, California. Albany (CA): Pacific Southwest Research Station, USDA Forest Service. General Technical Report PSW-GTR-166. (25 April 2011; www.rfl.psw.fs.fed.us/pubs/psw-gtr-164/fulltext/allen/ allen.html#anchor1473574).
- Allen, E. B., A. Sirulnik, L. Egerton-Warburton, S. Kee, A. Bytnerowicz, P. Padgett, P. Temple, M. Fenn, M. Poth and T. Meixner. 2005. Air pollution and vegetation change in California shrublands. Pages 79-96. *In* B. E. Kus and J. L. Beyers, technical coordinators. Planning for Biodiversity: Bringing Research and Management Together. Gen. Tech. Rep. PSW-GTR-195. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.
- American Ornithologists' Union (AOU). 1957. Check-list of North American Birds, 5th ed. American Ornithologists' Union, Baltimore.
- American Ornithologists' Union (AOU). 1983. Checklist of North American Birds, Sixth Edition. American Ornithologists' Union. Allen Press, Lawrence, KS.
- Anderson, B. W. and R. D. Ohmart. 1977. Wildlife use and densities report of birds and mammals in the lower Colorado River Valley. U.S. Bureau of Reclamation, Lower Colorado Region, Boulder City, NV.
- Anderson, J., F. Chung, M. Anderson, L. Brekke, D. Easton, M. Ejeta, R. Peterson, and R. Snyder. 2008. "Progress on Incorporating Climate Change into Management of California's Water Resources," *In Climatic Change*, Springer, Netherlands, Volume 89, Supplement 1, March 2008. Published online 12-22-2007. ISSN: 0165-0009 (Print) 1573-1480 (Online).
- Antos, M. J., G. C. Ehmke, and C. L. Tzaros. 2007. Unauthorized human use of an urban coastal wetland sanctuary: Current and future patterns. Landscape and Urban Planning 80(1-2):173-183.

- Atkinson, A. J., P. C. Trenham, R. N. Fisher, S. A. Hathaway, B. S. Johnson, S. G. Torres, and Y. C. Moore. 2004. Designing Monitoring Programs in an Adaptive Management Context for Regional Multiple Species Conservation Plans. U.S. Geological Survey Technical Report. USGS Western Ecological Research Center, Sacramento, California.
- Atwill, E. R., R. A. Sweitzer, M. Pereira, I. Gardner, D. Van Vuran, and W. Boyce. 1997. Prevalence of and associated risk factors for shedding *Cryptosporidium parvum* and *Giardia* Cysts within feral pig populations in California. Applied and Environmental Microbiology 63:3946-3949.
- Atwill, E. R., L. Hou, B. M. Karle, T. Harter, K. W. Tate, and R. A. Dahlgren. 2002. Transport of *Cryptosporidium parvum* Oocysts through Vegetated Buffer Strips and Estimated Filtration Efficiency. Applied and Environmental Microbiology 68(11):5517.
- Atwood, J. 1980. The United States distribution of the California black-tailed gnatcatcher. Western Birds 11:65-78.
- Atwood, J. 1990. Status review of the California gnatcatcher (*Polioptila californica*). Unpublished technical report, Manomet Bird Observatory, Manomet, Massachusetts.
- Atwood, J. 1991. Subspecies limits and geographic patterns of morphological variation in California gnatcatchers (*Polioptila californica*). Bulletin of the Southern California Academy of Sciences 90:118-133.
- Atwood, J. 1993. California gnatcatchers and coastal sage scrub: the biological basis for endangered species listing. Pages 149-169. *In* J. E. Keeley (ed.) Interface between ecology and land development in California. Southern California Academy of Science, Los Angeles.
- Atwood, J. and J. S. Bolsinger. 1992. Elevational distribution of California Gnatcatchers in the United States. Journal of Field Ornithology 63:159-168.
- Atwood, J. L. and D. R. Bontrager. 2001. California Gnatcatcher (*Polioptila californica*). Number 574. In A. Poole and F. Gill, editors. The Birds of North America. Philadelphia, Pennsylvania.
- Atwood, J., S. H. Tsai, C. A. Reynolds, J. C. Luttrell, and M. R. Fugagli. 1998. Factors affecting estimates of California gnatcatcher territory size. Western Birds 29:269-279.
- Axelsson E., P. Nyström, J. Sidenmark, and C. Brönmark. 1997. Crayfish predation on amphibian eggs and larvae. Amphibia-Reptilia 18:217-228.
- Bailey, E. and P. Mock. 1998. Dispersal capability of the California gnatcatcher: A landscape analysis of distribution data. Western Birds 29:351-360.
- Banks, Peter B., and Jessica V. Bryant. 2007. Four-legged friend or foe? Dog-walking displaces native birds from natural areas. Biology Letters doi: 10.1 098/rsb1.2007.0374. Published online.
- Barbour, E. and L. M. Kueppers. 2012. Conservation and Management of Ecological Systems in a Changing California. Climate Change 111:135-163.

- Barlow, J. C. 1962. Natural History of Bell's Vireo, *Vireo bellii* Audubon. University of Kansas Publication 12:241-296.
- Barratt, D. G. 1997. Home range size, habitat utilization and movement patterns of suburban and farm cats *Felis catus*. Ecography 20: 271-280.
- Barrows, C. W. and M. L. Murphy-Mariscal. 2012. Modeling impacts of climate change on Joshua trees at their southern boundary: How scale impacts predictions. Biological Conservation 152:29-36.
- Bartelt, G. A. 1987. Effects of disturbance and hunting on the behavior of Canada goose family groups in east central Wisconsin. Journal of Wildlife Management 51:517-522.
- Barto, W. 1999. Predicting potential habitat for the arroyo toad (*Bufo microscaphus californicus*) in San Diego County, using a habitat suitability model and digital terrain data. Master's Thesis.
- Bauder, E. T. 1986. San Diego Vernal Pools, Recent and Projected Losses, Their Condition, and Threats to Their Existence 1979-1980. Prepared for the California Department of Fish and Game, Endangered Plant Project, Sacramento. U.S. Fish and Wildlife Service, EP 85 II-1.
- Bauder, E. T. 2005. The effects of an unpredictable precipitation regime on vernal pool hydrology. Freshwater Biology 50:2129-2135.
- Bauder, E. T., and J. Sakrison. 1997. Autecology of San Diego thornmint (*Acanthomintha ilicifolia*). FG 5637 R5. Department of Fish and Game, Borrego Springs, California, 43 pp.
- Bauder, E. T., and J. Sakrison. 1999. Mechanisms of persistence of San Diego thornmint (Acanthomintha ilicifolia). FG7634R5. California Department of Fish and Game, Borrego Springs, California.
- Bauder, E. T., J. Snapp-Cook, and J. Sakrison. 2002. Ecology and management of *Deinandra* conjugens (D.D. Keck) B.G. Baldwin (Otay tarplant); Final Report. Prepared for California Department of Fish and Game, Region 5, Natural Community Conservation Planning Program, San Diego, California. Contract # FG 8058 HP, February 2002.
- Bauder, E. T. and Scott McMillan. 1998. Current Distribution and Historical Extent of Vernal Pools in Southern California and Northern Baja California, Mexico. Pages 56-70. *In* C. W. Witham, E. T. Bauder, D. Belk, W. R. Ferren Jr., and R. Ornduff (Editors). Ecology, Conservation, and Management of Vernal Pool Ecosystems – Proceedings from a 1996 Conference. California Native Plant Society, Sacramento, CA. 1998.
- Bauder, E. T., S. McMillian, and P. Kemp. 1994. Surveys and assessment of known Acanthomintha ilicifolia populations. CA HER 010394. California Department of Fish and Game, Sacramento, California.
- Beauchamp, R. M. 1986. A flora of San Diego County, California. Sweetwater River Press, National City, California.
- Beauchamp, R. M. and T. Cass. 1979. San Diego regional vernal pool survey. California Department of Fish and Game, Sacramento, CA.

- Beck, P. 1996. The relationship between song repertoire size and breeding ecology in the Least Bell's Vireo (*Vireo bellii pusillus*). Unpublished Master's thesis. San Diego State University, San Diego, California.
- Bent, A. 1960. Life histories of North American flycatchers, larks, swallows and their allies. Dover Press, New York, New York.
- Berryman, Judy and Stan Berryman. 1987. Rancho San Diego Phase III Development Archaeological Test Report Level I Testing: Site Significance. Appendix D, Rancho San Diego EIR, Unpublished report on file at Mooney-Lettieri Associates, San Diego.
- Berryman, Stanley. 1981. Preliminary Archaeological Test Results of Phase II Rancho San Diego. ACT, Unpublished report on file at the South Coastal Information Center, San Diego State University.
- Bevil, Alexander D. 1999. The History of the California China Products Company of National City, California, 1911-1917. The Journal of San Diego History, Fall 1999, Volume 45, Number 4.
- Beyers, J. L. and W. O. Wirtz. 1997. Vegetative characteristics of coastal sage scrub sites used by California gnatcatchers: Implications for management in a fire-prone ecosystem. Pages 81-89. *In* Greenlee, J. M. (ed.), Proceedings: First conference on fire effects on rare and endangered species and habitats, Coeur d'Alene, Idaho, November 1995. International Association of Wildland Fire, Fairfield, Washington.
- Bierbaum, R. M., J. P. Holdren, M. C. MacCracken, R. H. Moss, and P. H. Ravens (eds). 2007. Confronting Climate Change Avoiding the Unmanageable and Managing the Unavoidable. Report prepared for the United Nations Commission on Sustainable Development. Sigma Xi, Research Triangle Park, NC, and the United Nations Foundation, Washington DC.
- Black, C. and P. H. Zedler. 1996. An Overview of 15 Years of Vernal Pool Restoration and Construction Activities in San Diego County, California. Pages 195-205. In C. W. Witham, E. T. Bauder, D. Belk, W. R. Ferren Jr., and R. Ornduff (Editors). Ecology, Conservation, and Management of Vernal Pool Ecosystems – Proceedings from a 1996 Conference. California Native Plant Society, Sacramento, CA. 1998.
- Blyth, B. 1994. Predation by *Gambusia holbrooki* on anuran larvae at the RGC Wetlands Centre, Capel Western Australia. RGC Wetlands Centre Technical Report No. 22, Capel, W.A.
- Bohonak, A. J. 2005. MSCP vernal pool inventory City of San Diego (USFWS) conservation genetics of the endangered fairy shrimp species *Branchinecta sandiegonensis*. August 12, 2005.
- Bontrager, D. R. 1991. Habitat requirements, home range requirements, and breeding biology of the California Gnatcatcher (*Polioptila californica*) in south Orange County, California. Prepared for Santa Margarita Company, Ranch Santa Margarita, CA. April.
- Bossard, C. C., J. M. Randall, and M. C. Hoshovsky, editors. 2000. Invasive Plants of California's Wildlands. University of California Press, Berkeley and Los Angeles, California.

- Bowman, R. H., R. E. Bishop, R. W. Griffin, and M. L. Jones. 1973. Soil Survey, San Diego Area, California, Parts I and II and Accompanying Maps. USDA, Soil Conservation Service.
- Braden, G. T., R. L. McKernan, and S. M. Powell. 1997a. Association of within-territory vegetation characteristics and fitness components of California Gnatcatchers. The Auk 114:601-609.
- Braden, G. T., R. L. McKernan, and S. M. Powell. 1997b. Effects of nest parasitism by the Brownheaded Cowbird on nesting success of the California Gnatcatcher. Condor 99:858-865.
- Bramlet, D. 1993. Plant Species of Special Concern in the Alkaline Sinks of the San Jacinto River and Old Salt Creek Tributary Area. Unpublished.
- Brehme, C. S., C. Rochester, S. A. Hathaway, B. H. Smith, and R. N. Fisher. 2012. Rapid Assessment of the Distribution of American Badgers within Western San Diego County. Data Summary prepared for California Department of Fish and Game.
- Brian F. Smith and Associates. 1992. Results of an Archaeological Survey and Evaluation of Cultural Resources within the Rancho San Miguel Subdivision Project. Unpublished report on file at the South Coastal Information Center, San Diego State University.
- Brian F. Smith and Associates. 1997. Results of an Archaeological Survey and Evaluation of Cultural Resources within the Rancho San Miguel Subdivision (San Miguel Ranch) Project Sectional Planning Area, Chula Vista, CA. Unpublished report on file with USFWS, Reno, NV.
- Brooks, M. L. and D. A. Pyke. 2001. Invasive Plants and Fire in the Deserts of North America. Pages 1-14. *In* Proceedings of the Invasive Species Workshop: The Role of Fire in the Control and Spread of Invasive Species. Miscellaneous Publication No 11. Tall Timbers Research Station. Tallahassee, Florida.
- Brown, B. 1993. Bell's Vireo. *In* A. Poole, P. Stettenheim, and F. Gill, editors. The Birds of North America, No. 35. Philadelphia: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Brown, J. W., H. A. Wier, and D. Belk. 1993. New records of fairy shrimp (Crustacea: Anostraca) from Baja California, Mexico. Southwestern Naturalist 38(4):389-390.
- Browning, C. A. 2008. A preliminary examination of the effects of feral pigs on water quality and soil loss within a Hawaiian watershed. Hilo, HI: University of Hawai'i. Master's thesis.
- Burger, J. C., M. A. Patten, J. T. Rotenberry, and R. A. Redak. 1999. Foraging ecology of the California gnatcatcher deduced from fecal samples. Oecologia 120:304-310.
- Bury, R. B. and J. A. Whelan. 1984. Ecology and management of the bullfrog. U.S. Fish and Wildlife Service Resource Publication 155.
- Bury, B. R. and J. H. Wolfheim. 1973. Aggression in free-living pond turtles (*Clemmys marmorata*). BioScience 23:659-662.

- Bussan, A. J. and W. E. Dyer. 1999. Herbicides and rangeland. Pages 116-132. *In* R. L. Sheley and J. K. Petroff, eds. Biology and Management of Noxious Rangeland Weeds. Oregon State University Press. Corvallis, Oregon.
- Byrd, Brian F. and Carol Serr. 1993. Multi-Component Archaic and Late Prehistoric Residential Camps along the Sweetwater River, Rancho San Diego, California. Unpublished report on file with USFWS Reno, NV.
- Cadi, A. and P. Joly. 2003. Competition for basking places between the endangered European pond turtle (*Emys orbicularis*) and the introduced red-eared turtle (*Trachemys scripta elegans*). Canadian Journal of Zoology 81:1392-1398.
- Cadi, A. and P. Joly. 2004. Impact of the introduction of the red-eared slider (*Trachemys scripta elegans*) on the survival rates of the European pond turtle (*Emys orbicularis*). Biodiversity and Conservation 13:2511-2518.
- California Air Pollution Control Officers Association (CAPCOA). 2008. CEQA & Climate Change: Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act.
- California Department of Conservation. 1996. Update of the Mineral Land Classification: Aggregate Materials in the Western San Diego County Production-Consumption Region. Division of Mines and Geology, Open-File Report 96-04.
- California Department of Conservation, Division of Land Resources Protection. 2000. San Diego County Important Farmland 1998, Sheet 1 of 2.
- California Department of Conservation, California Geological Survey. 2006. Map Sheet 52 (Updated 2006) Aggregate Availability in California. Accessed at: http://www.consrv.ca.gov/cgs/information/publications/ms/Documents/MS\_52.pdf.
- California Department of Conservation. 2010a. 2010 Fault Activity Map of California. California Geologic Survey, Geologic Data Map No. 6. Website accessed on August 9, 2011. Accessed at: http://www.quake.ca.gov/gmaps/FAM/faultactivitymap.html.
- California Department of Conservation, Division of Land Resource Protection. 2010b. San Diego County Important Farmland 2008. Map published October 2010. Available at: ftp://ftp.consrv.ca.gov/pub/dlrp/FMMP/pdf/2008/sdg08\_west.pdf.
- California Department of Fish and Game. 2001. Final environmental document migratory game bird hunting (waterfowl, coots, moorhens).
- California Department of Fish and Game. 2002. Report on the 2002 Game Take Hunter Survey.
- California Department of Fish and Game. 2004a. Final environmental documents regarding resident game bird hunting.
- California Department of Fish and Game. 2004b. Report of the 2004 Game Take Hunter Survey.

- California Department of Fish and Game. 2012. California 2011-2012 Waterfowl and Upland Game Hunting & Department Lands Public Use Regulations Effective July 1, 2011 June 30, 2012 except as noted. Accessed online at: http://www.dfg.ca.gov/regulations/.
- California Department of Fish and Wildlife, Natural Diversity Database. July 2016a. Special Animals List. Periodic publication. 51 pp.
- California Department of Fish and Wildlife, Natural Diversity Database. July 2016b. Special Vascular Plants, Bryophytes, and Lichens List. Quarterly publication. 126 pp.
- California Department of Fish & Game (Wildlife Management Division), U. S. Department of Interior (Bureau of Land Management), and USDA Forest Service. 1998. Report to the Fish and Game Commission – An Assessment of Mule and Black-tailed Deer Habitats and Populations in California. Compilation of a workshop held April 29, 1997 at the Feather River Inn, Portola, California. February 1998. Accessed at: http://www.dfg.ca.gov/wildlife/hunting/deer/habitatassessment.html.
- California Department of Fish and Wildlife (CDFW). 2015. California State Wildlife Action Plan, 2015 Update: A Conservation Legacy for Californians. Edited by Armand G. Gonzales and Junko Hoshi, PhD. Prepared with assistance from Ascent Environmental, Inc., Sacramento, CA.
- California Department of Parks and Recreation. 2013. Final Initial Study and Mitigated Negative Declaration (MND) Feral Pig Eradication and Control Project, San Diego County (SCH# 2013061008).
- California Department of Transportation (Caltrans). 2011. 2010 Traffic Volumes on the California State Highway System. Division of Traffic Operations, Sacramento, CA 95814.
- California Department of Transportation (Caltrans). No date. San Diego County Designated Scenic Highways Webpage, accessed on August 5, 2011, http://www.dot.ca.gov/hq/LandArch/scenic\_highways/sdiego.htm.
- California Energy Commission. 2006. Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004.
- California Natural Diversity Database (CNDDB). 1999. Navarretia fossalis, unpublished report, Natural Heritage Division, California Department of Fish and Game, Sacramento, California.
- California Natural Diversity Database (CNDDB). 2001. California Department of Fish and Game, Natural Heritage Division, Sacramento, California.
- California Natural Diversity Database (CNDDB). 2002. *Hemizonia conjugens*. Unpublished report, California Natural Diversity Data Base, Natural Heritage Division, California Department of Fish and Game, Sacramento, California.
- California Natural Diversity Database (CNDDB). 2010. Element Occurrence Reports for *Ambrosia pumila*. Unpublished cumulative data current to January 26, 2010, California Natural Diversity Data Base, Natural Heritage Division, California Department of Fish and Game, Sacramento, California.

- California Office of Environmental Health Hazard Assessment. 2013. Indicators of Climate Change in California August 2013. Compiled and edited by: Kadir, T., L. Mazur, C. Milanes, K. Randles, California Environmental Protection Agency, and Office of Environmental Health Hazard Assessment. August 2013.
- California Office of Planning and Research. 2008. Technical Advisory CEQA and Climate Change: Addressing Climate Change through California Environmental Quality Act (CEQA) Review. June 19, 2008.
- CalPIF (California Partners in Flight). 2000. Version 1.0 (Draft). The draft grassland bird conservation plan: a strategy for protecting and managing grassland habitats and associated birds in California (B. Allen, lead author). Point Reyes Bird Observatory, Stinson Beach, CA. http://www.prbo.org/CPIF/Consplan.html.
- CalPIF (California Partners in Flight). 2002. Version 2.0. The oak woodland bird conservation plan: a strategy for protecting and managing oak woodland habitats and associated birds in California (S. Zack, lead author). Point Reyes Bird Observatory, Stinson Beach, CA. http://www.prbo.org/calpif/plans.html.
- CalPIF (California Partners in Flight). 2004. Version 2.0. The coastal scrub and chaparral bird conservation plan: a strategy for protecting and managing coastal scrub and chaparral habitats and associated birds in California (J. Lovio, lead author). PRBO Conservation Science, Stinson Beach, CA. http://www.prbo.org/calpif/plans.html.
- California Regional Water Quality Control Board, San Diego Region. 1994. Water Quality Control Plan for the San Diego Basin (9). September 8, 1994, with amendments effective prior to April 25, 2007. San Diego, California.
- California Regional Water Quality Control Board, San Diego Region. 2009. San Diego Regional Water Quality Control Board Clean Water Act Sections 305(b) and 303(d) Integrated Report for the San Diego Region. Staff Report, December 2009.
- Calkins, Jennifer D., Julie C. Hagelin and Dale F. Lott. 1999. California Quail (*Callipepla californica*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/ species/473.
- Campbell, K., R. Erickson, W. Haas, and M. Patteb. 1998. California gnatcatcher use of habitats other than coastal sage scrub: Conservation and management implications. Western Birds 29:421-433.
- Carothers, S. W., R. R. Johnson, and S. W. Aitchison. 1974. Population structure and social organization of Southwestern riparian birds. American Zoologist 14:97-108.
- Carver, Erin and James Caudill. 2013. Banking on Nature: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation. Prepared for the Division of Economics, U.S. Fish and Wildlife Service. Washington, D.C. October 2013.
- Cayan, D. 2009. Climate Change What Should Southern California Prepare For? *In* Climate Change and the Future of Southern California, Southern California Association of Governments.

- CCSP. 2008. Preliminary review of adaptation options for climate-sensitive ecosystems and resources. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. [Julius, S. H., J. M. West (eds.), J. S. Baron, B. Griffith, L. A. Joyce, P. Kareiva, B. D. Keller, M. A. Palmer, C. H. Peterson, and J. M. Scott (Authors)]. U.S. Environmental Protection Agency, Washington, DC, USA.
- Cessford, Gordon, R. 1995. Off-Road Impacts of Mountain Bikes: A Review And Discussion. Science & Research Series No. 92. Department of Conservation, Wellington, New Zealand.
- CEQ (The Whitehouse Council on Environmental Quality). 2012. Draft Federal Greenhouse Gas Accounting and Reporting Guidance. Draft Revision 1: March 12, 2012.
- Chace, Paul. 1985. An Investigation of the Barn at the Oaks: "2 Cows, 6 Horses, 5 Hogs, 30 Chickens" Supplemental Archaeological Assessment for the Las Montanas Resort and Country Club. Unpublished report on file with USFWS, Reno, NV.
- Chula Vista, City of. 2003. City Of Chula Vista MSCP Subarea Plan. http://www.chulavistaca.gov/ City\_Services/Development\_Services/Planning\_Building/Planning/Environmental/subAreaPlan .asp
- Cline, Lora L. 1984. Just Before Sunset. J and L Enterprises, Jacumba, California.
- Coastal Resources Center, University of Rhode Island, and International Resources Group. 2009. Adapting To Coastal Climate Change: A Guidebook for Development Planners.
- Cole, L. 1995. Deer and coyote use of Eastgate Mall vernal pool area, Miramar NAS, San Diego, CA. Unpublished student report.
- Cole, D. N. and R. L. Knight. 1990. Impacts of recreation on biodiversity in wilderness. Pages 33 40. In Proceedings of the symposium: Wilderness areas: their impacts, 19-20 April 1990, Utah State University, Logan, Utah.
- Collie, N. and E. W. Lathrop. 1976. Chemical characteristics of the standing water of a vernal pool on the San Rosa Plateau, Riverside County, California. Pages 27-31. In S. Jain (ed.), Vernal pools: Their ecology and conservation. University of California, Davis, Institute of Ecology Publication, No. 9, Davis, California.
- Conservation Biology Institute (CBI). 2009. An assessment of the known and potential impacts of feral pigs (*Sus scrofa*) in and near San Diego County, with management recommendations. Unpublished report, prepared for The Nature Conservancy.
- Conservation Biology Institute (CBI) and The Nature Conservancy. 2007. The Last Refuge Conservation Imperative for the Otay-Sweetwater Unit of the San Diego National Wildlife Refuge.
- Conservation Biology Institute (CBI), Dendra, Inc., and Cal-IPC. 2012. Management Priorities for Invasive Non-native Plants, A Strategy for Regional Implementation, San Diego County, California. Prepared for the San Diego Association of Governments. September 2012.
- Constance, L. 1993. Apiaceae in The Jepson Manual, Higher Plants of California, J. C. Hickman, edit., University of California Press, Berkeley, California.

- Courtenay, W. R., Jr. and J. E. Deacon. 1983. Fish introductions in the American Southwest: a case history of Rogers Spring, Nevada. The Southwestern Naturalist 28(2):221-224.
- Crooks, K. R. and M. E. Soulé. 1999. Mesopredator release and avifaunal extinctions in a fragmented system. Nature 400:563–566.
- Crother, B. (ed). 2008. Scientific and standard English names of amphibians and reptiles of North America, North of Mexico, with comments regarding confidence in our understanding. 6<sup>th</sup> Edition. Shoreview Society for the Study of Amphibians & Reptiles, Shoreview, Minnesota. Herpetological Circular No. 37. http://ssarherps.org/pages/HerpCommNames.php.
- Cushman, J. H., T. A. Tierney, and J. M. Hinds. 2004. Variable effects of feral pig disturbances on native and exotic plants in a California grassland. Ecological Applications 14(6):1746-1756.
- Dawson, T. P., Jackson, S. T., House, J. I., Prentice, I. C. and Mace, G. M. 2011. Beyond predictions: Biodiversity conservation in a changing climate. Science 332:53-85.
- Dawson, W. L. 1923. The Birds of California. Vol. 3 of 4. South Moulton Co., San Diego, CA.
- Day, A. G. 1993. *Navarretia. In* The Jepson Manual, Higher Plants of California, J. C. Hickman, ed., University of California Press, Berkeley, California.
- DeLong, A. K. 2002. Managing Visitor Use and Disturbance of Waterbirds Literature Review of Impacts and Mitigation Measures - prepared for Stillwater National Wildlife Refuge.
  Appendix L. In Stillwater National Wildlife Refuge Complex Final Environmental Impact Statement for the Comprehensive Conservation Plan and Boundary Revision (Vol. II).
  Portland, Oregon: Department of the Interior, U.S. Fish and Wildlife Service, Region 1.
- Delong, A. and J. Schmidt. 2000. Literature Review: Effects of Human Disturbance on Wildlife with Emphasis on Wildlife-dependent Recreation Relevant to Stillwater National Wildlife Refuge. (Draft).
- Deméré, T. No Date. Geology of San Diego County, California, San Diego Natural History Museum on the web at http://www.sdnhm.org/research/paleontology/sdgeol.html.
- DeSante, D. F., M. P. Nott, and D. R. Kaschube. 2004. MAPS Stations on National Wildlife Refuges in the USFWS Pacific Region Current Status and Future Direction. The Institute for Bird Populations. Point Reyes Station, California.
- Deutschman, D. H., L. A. Hierl, J. Franklin, H. M. Regan. 2007. Vegetation Community Monitoring Recommendations for the San Diego Multiple Species Conservation Program (Draft). Prepared for the California Department of Fish and Game for Task D & E of Local Assistance Grant #P0450009 by the Department of Biology, San Diego State University, San Diego, California.
- Deutschman, D. H., M. E. Berres, D. A. Marschalek, and S. L. Strahm. 2010. Initial Evaluation of the Status of Hermes Copper (*Lycaena hermes*) on Conserved Lands in San Diego County. Prepared for the San Diego Association of Governments (SANDAG), MOU# 5001442.

- Deutchman, D. H., M. E. Berres, D. A. Marschalek, and S. L. Strahm. 2011. Two-year evaluation of Hermes copper (*Lycaena hermes*) on conserved lands in San Diego County. Unpubl. report prepared for San Diego Association of Governments, San Diego, California.
- Diamond, J. M. 1996. A-bomb against amphibians. Nature 383:386-387.
- Dudek & Associates, Inc. 1994. Biological Resources Report and Impact Analysis for Las Montañas Resort, Jamul, San Diego County, California.
- Dudek & Associates, Inc. 1995. Inventory of Biological Resources on McGinty Ranch, San Diego County, California.
- Dudek & Associates, Inc. 1996. Draft Subsequent Environmental Impact Report Las Montañas San Diego County, California.
- Dudek & Associates, Inc. 2000. City of San Diego Mission Trails Regional Park, San Diego Ambrosia Management Plan.
- Dudek & Associates, Inc. 2008. San Diego National Wildlife Refuge Upland Game Species Survey. Prepared for the U. S. Fish and Wildlife Service, San Diego National Wildlife Refuge Complex. Carlsbad, California.
- Edvarchuk, K., C. Ransom, and G. Block. 2012. Inventory of invasive non-native plants at the San Diego National Wildlife Refuge. Prepared for the U.S. Fish and Wildlife Service by Utah State University; Plants, Soils, and Climate Department; Weed Science Research Project Report No. CR1201A.
- Ehrlich, P. R. and D. D. Murphy. 1987. Conservation lessons from long-term studies of checkerspot butterflies. Conservation Biology 1:122-131.
- Ehrlich, P. R., D. S. Dobkin, and D. Wheye. 1988. The birder's handbook: a field guide to the natural history of North American birds. Simon and Schuster, New York, NY.
- Ellis, L. A., D. M. Weddle, S. D. Stump, H. C. English, and A. E. Graber. 2008. Southwestern Willow Flycatcher final survey and monitoring report: Arizona Game and Fish Department, Research Technical Guidance Bulletin #10, Phoenix, Arizona.
- Ellstrand, N. C. 1992. Gene flow by pollen: implications for plant conservation genetics. Oikos 63:77-86.
- Emlen, S. T. 1977. "Double clutching" and its possible significance in the bullfrog. Copeia 1977(4):749-751.
- Eng, L. L., D. Belk, and C. H. Eriksen. 1990. California Anostraca: distribution, habitat and status. Journal of Crustacean Biology 10:247-277.
- ERC Environmental and Energy Services Co., Inc. (ERCE). 1991. Rancho San Miguel General Development Plan, Draft Environmental Impact Report (EIR-90-02).
- Eriksen, C. and D. Belk. 1999. Fairy Shrimps of California's Puddles, Pools, and Playas. Mad River Press, Inc., Eureka, California.

- Faber, T. A. and F. E. Kuo. 2009. "Children with attention deficits concentrate better after walk in the park." Journal of Attention Disorders 12:402-409.
- Famolaro, Peter. 2009. 2009 Annual Report (Recovery Permit TE813413-5). Unpublished report. Sweetwater Authority, San Diego, California.
- Faulkner, D and M. Klein. 2005. San Diego's sensitive butterflies: a workshop focusing on seven local species.
- Fellers, G. M. and P. M. Kleeman. 2007. California Red-legged Frog (*Rana Draytonii*) Movement and Habitat Use: Implications for Conservation. Journal of Herpetology 41(2):276-286.
- Fenn, M. E., J. S. Baron, E. B. Allen, H. M. Rueth, K. R. Nydick, L. Geiser, W. D. Bowman, J. O. Sickman, T. Meixner, D. W. Johnson, and P. Neitlich. 2003. Ecological Effects of Nitrogen Deposition in the Western United States. BioScience 53(4):404-420.
- Fernandez-Juricic E. and J. L. Telleria. 2000. Effects of human disturbance on spatial and temporal feeding patterns of blackbird *Turdus merula* in urban parks in Madrid, Spain. Bird Study 47:13–21.
- Ferree, K. 2002. Nest site selection and nest success of Yellow Warbler, Bell's Vireo, and Yellowbreasted Chat in a desert riparian ecosystem. Unpublished Master's thesis. San Diego State University, San Diego, CA.
- Fisher, R. N. and T. J. Case. 2000. Field Guide to the Reptiles and Amphibian of Coastal Southern California. U. S. Geological Survey, Western Ecological Research Center. Accessed at http://www.werc.usgs.gov/ProjectSubWebPage.aspx?SubWebPageID=1&ProjectID=75 (1/10/12).
- Fisher, R.N. and H.B. Schaffer. 1996. The decline of amphibians in California's great central valley. Conservation Biology 10(5):1387-1397.
- Focardi, S., D. Capizzi, and D. Monetti. 2000. Competition for acorns among wild boar (*Sus scrofa*) and small mammals in a Mediterranean woodland. Journal of Zoology, London 250:329–334.
- Forrest, A. and C. Cassady St. Clair. 2006. Effects of dog leash laws and habitat type on avian and small mammal communities in urban parks. Urban Ecosystems 9(2): 51-66.
- Fox, A. D. and Madsen, J. 1997. Behavioural and distributional effects of hunting disturbance on waterbirds in Europe: implications for refuge design. Journal of Applied Ecology 34:1-13.
- Franklin, J., L. A. Hierl, D. H. Deutschman, and H. M. Regan. 2006. Grouping and Prioritizing Natural Communities for the San Diego Multiple Species Conservation Program. Report for Task B2 of Local Assistance Grant #P0450009. Prepared for California Department of Fish and Game by the Department of Biology, San Diego State University, San Diego, California.
- Franzreb, K. E. 1989. Ecology and Conservation of the Endangered Least Bell's Vireo. U. S. Fish and Wildlife Service, Biological Report 89(1).

- Friggens, M. M., J. R. Pinto, R. K. Dumroese, and N. L. Shaw. 2012. Decision support: Vulnerability, conservation, and restoration. Pages 116–139 In Climate change in grasslands, shrublands, and deserts of the interior American West: A review and needs assessment, Finch, D.M. (ed.). USDA For. Serv., Gen. Tech. Rep. RMRS-GTR-285, Fort Collins, CO.
- Frost, D. R., T. Grant, J. Faivovich, R. H. Bain, A. Haas, C. F. B. Haddad, R. O. De Sa, A. Channing, M. Wilkinson, S. C. Donnellan, C. J. Raxworthy, J. A. Campbell, B. L. Blotto, P. Moler, R. C. Drewes, R. A. Nussbaum, J. D. Lynch, D. M. Green, and W. C. Wheeler. 2006. The amphibian tree of life. Bulletin of the AMNH; No. 297. http://hdl.handle.net/2246/5781.
- Fugate, M. 1993. Branchinecta sandiegonensis, a new species of fairy shrimp (Crustacea: Anostraca) from western North America. Proceedings of the Biological Society of Washington 106: 296-304.
- Fuller, T. K. 1990. Dynamics of a declining white-tailed deer population in north central Minnesota. Wildlife Monographs 110:1-37.
- Gaines, D. and S. A. Laymon. 1984. Decline, status and preservation of the yellow billed cuckoo in California. Western Birds 15:49-80.
- Galvin, J. 1998. Breeding and dispersal biology of the California gnatcatcher in central Orange County. Western Birds 29:323-332.
- Gardali, T., N. E. Seavy, R. T. Di Gaudio, and L. A. Comrack. 2012. A Climate Change Vulnerability Assessment of California's At-Risk Birds. PLoS ONE 7(3):e29507.
- Garrett, K. and J. Dunn. 1981. Birds of southern California: status and distribution. Los Angeles Audubon Society.
- Garrison, B. and R. B. Standiford, R. B. 1996. Chapter 2: Oaks and Habitats of the Hardwood Rangeland. In Guidelines for managing California's hardwood rangelands. U.C. Division of Agriculture and Natural Resources Publication.
- George, R. R. 1993. White-winged dove banding analysis. Final Report. Federal Aid Project W-128-R, Job 6. Texas Parks and Wildlife Department, Austin Texas, USA.
- George, S. L. and K. R. Crooks. 2006. Recreation and large mammal activity in an urban nature reserve. Biological Conservation 133:107-177.
- Given, David R. 1994. Principles and practice of plant conservation. Timber Press. Portland, OR.
- Glenn, Brian K. 1995. Draft Final Cultural Resources Survey and National Register Eligibility Evaluation Program for the Rancho San Diego Equestrian Center, San Diego County, California. Unpublished report on file with USFWS, Reno, NV.
- Goldwasser, S. 1981. Habitat Requirements of the Least Bell's Vireo. Final Report, California Department of Fish and Game, Job IV-38.1.
- Gonzalez, Richard J., Jeff Drazen, Stacie Hathaway, Brent Bauer, and Marie Simovich. 1996. Physiological correlates of water chemistry requirements in fairy shrimps (Anostraca) from Southern California. Journal of Crustacean Biology 16(2):315-322.

- Good, T. P., R. S. Waples, and P. Adams (Editors). 2005. Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead. U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-NWFSC-66, 598 p.
- Gray, M. V., and J. Greaves. 1984. The Riparian Forest as Habitat for the Least Bell's Vireo. *In* R. Warner and K. Hendrix, eds. California Riparian Systems: Ecology, Conservation, and Productive Management. University of California Press, Davis CA.
- Greaves, J. M. 1987. Nest-site Tenacity of Least Bell's Vireos. Western Birds 18:50-54.
- Greaves, J. and Z. Labinger. 1997. Site tenacity and dispersal of least Bell's vireos. *In* Proceedings of The Wildlife Society Conference, Western Section, February 5-8, 1997.
- Griffin, P. C. 1999. *Bufo californicus*, arroyo toad movement patterns and habitat preferences. Master's Thesis for University of California, San Diego.
- Griffin, P. C., T. J. Case, and R. N. Fisher. 1999. Radio telemetry study of *Bufo californicus*, arroyo toad movement patterns and habitat preferences. Contract Report to California Department of Transportation Southern Biology Pool.
- Griffith, J. and J. Griffith. 2000. Cowbird control and the endangered least Bell's vireo: a management success story. *In* J. Smith, T. Cook, S. Rothstein, S. Robinson, and S. Sealy, editors. Ecology and management of cowbirds and their hosts. University of Texas Press, Austin, Texas.
- Griffith Wildlife Biology. 1994. Brown-headed Cowbird trapping protocol. Unpublished document prepared by J.C. Griffith and J.T. Griffith, Griffith Wildlife Biology, Calumet, Michigan.
- Griggs, T. 1976. Life history strategies of the genus *Orcuttia* (Gramineae). Pages 57-63. *In* S. Jain (ed.). Vernal pools, their ecology and conservation. Inst. of Ecol. Publ. # 9. University of California, Davis.
- Griggs, T. 1981. Life histories of vernal pool annual grasses. Fremontia 9:14-17.
- Grinnell, J. and A. H. Miller. 1944. The distribution of the birds of California. Cooper Ornithological Club, Berkeley, CA. 1986 (Reprinted by Artemisia Press, Lee Vining, CA.)
- Grinnell, J., and T. Storer. 1924. Animal life in the Yosemite. University of California Press, Berkeley, CA.
- Grishaver, M., P. Mock, and K. Preston. 1998. Breeding behavior of the California gnatcatcher in southwestern San Diego County, California. Western Birds 29:299-322.
- Gutierrez, R. J. and D. J. Delehanty. 1999. Mountain Quail (*Oreortyx pictus*). In the Birds of North America, No. 457 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Hamilton, T. 1962. Species relationships and adaptations for sympatry in the avian genus *Vireo*. Condor 64:40-68.

- Hamrick, B., M. Smith, C. Jaworowski, and B. Strickland. 2011a. A Landowner's Guide for Wild Pig Management, Practical Methods for Wild Pig Control. Mississippi State University Extension Service and Alabama Cooperative Extension System.
- Hamrick, B., T. Campbell, B. Higginbotham, and S. Lapidge. 2011b. Managing an Invasion, Effective Measures to Control Wild Pigs. 2011. The Wildlife Professional (Summer):41-42.
- Hannah, Lee, M. Rebecca Shaw, Makihiko Ikegami, Patrick R. Roehrdanz, Oliver Soong, and
- James Thorne. 2012. Consequences of Climate Change for Native Plants and Conservation. California Energy Commission. Publication number: CEC-500-2012-024.
- Hanson E. and M. Sytsma. 2001. Oregon Aquatic Nuisance Species Management Plan. Portland State University. Portland, OR.
- Harper, Brooks. 1991. Letter from Brooks Harper, USFWS Laguna Niguel Office Supervisor to John Ong, Chief, U.S. Environmental Protection Agency, Region IX, 23, May 1991, Files of USFWS Carlsbad Fish and Wildlife Office, Carlsbad, California.
- Haskett, G. 2007. Chief, National Wildlife Refuge System, U.S. Fish and Wildlife Service, Testimony to U.S. House of Representatives Natural Resources Committee, Subcommittee on Fisheries, Wildlife, and Oceans, regarding H.R. 767, The Refuge Ecology Protection, Assistance, and Immediate Response Act, June 21, 2007.
- Hathaway, S. A. and M. A. Simovich. 1996. Some factors affecting the distribution and cooccurrence of two Southern California anostracans (Branchiopoda): Branchinecta sandiegonensis and Streptocephalus woottoni. Journal of Crustacean Biology 16:669-677.
- Havera, S. P., L. R. Boens, M. M. Georgi, and R. T. Shealy. 1992. Human disturbance of waterfowl on Cacique Pool, Mississippi River. Wildlife Society Bulletin 20:290-298.
- Hayes, G. F. and K. D. Holl. 2003. Cattle grazing impacts on annual forbs and vegetation composition of Mesic Grasslands in California. Conservation Biology 17(6):1694-1702.
- Hayes, M. P. and M. M. Miyamoto. 1984. Biochemical, behavioral and body size difference between *Rana aurora aurora* and *R. a. draytonii*. Copeia 1984(4):1018-1022.
- Hayes, M. P. and M. R. Jennings. 1988. Habitat correlates of distribution of the California red-legged frog (*Rana aurora draytonii*) and the foothill yellow-legged frog (*Rana boylii*): Implications for management. Pages 144–158. *In* R. C. Szaro, K. E. Severson, and D. R. Patton (technical coordinators), Proceedings of the symposium on the management of amphibians, reptiles, and small mammals in North America. U.S. Department of Agriculture, Forest Service, General Technical Report RM-166.
- Hayhoe K., D. Cayan, C. B. Field, P.C. Frumhoff, E. P. Maurer, N. L. Miller, S. C. Moser, S. H. Schneider, K. N. Cahill, E. E. Cleland, L. Dale, R. Drapek, R. M. Hanermann. 2004. Emissions Pathways, Climate Change, and Impacts on California. Proceedings of the National Academy of Science USA 101(34):12422–12427 24 August 2004.

- Hays, D. W., K. R. McAllister, S. A. Richardson, and D. W. Stinson. 1999. Washington State recovery plan for the western pond turtle. Washington Department of Fish and Wildlife, Olympia.
- Hector, Susan and Stephen Van Wormer. 1986. Broken Fragments of Past Lifeways: Archaeological Excavations at Los Peñasquitos Ranch House, Volumes I and II. Unpublished report on file at the RECON, San Diego.
- Hensley, M. 1950. Notes on the Breeding Behavior of the Bell's Vireo. Auk 67:243-244.
- Hesselbarth, W., B. Vachowski, M. A. Davies. 2007. Trail Construction and Maintenance Notebook. 2007 Edition. USDA Forest Service, Missoula Technology and Development Center, Missoula, Montana.
- Hinde, R. A. 1954. Factors governing the changes in strength of a partially inborn response, as shown by the mobbing behaviour of the chaffinch (*Fringilla coelebs*). *In* The nature of the response, and an examination of its course. Proc. R. Soc. Lond., B, Biol. Sci. 142:306-331.
- Hierl, L. A., H. M. Regan, J. Franklin, and D. H. Deutschman. 2005. Assessment of the Biological Monitoring Plan for San Diego's Multiple Species Conservation Program. Report for Task A of Local Assistance Grant #P0450009. Prepared for California Department of Fish and Game by the Department of Biology, San Diego State University, San Diego, California.
- Hierl, L. A., J. Franklin, D. H. Deutschman, and H. M. Regan. 2007. Developing Conceptual Models to Improve the Biological Monitoring Plan for San Diego's Multiple Species Conservation Program. Report for Task C of Local Assistance Grant #P0450009. Prepared for California Department of Fish and Game by the Department of Biology, San Diego State University, San Diego, California.
- Holland, D. C. 1988. *Clemmys marmorata* (western pond turtle). Behavior. Herpetol. Rev.19:87-88.
- Holland, D. 1991. A synopsis of the ecology and status of the western pond turtle (*Clemmys marmorata*). *In* Report to National Ecological Research Center. U.S. Fish and Wildlife Service, San Simeon, California.
- Holland, D.C. 1994. The western pond turtle: habitat and history. U.S. Department of Energy, Bonneville Power Administration, Portland, Oregon.
- Holland, D. C. 1995. Sensitive species hydroecological evaluation Margarita River. Unpublished report.
- Holland, D. C. and R. H. Goodman, Jr. 1998. A guide to the amphibians and reptiles of MCB Camp Pendleton, San Diego County, California. Final report prepared for AC/S Environmental Security Resources Management Division under Contract M00681-94-0039.
- Holland, D. C. and N. R. Sisk. 2000. Habitat use and population demographics of the arroyo toad (*Bufo californicus*) on MCB Camp Pendleton, San Diego County, California: Final report for 1998-1999. Unpublished report submitted to MCB Camp Pendleton.

- Holland, D. and N. Sisk. 2001. Habitat use and population demographics for the arroyo toad (*Bufo californicus*) on MCB Camp Pendleton, San Diego County, California 1998-2000. Prepared for AC/S Environmental Security, Resource Management Division, Marine Corps Base Camp Pendleton. Contract # M00681-97-C-0034.
- Holland, R. F. 1976. The vegetation of vernal pools: A survey. Pages 11-14. In Vernal Pools: Their Ecology and Conservation. S. Jain (ed.). University of California, Davis Institute of Ecology Publication No. 9. Davis, California.
- Holland, R. F. and S. Jain. 1977. Vernal pools. *In* M. G. Barbour and J. Major (eds.), Terrestrial Vegetation of California. John Wiley and Sons, New York.
- Holland, R. F. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. Unpublished report submitted to the California Department of Fish and Game.
- Holland, R. F. and S. Jain. 1988. Vernal pools. Pages 9:515-531. In M. G. Barbour and J. Major (eds), Terrestrial Vegetation of California. California Native Plant Society Special Publication Sacramento, California.
- Holmes, A. L. and G. R. Geupel. 2005. Effects of Trail Width on the Densities of Four Species of Breeding Birds in Chaparral. USDA Forest Service General Technical Report (PSW-GTR-191). Accessed at http://www.fs.fed.us/psw/publications/documents/psw gtr191/Asilomar/pdfs/610-612.pdf.
- Horsley and Witten, Inc. 1996. Identification and evaluation of nutrient and bacterial loadings to Maquoit Bay, New Brunswick and Freeport, Maine. Final report.
- Howell, J. T. 1931. III. The genus Pogogyne. Proc. Calif. Acad. Sci. Ser. 23(3):105-128.
- Hughes, J. M. 1999. Yellow-billed cuckoo (*Coccyzus americanus*). In The birds of North America, No. 418 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- IPCC (Intergovernmental Panel on Climate Change). 2007. Summary for Policymakers. In Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor and H. L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Ilse, L. M. and E. C. Hellgren. 1995. Resource partitioning in sympatric populations of collared peccaries and feral hogs in southern Texas. Journal of Mammalogy 76:784–789.
- Jacobson, E. R., J. L. Behler, and J. L. Jarchow. 1999. Health assessment of Chelonians and release into the wild. Pages 232-242. *In* Powler, M. E. and R. E. Miller (Eds.), Zoo and Wild Animal Medicine. W. B. Saunders Company, Philadelphia.
- Jennings, M. R. and M. P. Hayes. 1985. Pre-1900 overharvest of California red-legged frogs (Rana aurora draytonii): the inducement for bullfrog (Rana catesbeiana) introduction. Herpetologica 41(1):94–103.

- Jennings, M. R. and M. P. Hayes. 1994. Amphibian and Reptile Species of Special Concern in California. California Department of Fish and Game, Inland Fisheries Division (Contract Number 8023).
- Jennings, M. R., M. P. Hayes, and D. C. Holland. 1992. A petition to the U.S. Fish and Wildlife Service to place the California red-legged frog (*Rana aurora draytonii*) and the western pond turtle *Clemmys marmorata*) on the list of endangered and threatened wildlife and plants.
- Jokerst, J. D. 1993. *Acanthomintha*. Page 713. *In* J. C. Hickman (editor), The Jepson Manual: Higher Plants of California. University of California Press, Berkeley, California.
- Keck, D. D. 1959. *Hemizonia*. In Munz, P. A. A California flora. University of California Press, Berkeley.
- Keegan T. W., B. B. Ackerman, A. N. Aoude, L. C. Bender, T. Boudreau, L. H. Carpenter, B. B. Compton, M. Elmer, J. R. Heffelfinger, D. W. Lutz, B. D. Trindle, B. F. Wakeling, and B. E. Watkins. 2011. Methods for monitoring mule deer populations. Mule Deer Working Group, Western Association of Fish and Wildlife Agencies, USA.
- Keeler-Wolf, T., D. R. Elam, K. Lewis, and S. A. Flint. 1998. California Vernal Pool Assessment. Preliminary Report. California Department of Fish and Game. Wetlands Inventory and Conservation Unit, Sacramento, California.
- Keeley, J. E. 1988. Anaerobiosis as a stimulus to germination in two vernal pool grasses. Am. J. of Botany 75:1086-1089.
- Keeley, J. E. 1990. Photosynthesis in vernal pool macrophytes: relation of structure and function. Pages 61-87. *In* D. H. Ikeda and R. A. Schlising, editors. Vernal pool plants-their habitat and biology. California State University, Chico, California.
- Keeley, J. E. 1998. CAM photosynthesis in submerged aquatic plants. Botanical Review 64:121-175.
- Keeley, Jon E. and C. J. Fotheringham. 2001. Historic fire regime in southern California shrublands. Conservation Biology 15(6):1536-1548.
- Kelly, A. E. and M. L. Goulden. 2008. Rapid shifts in plant distribution with recent climate change. Proc. Natl Acad. Sci. USA 105:11823–11826.
- Kelman, W. M. 1991. A Revision of *Fremontodendron* (Sterculiaceae). Systematic Botany 16(1): 3–20.
- Kimball, S. and P. M. Schiffman. 2003. Differing Effects of Cattle Grazing on Native and Alien Plants. Conservation Biology 17:1681–1693.
- Klein, M. W., Sr. 2009. Pollinator Study on Lakeside Ceanothus (*Ceanothus cyaneus*) and San Diego Thorn-mint (*Acanthomintha ilicifolia*). Prepared for the California Department of Fish and Game, Sacramento, CA. (Section 6 Project Final Report, State of California Contract Number P0650018.)

- Knight, R. L. and D. N. Cole. 1991. Effects of recreational activity on wildlife in wildlands. Transactions of the North American Wildlife and Natural Resource Conference 56:238-247.
- Koenig, J., R. Shine, and G. Shea. 2002. The Dangers of Life in the City: Patterns of Activity, Injury and Mortality in Suburban Lizards (*Tiliqua scincoides*). Journal of Herpetology 36(1):62-68.
- Kraus, F. 2009. Alien Reptiles and Amphibians: A Scientific Compendium and Analysis. Springer.
- Krombein, K. V., P. D. Hurd, Jr., D. Smith, and B. D. Burks. 1979. Catalog of Hymenoptera in America North of Mexico. Smithsonian Institution Press, Washington, D.C.
- Kroodsma, R. L. 1984. Effect of edge on breeding forest bird species. Wilson Bull. 96:426-436.
- Kruse, K. C. and M. G. Francis. 1977. A predation deterrent in larvae of the bullfrog, *Rana* catesbeiana. Transactions of the American Fisheries Society 106(3):248-252.
- Kuperman, B. J., V. E. Matey, R. R. Fisher, E. L. Ervin, M. L. Warburton, L. Bakhireva, and C. A. Lehman. 2004. Parasites of the African clawed frog, *Xenopus laevis*, in southern California, U.S.A. Comparative Parasitology 71(2):229-232.
- Kus, B. E. 1999. Impacts of brown-headed cowbird parasitism on productivity of the endangered least Bell's vireo. Research and management of the brown-headed cowbird in western landscapes. Studies in Avian Biology 18:160-166.
- Kus, B. E. 2002. Least Bell's Vireo (*Vireo bellii pusillus*). *In* The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian-associated birds in California. California Partners in Flight. http://www.prbo.org/calpif/htmldocs/riparian\_v-2.html.
- Kus, B. E. and M. J. Whitfield. 2005. Parasitism, productivity, and population growth: response of Least Bell's Vireos (Vireo bellii pusillus) and Southwestern Willow Flycatchers (Empidonax traillii extimus) to cowbird (Molothrus spp.) control. Ornithological Monographs 57:16-27.
- Kushlan, J. A., J. Steinkamp, K. C. Parsons, J. Capp, M. Acosta Cruz, M. Coulter, I. Davidson, L. Dickson, N. Edelson, R. Elliot, R. M. Erwin, S. Hatch, S. Kress, R. Milko, S. Miller, K. Wheeler, and K. Wohl. 2002. Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1. Waterbird Conservation for the Americas, Washington, DC, U.S.A.
- LaDochy, S., R. Medina, and W. Patzert. 2007. Recent California climate variability: Spatial and temporal patterns in temperature trends. Climate Research 33:159–169.
- Lafferty, K. D. and C. J. Page. 1997. Predation on the endangered tidewater goby, *Eucyclogobius newberryi*, by the introduced African clawed frog, *Xenopus laevis*, with notes on the frog's parasites. Copeia 1997(3):589-592.
- Lafferty, K. D. 2001. Birds at a southern California beach: Seasonality, habitat use and disturbance by human activity. Biodiversity Conservation 10:1949-1962.

- Launer, A. E. D. D. Murphy, S. A. Laymon, and M. D. Halterman. 1990. 1990 Distribution and habitat requirements of the yellow-billed cuckoo in California. Center for Conservation Biology Stanford University. Stanford, CA.
- Laurance, W. F. 1997. A distributional survey and habitat model for the endangered northern bettong (*Bettongia tropica*) in tropical Queensland. Biol. Conserv. 82:47-60.
- Lawler, S. P., D. Dritz, T. Strange, and M. Holyoak. 1999. Effects of introduced mosquitofish and bullfrogs on the threatened California red-legged frog. Conservation Biology 13(3):613-622.
- Laymon, S. A. and M. D. Halterman. 1987a. Distribution and status of the yellow-billed cuckoo in California. Final report to the California Department of Fish and Game, Contract #C-1845. Sacramento, CA.
- Laymon, S. A. and M. D. Halterman. 1987b. Can the western subspecies of the yellow-billed cuckoo be saved from extinction? Western Birds 18:19-25.
- Lee, D. S., C. R. Gilbert, C. H. Hocutt, R. E. Jenkins, D. E. McAllister, and J. R. Stauffer, Jr. 1980. Atlas of North American freshwater fishes. North Carolina Museum of Natural History.
- Lenth, B. E., R. L. Knight, and M. E. Brennan. 2008. The Effects of Dogs on Wildlife Communities. Natural Areas Journal 28(3):218-227. Published by the Natural Areas Association.
- Licht, L.E. 1969. Comparative breeding behavior of the Red-legged Frog (*Rana aurora aurora*) and the Western Spotted Frog (*Rana pretiosa pretiosa*) in southwestern British Columbia. Canadian Journal of Zoology 47(6):1287-1299.
- Lindeman, P. V. 1999. Aggressive interactions during basking among four species of Emydid turtles. Journal of Herpetology 33:214-219.
- Lord, Andrea, Joseph R. Waas, John Innes, and Mark J. Whittingham. 2001. Effects of human approaches to nests of northern New Zealand dotterels. Biological Conservation 98:233-240.
- Lorenz, K. Z. 1939. Vergleischende Verhaltenzforschung. Zoologische Anzeitung 12:69-102.
- Louv, R. 2005. Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder. Chapel Hill, NC: Algonquin Books of Chapel Hill.
- Lowry, D. A. 1978. Domestic dogs as predators on deer. Wildl. Soc. Bull. 6:38-39.
- Lucas, A. M., C. F. Scholl, D. D. Murphy, C. R. Tracy, and M. L. Forister. 2013. Geographic distribution, habitat association, and host quality for one of the most geographically restricted butterflies in North America: Thorne's hairstreak (*Mitoura thornei*). Insect Conservation and Diversity.
- Macdonald, Stuart. 2011. Evidence of Many Varieties of Economic Benefits Linked to Trails. *In* American Trails Magazine, Summer 2011. Available on line at: http://www.americantrails.org/resources/economics/economic-benefits-trails-macdonald.html.

- Macmynowski, D. P., T. L. Root, G. Ballard, and G. R. Geupel. 2007. Changes in Spring Arrival of Nearctic-Neotropical Migrants Attributed to Multiscalar Climate. Global Change Biology 13(11):2239–2251.
- Madden-Smith, M. C., E. L. Ervin, K. P. Meyer, S. A. Hathaway, and R. N. Fisher. 2005.
  Distribution and Status of the Arroyo Toad (*Bufo californicus*) and Western Pond Turtle (*Emys marmorata*) in the San Diego MSCP and Surrounding Areas. U.S. Geological Survey, Western Ecological Research Center. Prepared for the County of San Diego and California Department of Fish and Game. Sacramento, California.
- Madsen, J. 1985. Impact of disturbance on field utilization of pink-footed geese in West Jutland, Denmark. Biol. Conserv. 33:53-63.
- Magness, D. R., J. M. Morton, F. Huettmann, F. S. Chapin, III, and A. D. McGuire. 2011. A Climate-Change Adaptation Framework to Reduce Continental-Scale Vulnerability across Conservation Reserves. Ecosphere 2(10):112.
- Mallord, J. W., P. M. Dolman, A. F. Brown, and W. J. Sutherland. 2007. Linking recreational disturbance to population size in a ground-nesting passerine. Journal of Applied Ecology 44:185-195.
- Marine Corps Air Station Miramar. 2006. Vernal pool GIS data for MCAS Miramar provided to Carlsbad Fish and Wildlife Office in 2007; Carlsbad, CA.
- Marschalek, D. A. and D. H. Deutschman. 2008. Hermes copper (*Lycaena Hermelycaena*] *hermes*: Lycaenidae): life history and population estimation of a rare butterfly. Journal of Insect Conservation 12:97-105.
- Martin, T., and J. Clobert. 1996. Nest predation and avian life-history evolution in Europe versus North America: A possible role of humans? American Naturalist 147:1028-1046.
- Mason, Daivd. 2003. Savings and Loan Industry, US. EH.Net Encyclopedia, edited by Robert Whaples. June 10, 2003. Available on the World Wide Web at http://eh.net.encyclopeida/article/mason.savings.loan.industry.us.
- Massei, G., S. Roy, and R. Bunting. 2011. Too many hogs? A review of methods to mitigate impact by wild boar and feral hogs. Human–Wildlife Interactions 5(1):79–99, Spring 2011.
- Mastrandrea, M. D. and A. L. Luers. 2012. Climate change in California: scenarios and approaches for adaptation. Climatic Change (2012)111:5–16.
- Mastrup, S. 2002. Guide to Hunting Quail in California (4<sup>th</sup> Edition). Updated by D. S. Blankenship and J. Garcia. California Department of Fish and Game, Sacramento, CA.
- Mattoni, R., G. F. Pratt, T. R. Longcore, J. F. Emmel, and J. N. George. 1997. The endangered Quino checkerspot, *Euphydryas editha quino* (Lepidoptera: Nymphalidae). Journal of Research on the Lepidoptera 34:99-118.
- May, R. V. 1978. A Southern California Indigenous Ceramic Typology: A Contribution to Malcolm J. Rogers Research. ASA Journal 2:2.

- McCaull, J. 1994. The Natural Community Conservation Planning Program and the coastal sage scrub ecosystem of southern California. Pages 281-292. *In* Environmental Policy and Biodiversity (R. E. Grumbine, ed.). Island Press, Washington, D.C.
- McCoid, M. J. and T. H. Fritts. 1980. Notes on the diet of a feral population of *Xenopus laevis* (Pipidae) in California. The Southwestern Naturalist 25:272-275.
- McEachern, K., B. Pavlik, J. Rebman, and R. Sutter. 2007. San Diego Multiple Species Conservation Program (MSCP) Rare Plant Monitoring Review and Revision. U.S. Geological Survey, Western Ecological Research Center. Sacramento, California.
- McGlaughlin, M. E. and E. A. Friar. 2007. Clonality in the endangered *Ambrosia pumila* (Asteraceae) inferred from RAPD markers; implications for conservation and management. Cons. Genetics 8:319-30.
- Meighan, Clement W. 1954. A Late Complex in Southern California Prehistory. Southwestern Journal of Anthropology 10:215-227.
- Merkel & Associates, Inc. 1999. San Miguel Ranch South Parcel Otay Tarplant (*Hemizonia conjugens*). Preliminary Survey Report Submitted to P&D Consultants, Inc., San Diego, California. Unpublished Report. May 20, 1999.
- Migliarese, N. L. 2008. Researching the Child ~ Nature Connection. California State Parks. (Available at www.parks.ca.gov).
- Miller, S. G., R. L. Knight, and C. K. Miller. 1998. Influence of Recreational Trails on Breeding Bird Communities. Ecological Applications 8(1):162-169.
- Miller, S. G., R. Knight, and C. Miller. 2001. Wildlife responses to pedestrians and dogs. Wildlife Society Bulletin 29(1):124-132.
- Miner, K. L. 1989. Foraging ecology of the Least Bell' Vireo, *Vireo bellii pusillus*. Unpublished Master's Thesis, San Diego State University, San Diego, California.
- Mitchell J. R., M. E. Moser, and J. S. Kirby. 1988. Declines in midwinter counts of waders roosting on the Dee estuary. Bird Study 35:191–198.
- Mooney-Levine and Associates. 1987. Draft Environmental Impact Report for Rancho San Diego Specific Plan. Unpublished report on file USFWS, Carlsbad. CA.
- Moore, D. and D. Ahlers. 2009. 2008 Southwestern Willow Flycatcher study results: selected sites along the Rio Grande from Velarde to Elephant Butte Reservoir, New Mexico: Report by the Bureau of Reclamation, Technical Service Center, Denver, Colorado.
- Moran, R. 1977. New or Renovated Polemoniaceae from Baja California, Mexico (*Ipomopsis, Linanthus, Navarretia*). Madroño 24:141-159.
- Moser, S., J. Ekstrom, and G. Franco. 2012. Our Changing Climate 2012 Vulnerability & Adaptation to the Increasing Risks from Climate Change in California. A Summary Report on the Third Assessment from the California Climate Change Center.

- Moyle, P. B. 1976. Fish introductions in California: History and impact on native fishes. Biological Conservation 9(1):101-118.
- Mule Deer Working Group. 2004. North American Mule Conservation Plan. Sponsored by the Western Association of Fish and Wildlife Agencies. Accessed at http://www.dfg.ca.gov/wildlife/hunting/deer/docs/NAMuleDeerConsPlanFinal.pdf.
- Munz, P. A. 1974. A Manual of Southern California Botany. University of California Press, Berkeley and Los Angeles, California.
- Murphy, D. D. and R. R. White. 1984. Rainfall, resources, and dispersal in southern populations of *Euphydryas editha* (Lepidoptera: Nymphalidae). Pan-Pacific Entomologist 60:350-355.
- Myers, E. L. 1975. Seed germination of two vernal pool species: *Dowingia cuspidate* and *Plagiobothrys leptocladus*. A thesis presented to the faculty of San Diego State University, San Diego, California.
- National Invasive Species Strategy Team. 2003. The National Strategy for Management of Invasive Species, U.S. Fish and Wildlife Service, National Wildlife Refuge System. http://www.fws.gov/invasives/pdfs/NationalStrategyFinalRevised05-04.pdf.

National Invasive Species Council. 2008. 2008-2012 National Invasive Species Management Plan.

- National Park Service. 2006. Dogs in National Parks. <u>http://www.nps.gov/jotr/parkmgmt/</u><u>dogs.htm.</u>
- National Research Council. 1993. Managing Wastewater in Coastal Urban Areas. Water Science and Technology Board, Commission on Engineering and Technical Systems, National Research Council, Washington, D.C. National Academy Press.
- Nelson, L. Jr. and J. K. Hooper. 1975. California Big Game and Its Management. Division of Agricultural Sciences, University of California. Leaflet 75-LE/2223.
- Newman, J. 1992. Relationships between territory size, habitat structure and reproductive success in the least Bell's vireo, *Vireo bellii pusillus*. Unpublished Master's thesis, San Diego State University.
- Nolan, V. 1960. Breeding Behavior of the Bell Vireo in southern Indiana. Condor 62:225-244.
- North American Bird Conservation Initiative, U.S. Committee, 2011. The State of the Birds 2011. Report on Public Lands and Waters. U.S. Department of Interior: Washington, DC.
- Nuttall, T. 1840. Descriptions of new species and genera of plants in the natural order of the Compositae, collected in a tour across the continent to the Pacific, a residence in Oregon, and a visit to the Sandwich Islands and Upper California during the years 1834 and 1835. Trans. Am. Philos. Soc. pages 283-453.
- Oberbauer, Thomas, Meghan Kelly, and Jeremy Buegge. 2008. Draft Vegetation Communities of San Diego County. Based on "Preliminary Descriptions of the Terrestrial Natural Communities of California," Robert F. Holland, Ph.D., October 1986.

- Oberbauer, T. and J. Vanderwier. 1991. The vegetation and geologic substrate association and its effect on development in southern California. Pages 203-212. In N P. Abbott and W. Elliot. 1991. Environmental perils San Diego Region. San Diego Assoc. Geologists. San Diego, California.
- Ogden Environmental and Energy Services. 1992. Rancho San Miguel General Development Plan (Volume 1: Final Environmental Impact Report EIR 90-02).
- Ogden Environmental and Energy Services. 1994. Habitat Conservation Plan for Rancho San Diego.
- Ogden Environmental and Energy Services Company, Inc. 1996. Biological Monitoring Plan for the Multiple Species Conservation Program. Prepared for the City of San Diego, California Department of Fish and Game, and U.S. Fish and Wildlife Service for the San Diego Multiple Species Conservation Plan Program.
- O'Leary, J. F. 1995. Coastal sage scrub: threats and current status. Fremontia 23:427-31.
- Opdycke, Jeffrey. 1991. Letter from Jeffrey Opdycke, USFWS Southern California Field Supervisor to Scientific Advisory Committee Members, 13, December 1991, Files of USFWS Carlsbad Fish and Wildlife Office, Carlsbad, California.
- Otis, D. L., J. H. Schulz, D. Miller, R. E. Mirarchi and T. S. Baskett. 2008a. Mourning Dove (*Zenaida macroura*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/ species/117.
- Otis, D. L., J. H. Schulz, and D. P. Scott. 2008b. Mourning Dove (*Zenaida macroura*) harvest and population parameters derived from a national banding study. U.S. Department of Interior, Fish and Wildlife Service, Biological Technical Publication FWS/BTP-R3010-2008, Washington, D.C.
- Outdoor Economy Foundation. 2006. The Active Outdoor Recreation Economy. Accessed at: http://www.outdoorindustry.org/images/researchfiles/RecEconomypublic.pdf.
- Owens, N.W. 1977. Responses of wintering Brent Geese to human disturbance. Wildfowl 28:5-11.
- Pacific Flyway Council. 2003. Pacific Flyway Management Plan for Western White-winged Doves. U. S. Fish and Wildlife Service, Portland, Oregon.
- Pacific Southwest Biological Services, Inc. 1991. Report of a Biological Assessment of the Rancho San Miguel Property San Diego County, California.
- Parsick, D. P. 2002. An examination of feeding in the fairy shrimp *Branchinecta sandiegonensis*. Master's Thesis, University of San Diego, California.
- Pashley, D. N., C. J. Beardmore, J. A. Fitzgerald, R. P. Ford, W. C. Hunter, M. S. Morrison, K. V. Rosenberg. 2000. Partners in Flight: Conservation of the Land Birds of the United States. American Bird Conservancy, The Plains, VA.

- Patten, M. A. and J. T. Rotenberry. 1999. The approximate effects of rainfall on clutch size of the California Gnatcatcher. Condor 101:876-880.
- Payne, W. 1976. Biochemistry and species problems in *Ambrosia* (Asteraceae–Ambrosieae). Plant Syst. Evol. 125:169-178.
- Payne, W. 1993. *Ambrosia. In* Jepson WL, Hickman J. C. (eds.) The Jepson manual: higher plants of California. University of California Press, Berkeley, California.
- Penrod, K., C. Cabañero, P. Beier, C. Luke, W. Spencer, and E. Rubin. 2006. South Coast Missing Linkages Project: A Linkage Design for the Peninsular-Borrego Connection. Produced by South Coast Wildlands, Idyllwild, CA. www.scwildlands.org, in cooperation with California State Parks.
- Pesticide Properties Database (PPDB). 2009. PPDB, developed by the Agriculture & Environment Research Unit (AERU), University of Hertfordshire, funded by UK national sources and the EU-funded FOOTPRINT project (FP6-SSP-022704).
- Peterson, B. L., B. E. Kus, and D. H. Deutschman. 2004. Determining nest predators of the Least Bell's Vireo through point counts, tracking stations, and video photography. Journal of Field Ornithology 75(1):89-95.
- Pierce, D. W., D. R. Cayan, Tapash Das, E. P. Maurer, N. L. Miller, Yan Bao, M. Kanamitsu, Kei Yoshimura, M. A. Snyder, L. C. Sloan, Guido Franco, and M. Tyree. 2013. The Key Role of Heavy Precipitation Events in Climate Model Disagreements of Future Annual Precipitation Changes in California. Journal of Climate 26:5879-5896.
- Pitelka, F. and Koestner. 1942. Breeding Behavior of Bell's Vireo in Illinois. Wilson Bulletin 54:97-106.
- Pimental, D., R. Zuniga, and D. Morrison. 2005. Update on the environmental and economic costs associated with alien-invasive species in the United States. Ecological Economics 52(3):273-288.
- Polite, C. 1988–1990. Brush Rabbit (California Wildlife Habitat Relationships System Species Account). Originally published in: Zeiner, D. C., W. F. Laudenslayer, Jr., K. E. Mayer, and M. White, eds. 1988-1990. California's Wildlife. Vol. I-III. California Department of Fish and Game, Sacramento, California. Account updated by California Wildlife Habitat Relationships staff in May, 2000.
- Polite, C. and G. Ahlborn. 1988–1990. Desert Cottontail (California Wildlife Habitat Relationships System Species Account). Originally published in: Zeiner, D. C., W. F. Laudenslayer, Jr., K. E. Mayer, and M. White, eds. 1988-1990. California's Wildlife. Vol. I-III. California Department of Fish and Game, Sacramento, California.
- Pollak, Daniel. 2001. Natural Community Conservation Planning (NCCP), The Origins of an Ambitious Experiment to Protect Ecosystems (Part 1 of a Series). (Prepared at the request of Senator Byron D. Sher). California Research Bureau, Sacramento, California.
- Pourade, Richard F. 1963. The Silver Dons. The History of San Diego. Union-Tribune Publishing, San Diego, California.

- Pourade, Richard F. 1964. The Glory Years. The History of San Diego. Union-Tribune Publishing, San Diego, California.
- Pratt, J. and K. Mooney. 2013. Clinal adaptation and adaptive plasticity in Artemisia californica: implications for the response of a foundation species to predicted climate change. Global Change Biology (2013):1-13.
- PRBO Conservation Science. 2011. Projected Effects of Climate Change in California: Ecoregional Summaries Emphasizing Consequences for Wildlife. Version 1.0. http://data.prbo.org/apps/bssc/climatechange (Accessed March 6, 2012).
- Preston, K. L., P. J. Mock, M. A. Grishaver, E. A. Bailey, and D. F. King. 1998a. California gnatcatcher territorial behavior. Western Birds 29:242-257.
- Preston, K. L, M. A. Grishaver, and P. J. Mock. 1998b. California gnatcatcher vocalization behavior. Western Birds 29:258-268.
- Pretty J., C. Angus, M. Bain, J. Barton, V. Gladwell, R. Hine, S. Pilgrim, S. Sandercock, and M. Sellens. 2009. Nature, Childhood, Health and Life Pathways. Interdisciplinary Centre for Environment and Society Occasional Paper 2009-02. University of Essex, UK.
- Proctor, V. W., C. R. Malone, and V. L. DeVlaming. 1967. Dispersal of aquatic organism: viability of disseminules recovered from the intestinal tract of captive killdeer. Ecology 48:672-676.
- Prudhoe, S. and R. A. Bray. 1982. Platyhelminth Parasites of the Amphibia. British Museum (Natural History), London, and Oxford University Press, Oxford.
- Rabe, M. J., and T. A. Sanders. 2010. White-winged dove population status, 2010. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C.
- Ramirez, R. S., Jr. 2003. Arroyo toad (*Bufo californicus*) hydrogeomorphic habitat baseline analysis/radio telemetry study - Rancho Las Flores San Bernardino County, California. Final report to Rancho Las Flores Limited Partnership by Cadre Environmental, Carlsbad, California.
- Randall, J. 1996. Weed control for the preservation of biological diversity. Weed Technology 10:370-383.
- Randler, Christopher. 2006. Disturbance by dog barking increases vigilance in Coots (*Fulica atrata*). European Journal of Wildlife Research 54(4):265-270.
- RECON Environmental, Inc. 2010. Results of the pre-water transfer clearance survey for arroyo toad on the Sweetwater River between the Loveland and Sweetwater Reservoirs. (RECON number 5805). Unpubl. Report prepared for Sweetwater Authority, Chula Vista, California.
- RECON Environmental, Inc. 2011. Letter to John Martin, U.S. Fish and Wildlife Service, dated June 3, 2011 regarding San Diego Ambrosia (*Ambrosia pumila*) Populations Summary Report.

- Reeder, J. R. 1982. Systematics of the tribe Orcuttieae (Gramineae) and the description of a new segregate genus, *Tuctoria*. Am. J. of Bot. 69:1082-1095.
- Reeder, J. R. 1993. *Orcuttia*. Pages 1276-1277. *In* J. C. Hickman, editor. The Jepson manual: higher plants of California. University of California Press, Berkeley, California.
- Rees, N. E., P. C. Quimby Jr., G. L. Piper, E. M. Coombs, C. E. Turner, N. R. Spencer, and L. V. Knutson (editors). 1996. Biological control of weeds in the west. Western Society of Weed Science in cooperation with USDA Agricultural Research Service, Montana Department of Agriculture, and Montana State University.
- Regan, H. M., L. A. Hierl, J. Franklin, and D. H. Deutschman. 2006. Draft MSCP Covered Species Prioritization. Prepared by San Diego State University, Department of Biology for the California Department of Fish and Game (Task B of Local Assistance Grant #P0450009). January 2006.
- Reider, Shirley Bowman. n.d. Highway 94 History. Available at: http://www.hwy94.com.
- Reiser, C. H. 1996. Rare plants of San Diego County, 1996 edition. Aquafir Press, San Diego, California.
- Reiser, C. H. 2001. Rare plants of San Diego County. 2001 edition. Aquafir Press.
- RHJV (Riparian Habitat Joint Venture). 2004. Version 2.0. The riparian bird conservation plan: a strategy for reversing the decline of riparian associated birds in California. California Partners in Flight. Available at: http://www.prbo.org/calpif/pdfs/riparian.v-2.pdf.
- Rice, Kevin J. 1989. Impacts of seed banks on grassland community structure and population dynamics. In: Ecology of soil seed banks. Eds. Leck, Mary A., V. Thomas Parker, and Robert L. Simpson. Academic Press, Inc. San Diego, CA.
- Rich, T. D., C. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Iñigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, T. C. Will. 2004.
  Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, NY. Partners in Flight website: http://www.partnersinflight.org/cont\_plan/ (VERSION: March 2005).
- Ripley, B. J., J. Holtz, and M. A. Simovich. 2004. Cyst bank life-history model for a fairy shrimp from ephemeral ponds. Freshwater Biology 49:221-231.
- Rochester, C., S. Hathaway, C. Brown, K. Pease, and R. Fisher. 2001. Herpetofaunal monitoring in MSCP Region of San Diego. US Geological Survey and San Diego State University, Department of Biology, Prepared for City of San Diego.
- Rochester, C. J., R. N. Fisher, C. S. Brehme, D. R. Clark, D. C. Stokes and S. A. Hathaway. 2008. Herpetofaunal responses to wildfire. Presented at Pacific Coast Fire Conference Dec. 1-4, 2008. San Diego, CA (Poster with Abstract).
- Rogers, Malcolm J. 1938. Archaeological and Geological Investigations of the Culture Levels in an Old Channel of San Dieguito Valley. Carnegie Institution of Washington Yearbook 37:344-45.

- Rogers, Malcolm J. 1939. Early Lithic Industries of the Lower Basin of the Colorado River and Adjacent Desert Areas. San Diego Museum of Man Papers 3.
- Rogers, Malcolm J. 1945. An Outline of Yuman Prehistory. Southwestern Journal of Anthropology 1(2):167-198. Albuquerque.
- Rolle, Andrew. 1998. California: A History. Harlan Davidson, Inc. Wheeling, Illinois.
- Rosen, P. C. and C. R. Schwalbe. 2002. Widespread effects of introduced species on reptiles and amphibians in the Sonoran Desert region. Pages 220–240. *In* B. Tellman (ed.), Invasive Exotic Species in the Sonoran Region. University of Arizona Press and the Arizona-Sonora Desert Museum, Tucson.
- Salata, L. R. 1983a. Status of the Least Bell's Vireo on Camp Pendleton, California. Report on research done in 1982. U.S. Fish and Wildlife Service Contract Report No. 11100-0145-82, Laguna Niguel, California.
- Salata, L. R. 1983b. Status of the Least Bell's Vireo on Camp Pendleton, California. Report on research done in 1983. U.S. Fish and Wildlife Service Contract Report No. 10181-9373, Laguna Niguel, California.
- Saldaña, Lori. 1993. MSCP Plans the Future of Conservation in San Diego, in San Diego Earth Times, February 1994.
- Salton Sea Authority. 2006. Salton Sea Revitalization and Restoration. Salton Sea Authority Plan for Multi-Purpose Project.
- San Diego Association of Governments (SANDAG). 1995. Vegetation\_CN [ESRI shapefile]. San Diego, CA. http://www.sandag.org [January 18, 2012].
- San Diego Association of Governments (SANDAG). Current Estimates (data extracted in November 2011 from Data Warehouse at http://datawarehouse.sandag.org/).
- San Diego Association of Governments (SANDAG). 2011. San Diego Region Aggregate Supply Study.
- San Diego Association of Governments (SANDAG). "Land Use Current" SanGIS/SANDAG. SanGIS/SANDAG Data Warehouse. 2009 January 1.
- San Diego Association of Governments (SANDAG). Average Weekday Traffic Volumes. Website http://www.sandag.org/resources/demographics\_and\_other\_data/transportation/adtv/index.asp , accessed on 1/31/12.
- San Diego, City of. 1995. Multiple Species Conservation Program (MSCP), Volume 1: MSCP Resource Document.
- San Diego, City of. 1997. Multiple Species Conservation Program, City of San Diego MSCP Subarea Plan.
- San Diego, City of. 1998a. Final Multiple Species Conservation Program MSCP Plan.

San Diego, City of. 1998b. City of San Diego Traffic Impact Study Manual.

7-28 San Diego National Wildlife Refuge -

San Diego, City of. 2004. City of San Diego Vernal Pool Inventory 2002-2003.

- San Diego, City of. 2005. City of San Diego Rare Plant Monitoring Report, 2005: Acanthomintha ilicifolia. City of San Diego, Multiple Species Conservation Program, San Diego.
- San Diego, City of. 2008. Final Program Environmental Impact Report for the Draft General Plan.
- San Diego, City of. 2009a. City of San Diego Water Department Recycled Water Pricing Study, Draft Report (January 9, 2009).
- San Diego, City of. 2011. Carmel Mountain and Del Mar Mesa Preserves Resource Management Plan (draft).
- San Diego, City of and U.S. Fish and Wildlife Service. 1997. Final EIR/EIS for Issuance of Take Authorizations for Threatened and Endangered Species Due to Urban Growth Within the Multiple Species Conservation Program (MSCP) Planning Area.
- San Diego, County of, Office of the Assessor. 1955. Historic Roads and Trails: 1769–1885. Map on file at the South Coast Information Center.
- San Diego, County of. 1963. Geology and Mineral Resources of San Diego, California. County Report Number 3.
- San Diego, County of. 1997. Multiple Species Conservation Program County of San Diego Subarea Plan. http://www.sdcounty.ca.gov/pds/mscp/docs/SCMSCP/MSCP\_County\_Subarea\_Plan.pdf.
- San Diego, County of. 2007a. County of San Diego Guidelines for Determining Significance Geologic Hazards. Land Use and Environment Group, Department of Planning and Land Use and Department of Public Works, San Diego, California.
- San Diego, County of. 2007b. County of San Diego Guidelines for Determining Significance and Report Format and Content Requirements Agricultural Resources. Land Use and Environment Group, Department of Planning and Land Use and Department of Public Works, San Diego, California.
- San Diego, County of. 2009. County of San Diego Guidelines for Determining Significance Paleontological Resources. Land Use and Environment Group, Department of Planning and Land Use and Department of Public Works, San Diego, California.
- San Diego, County of. 2010a. Draft General Plan, Mobility Element (Chapter 4). Draft version dated April 2, 2010.
- San Diego, County of. 2010b. Public Road Standards. Department of Public Works.
- San Diego, County of. 2011. San Diego County General Plan Update Draft Final Environmental Impact Report, Volume 1. Department of Planning and Land Use, San Diego, California.
- San Diego, County of, Vector Control Website: http://www.sdcounty.ca.gov/deh/pests/vector\_disease.html, accessed on February 1, 2012.

- San Diego Management and Monitoring Program. 2013. Management Strategic Plan for Conserved Lands in Western San Diego County, Volume 1: Overview and Approach. 3 Volumes. Prepared for the San Diego Association of Governments. San Diego. Version 08.27.2013.
- San Diego Natural History Museum (SDNHM). 2010. Feral Pig Distribution Survey Report, San Diego County; prepared for the Nature Conservancy. Available online at: http://sdferalpigs.org/.
- Sawyer , J. O., T. Keeler-Wolf, and J. M. Evens. 2008. A Manual of California Vegetation, 2nd ed. California Native Plant Society, Sacramento, California, USA.
- Schaal, B. A. and W. J. Leverich. 1981. The demographic consequences of two-stage life cycles: survivorship and the time of reproduction. American Naturalist 118(1):135-138.
- Scheidlinger, C. R. 1981. Population dynamics of *Pogogyne abramsii* on the Clairemont Mesa, San Diego County, California. M.S. Thesis, San Diego State University, San Diego, California.
- Schiller, J. R., P. H. Zedler, and C. H. Black. 2000. The effect of density-dependent insect visits, flowering phenology, and plant size on seed set of the endangered vernal pool plant *Pogogyne ambramsii* (Lamiaceae) in natural compared to created vernal pools. Wetlands 20:386-396.
- Seamans, M. E., K. Parker, and T. A. Sanders. 2011. Mourning Dove Population Status, 2011. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C.
- Sedgwick, J. A. 2000. Willow Flycatcher (*Empidonax traillii*). *In* Poole, A. and Gill, F., eds., The Birds of North America, No. 533: The Birds of North America, Inc., Philadelphia, Pennsylvania.
- Sharp, B. L. 2002. Factors influencing the incidence of brood parasitism by Brown-headed Cowbirds (*Molothrus ater*) of Least Bell's Vireos (*Vireo bellii pusillus*). Unpublished Master's Thesis, San Diego State University, California.
- Sharp, B. L. and B. E. Kus. 2006. Factors Influencing the Incidence of Cowbird Parasitism of Least Bell's Vireos. Journal of Wildlife Management 70(3):682–690.
- Shipek, Florence C. 1986. The Impact of Europeans upon Kumeyaay Culture. Pages 13-25. *In* The Impact of European Exploration and Settlement on Local Native Americans. Cabrillo Festival Historical Seminar. San Diego: Cabrillo Historical Association.
- Shipek, Florence C. 1991. Delfina Cuero: Her Autobiography. Ballena Press, Menlo Park, California.
- Shuford, W. D., and Gardali, T., editors. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.
- Sigler, W. F. and J. W. Sigler. 1996. Fishes of Utah: A Natural History. University of Utah Press.

- Sime, C. A. 1999. Domestic dogs in wildlife habitats. Pages 8.1–8.17. *In* Joslin G., Youmans H. (coordinators) Effects of recreation on Rocky Mountain wildlife: A review for Montana committee on effects of recreation on wildlife, Montana Chapter of the Wildlife Society.
- Simovich, M. A. and S. A. Hathaway. 1997. Diversified bet-hedging as a reproductive strategy of some ephemeral pool anostracans (*Branchiopoda*). Journal of Crustacean Biology 17(1): 38-44.
- Small, A. 1994. California birds: their status and distribution. Ibis Publishing Co.
- Smith, S. D., T. E. Huxman, S. F. Zitzer, T. N. Charlet, D. C. Housman, J. S. Coleman, L. K. Fenstermaker, J. R. Seemann, and R. S. Nowak. 2000. Elevated CO<sub>2</sub> Increases Productivity and Invasive Species Success in an Arid Ecosystem. Letters to Nature, Nature 408:79-82. November 2, 2000 (www.nature.com).
- Sogge, M. K., Ahlers, Darrell, and Sferra, S. J. 2010. A natural history summary and survey protocol for the southwestern willow flycatcher: U.S. Geological Survey Techniques and Methods 2A-10.
- Sogge, M. K. and S. L. Durst. 2008. Southwestern willow flycatcher rangewide abundance, distribution, and site characteristic database 2007. U.S. Geological Survey Southwest Biological Science Center, Colorado Plateau Field Station, Flagstaff, AZ.
- Sogge, M. K., T. J. Tibbitts, and J. Petterson. 1997. Status and ecology of the southwestern willow flycatcher in the Grand Canyon. Western Birds 28:142-157.
- Sonoran Joint Venture (SJV) Technical Committee. Beardmore, C.J., ed. 2006. Sonoran Joint Venture: Bird Conservation Plan, Version 1.0. Tucson: Sonoran Joint Venture.
- Spenser, S. C. and L. H. Rieseberg. 1998. Evolution of amphibious vernal pool specialist annuals: putative vernal pool adaptive traits in *Navarretia* (Polemoniaceae). Pages 76-85. *In* C. W. Withim et al. (editors), Ecology, conservation and management of vernal pool ecosystems proceedings from a 1996 conference. California Native Plant Society, Sacramento, California.
- Speulda, Lou Ann. 1999. U.S. Fish and Wildlife Service, Historic Properties Identification and Evaluation Report of the San Miguel Ranch Buildings Evaluation. Unpublished report on file with USFW, Reno, NV.
- Spier, Leslie. 1923. Southern Diegueño Customs. University of California Publications in American Archaeology and Ethnology 20(16):295-358. Berkeley.
- Spinks, P. Q., G. B. Pauly, J. J. Crayon, and H. B. Shaffer. 2003. Survival of the Western Pond Turtle (*Emys marmorata*) in an Urban California Environment. Biological Conservation 113(2):257-267.
- Sproul, Fred, Todd Keeler-Wolf, Patricia Gordon-Reedy, Jonathan Dunn, Anne Klein, and Kyle Harper. 2011. Vegetation Classification Manual for Western San Diego County. Prepared by AECOM, California Department of Fish and Game Vegetation Classification and Mapping Program, and Conservation Biology Institute and prepared for San Diego Association of Governments, San Diego County, California. Available on the web at: http://www.dfg.ca.gov/ biogeodata/vegcamp/veg\_classification\_reports\_maps.asp.

- Stebbins, R. C. 1985. A field guide to western reptiles and amphibians. McGraw Hill Book Company, New York, New York.
- Stebbins, R. C. 2003. A Field Guide to Western Reptiles and Amphibians. Third Edition. Houghton Mifflin Company, Boston.
- Stokes, D. C., C. S. Brehme, S. A. Hathaway, and R. N. Fisher. 2005. Bat Inventory of the Multiple Species Conservation Program Area in San Diego County, California. Prepared for the County of San Diego and the California Department of Fish and Game, by the U. S. Geological Survey, Western Ecological Research Center.
- Stone, D. R. 1990. California's endemic vernal pool plants: some factors influencing their rarity and endangerment. Pages 89-108. In D. H. Ikeda and R. A. Schlising (Editors). Vernal Pool Plants: Their Habitat and Biology. Studies from the Herbarium, Number 8, California State University. Chico, CA.
- Storer, T. I. 1925. A synopsis of the Amphibia of California. University of California Publications in Zoology 27:1-342.
- Storer, T. I. 1933. Frogs and their commercial use. California Fish and Game 19(3):203-213.
- Strategic Issues Panel on Fire Suppression Costs. 2004. Large Fire Suppression Costs Strategies for Cost Management a Report to the Wildland Fire Leadership Council from the Strategic Issues Panel on Fire Suppression Costs.
- Sweet, S. S. 1992. Initial report on the ecology and status of the arroyo toad (*Bufo microscaphus californicus*) on the Los Padres National Forest of Southern California, with management recommendations. Contract report to USDA, Forest Service, Los Padres National Forest, Goleta, California.
- Sweet, S. S. 1993. Second report on the biology and status of the arroyo toad (*Bufo microscaphus californicus*) on the Los Padres National Forest of southern California. Report to the United States Department of Agriculture, Forest Service. Los Padres National Forest, Goleta, California.
- Sweetwater Authority and RMC Water and Environment. 2011. Sweetwater Authority 2010 Urban Water Management Plan (Public Review Draft of May 24, 2011). Chula Vista, California.
- Sweitzer, R. A. 2003. Wild Pig Management Plan for Pacheco State Park. University of North Dakota.
- Sweitzer, R. and B. Mccann. 2007. Natural Areas Ecological Damage and Economic Costs Survey Report 2007. Department Of Biology, University Of North Dakota, Grand Forks, ND.
- Sweitzer, R. A. and D. VanVuren. 2002. Rooting and foraging effects of wild pigs on tree regeneration and acorn survival in California's oak woodland ecosystems. Proceedings of the 5<sup>th</sup> symposium on oak woodlands: oaks in California's changing landscape. General Technical Report PSW-GRT-184. Albany California: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.

- Sweitzer, R. A. and D. VanVuren. 2008. Effects of Wild Pigs on Seedling Survival in California Oak Woodlands. Proceedings of the 6<sup>th</sup> symposium on oak woodlands: today's challenges, tomorrow's opportunities. General Technical Report PSW-GRT-217. Albany California: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.
- Task Force. 2004. Equestrian-Related Water Quality Best Management Practices; A Cooperative Effort among Private and Public Entities in Orange and San Diego Counties, California in response to NPDES permits issued by the Santa Ana and San Diego Regional Water Quality Control Boards. Accessed online at: http://www.ci.laguna-hills.ca.us/civica/filebank/blobdload.asp?BlobID=2745.
- Tanowitz, Barry D., Paul F. Salopek, and Bruce E. Mahall. 1987. Differential germination of ray and disc achenes in *Hemizonia increscens* (Asteraceae). Amer. J. Bot. 74(3):303-312.
- Taylor, A. R. and R. L. Knight. 2003. Wildlife Responses to Recreation and Associated Visitor Perceptions. Ecological Applications 13:951–963. Accessed online at: http://dx.doi.org/10.1890/ 1051-0761(2003)13[951:wrtraa]2.0.co;2.
- Technology Associates International Corporation (TAIC). 2002. California gnatcatcher habitat evaluation model for USFWS. Digital Data. USFWS Office, Carlsbad, CA.
- Templeton, A. R. and D. A. Levin. 1979. Evolutionary consequences of seed pools. American Naturalist 114(2):232-249.
- Thorne, F. 1963. The distribution of an endemic butterfly *Lycaena hermes*. Journal of Research in Lepidoptera 2:143-150.
- Thorne, R. F. 1976. The vascular plant communities of California. Pages 1-30. *In* J. Latting, editor. Plant Communities of Southern California. California Native Plant Society, Berkeley, CA.
- Thorne, R. F. 1984. Are California's vernal pools unique? Pages 1-8. In Vernal Pools and Intermittent Streams. S. Jam and P. Moyle (eds.). University of California, Davis Institute of Ecology Publication No. 28. Davis, California.
- Tierra Madre Consultants, Inc. 1992. Eastern Municipal Water District, Hemet-Winchester Interceptor Sewer, Mitigation Plan for Chenopod Scrub and Vernal Pool. Unpublished.
- Tinbergen, N. 1951. "The Study of Instinct." Oxford University Press, New York (reprinted 1961).
- Tinsley, R. C. 1996. Parasites of Xenopus. Page 233-261. In R. C. Tinsley and H. R. Kobel (editors). The Biology of Xenopus. Clarendon Press for The Zoological Society of London, Oxford.
- Tracey, J., K. McEachern, and K. Greer. 2011. San Diego Rare Plant Monitoring Plan: Fiscal Year 2011. January 2011.
- True, Delbert L. 1970. Investigation of a Late Prehistoric Complex in Cuyamaca Rancho State Park, San Diego County, California. Department of Anthropology Publications, University of California, Los Angeles.
- True, Delbert L. 1980. The Pauma Complex in Northern San Diego County: 1978. The Journal of New World Archaeology 3(4):1-39.
- Tu, M., C. Hurd, and J. Randall. 2001. Weed Control Methods Handbook: Tools & Techniques for use in Natural Areas. The Nature Conservancy. Available at http://tncweeds.ucdavis.edu, version: April 2001.
- Twedt, B. 1993. A comparative ecology of *Rana aurora* Baird and Girard and *Rana catesbeiana*, Shaw at Freshwater Lagoon, Humboldt County, California. Unpublished Master's Thesis, Humboldt State University.
- USDA Forest Service. 2013. Environmental Assessment Feral Pig Damage Control Project on Cleveland National Forest and Bureau of Land Management Lands.
- U.S. Environmental Protection Agency (USEPA). 1993. Reregistration Eligibility Decision (RED) Facts Glyphosate. EPA-738-R-93-014.
- U.S. Environmental Protection Agency (USEPA). 2005. Registration eligibility decision for chlorsulfuron, List A, Case No. 0631. Office of Pesticide Programs, U.S. Environmental Protection Agency, Washington, D.C.
- U.S. Environmental Protection Agency (USEPA). 2011a. Letter to Governor Brown from USEPA Regional Administrator (Region IX) Jared Blumenfeld, dated December 9, 2011. Accessed online at: http://www.epa.gov/ozonedesignations/2008standards/rec/eparesp/R9\_CA\_resp.pdf.
- U.S. Environmental Protection Agency (USEPA). 2011b. Greenhouse Gas Equivalencies Calculator Website: http://www.epa.gov/RDEE/energy-resources/calculator.html. Updated May 2011.
- U.S. Fish and Wildlife Service. 1986. Endangered and threatened wildlife and plants; determination of endangered status for the least Bell's vireo; Final rule. *Federal Register* 51:16474-16482. May 2, 1986.
- U.S. Fish and Wildlife Service. 1993. Endangered and threatened wildlife and plants; determination of threatened status for the coastal California gnatcatcher; Final rule. *Federal Register* 58: 16742-16757. March 30, 1993.
- U.S. Fish and Wildlife Service. 1994. Endangered and threatened wildlife and plants; designation of critical habitat for least Bell's vireo; Final rule. *Federal Register* 59:4845-4867. February 2, 1994.
- U.S. Fish and Wildlife Service. 1995a. Final Environmental Assessment for the Proposed Acquisition of Rancho San Diego, Sweetwater II, and Lot 707 Properties for the Resolution Trust Corporation for the Proposed San Diego National Wildlife Refuge, Otay Sweetwater Unit, San Diego County, California.
- U.S. Fish and Wildlife Service. 1995b. Level I Preacquisition Contaminants Survey of Rancho San Diego and Sweetwater II Parcels of the Proposed Otay-Sweetwater National Wildlife Refuge (Interim Report, January 18, 1995). Division of Environmental Contaminants, Carlsbad, California.

- U.S. Fish and Wildlife Service. 1995c. Sacramento-San Joaquin Delta Native Fishes Recovery Plan. Portland, Oregon.
- U.S. Fish and Wildlife Service. 1997a. Environmental Assessment and Land Protection Plan. Otay-Sweetwater Unit, San Diego National Wildlife Refuge, San Diego County, California.
- U.S. Fish and Wildlife Service. 1997b. Conceptual Management Plan San Diego National Wildlife Refuge, San Diego County, California.
- U.S. Fish and Wildlife Service. 1997c. Environmental Assessment and Land Protection Plan. Vernal Pools Stewardship Project, San Diego National Wildlife Refuge, San Diego County, California.
- U.S. Fish and Wildlife Service. 1998a. Vernal Pools of Southern California Recovery Plan. U.S. Fish and Wildlife Service, Portland, Oregon.
- U.S. Fish and Wildlife Service. 1998b. Draft Recovery Plan for the Least Bell's Vireo (Vireo bellii pusillus). U.S. Fish and Wildlife Service, Region 1, Portland, Oregon. March 1998.
- U.S. Fish and Wildlife Service. 1999a. Survey Protocol for the Arroyo Toad.
- U.S. Fish and Wildlife Service. 1999b. Arroyo southwestern toad (*Bufo microscaphus californicus*) recovery plan. Portland, Oregon.
- U.S. Fish and Wildlife Service. 2002a. Southwestern Willow Flycatcher Recovery Plan. Albuquerque, New Mexico.
- U.S. Fish and Wildlife Service. 2002c. Recovery Plan for the California Red-legged Frog (*Rana aurora draytonii*). U.S. Fish and Wildlife Service, Portland, Oregon.
- U.S. Fish and Wildlife Service. 2003a. Mourning Dove National Strategic Harvest Management Plan. Prepared by the National Mourning Dove Planning Committee, with input from the Pacific Flyway Study Committee, Central Flyway Webless Migratory Game Bird Central Committee, and Eastern Management Unit Dove Technical Committee.
- U.S. Fish and Wildlife Service. 2003b. Quino Checkerspot Butterfly (*Euphydryas editha quino*) Recovery Plan. Portland, Oregon.
- U.S. Fish and Wildlife Service. 2004a. Wildland Fire Management Plan for the San Diego National Wildlife Refuge Complex. Carlsbad, CA.
- U.S. Fish and Wildlife Service. 2004b. Recovery plan for *Deinandra conjuguns* (Otay tarplant). Carlsbad, CA.
- U.S. Fish and Wildlife Service. 2006a. San Diego Bay National Wildlife Refuge, Sweetwater Marsh and South San Diego Bay Units, Final Comprehensive Conservation Plan and Environmental Impact Statement. August.
- U.S. Fish and Wildlife Service. 2006b. Least Bell's Vireo (*Vireo bellii pusillus*) 5-Year Review and Summary Evaluation. Carlsbad Fish and Wildlife Office, Carlsbad, California. September, 2006.

- U.S. Fish and Wildlife Service. 2007. Endangered and threatened wildlife and plants; designation of critical habitat for *Ceanothus ophiochilus* (Vail Lake ceanothus) and *Fremontodendron mexicanum* (Mexican flannelbush). *Federal Register* 72: 54984–55010. September 27, 2007.
- U.S. Fish and Wildlife Service. 2008a. Environmental Site Assessment Report Canyon Dump Site, San Diego National Wildlife Refuge, Jamul, California. Prepared by the Environmental Contaminants Division, Carlsbad Fish and Wildlife Office, Carlsbad, California.
- U.S. Fish and Wildlife Service. 2008b. San Diego Fairy Shrimp (*Branchinecta sandiegonensis*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California. September 2008.
- U.S. Fish and Wildlife Service. 2008c. Riverside Fairy Shrimp (*Streptocephalus woottoni*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California. September 2008.
- U.S. Fish and Wildlife Service. 2008d. Birds of Conservation Concern 2008. Division of Migratory Bird Management, Arlington, Virginia.
- U.S. Fish and Wildlife Service. 2008e. Wildlife Watching in the U.S.: The Economic Impacts on National and State Economies in 2006 (Addendum to the 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation). Report 2006-1. Prepared by Jerry Leonard, Wildlife and Sport Fish Restoration Program, Arlington, VA.
- U.S. Fish and Wildlife Service. 2009a. *Acanthomintha ilicifolia* (San Diego thornmint) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California. August 12, 2009.
- U.S. Fish and Wildlife Service. 2009b. *Deinandra conjugens* (Otay tarplant) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California. June 30, 2009.
- U.S. Fish and Wildlife Service. 2009c. *Fremontodendron mexicanum* (Mexican flannelbush) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California. August 14, 2009.
- U.S. Fish and Wildlife Service. 2009d. *Navarretia fossalis* (Spreading navarretia) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California. August 10, 2009.
- U.S. Fish and Wildlife Service. 2009e. Quino Checkerspot Butterfly (*Euphydryas editha quino*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California. August 13, 2009.
- U.S. Fish and Wildlife Service. 2009f. Arroyo Toad (*Bufo californicus* (=*microscaphus*)) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California. August 2009.
- U.S. Fish and Wildlife Service. 2010a. Operational Blueprint for Inventory and Monitoring on National Wildlife Refuges: Adapting to Environmental Change. USFWS, National Wildlife Refuge System, Inventory and Monitoring Program.

- U.S. Fish and Wildlife Service. 2010b. Coastal California gnatcatcher (*Polioptila californica californica*) 5-year review: Summary and evaluation. Carlsbad Fish and Wildlife Office, Carlsbad, California.
- U.S. Fish and Wildlife Service. 2010c. *Ambrosia pumila* (San Diego ambrosia) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California. July 15, 2010.
- U.S. Fish and Wildlife Service. 2010d. *Arctostaphylos glandulosa* subsp. *Crassifolia* (Del Mar manzanita) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California. August 13, 2010.
- U.S. Fish and Wildlife Service. 2010e. *Pogogyne abramsii* (San Diego mesa mint) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California. September 1, 2010.
- U.S. Fish and Wildlife Service. 2010f. *Pogogyne nudiuscula* (Otay mesa mint) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California. September 1, 2010.
- U.S. Fish and Wildlife Service. 2010g. *Eryngium aristulatum* var. *parishii* (San Diego button celery) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California. September 1, 2010.
- U.S. Fish and Wildlife Service. 2010h. Rising to the Urgent Challenge: Strategic Plan for Responding to Accelerating Climate Change.
- U.S. Fish and Wildlife Service. 2011a. *Orcuttia californica* (California Orcutt grass) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California. March 11, 2011.
- U.S. Fish and Wildlife Service. 2011b. *Baccharis vanessae* (Encinitas Baccharis) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California. December 22, 2011.
- U.S. Fish and Wildlife Service and U.S. Bureau of the Census. 1993. 1991 National survey of fishing, hunting, and wildlife-associated recreation. U.S. Government Printing Office.
- U.S. Geological Survey, Western Ecological Research Center. 2003. Development of a comprehensive ecological monitoring strategy in support of the coastal sage scrub NCCP program in southern California and analysis of the existing monitoring efforts. Available:<a href="http://www.werc.usgs.gov/sandiego/pdfs/hcpsocal.pdf">http://www.werc.usgs.gov/sandiego/pdfs/hcpsocal.pdf</a>>.
- Unitt, P. 1987. *Empidonax traillii extimus*: an endangered subspecies. Western Birds 18:137-162.
- Unitt, P. 2004. San Diego County Bird Atlas. San Diego Natural History Museum and Ibis Publishing Company, San Diego.
- University of California Riverside. 2011. The Goldspotted Oak Borer. Center for Invasive Species Research Webpage, accessed on 2/1/12 (http://cisr.ucr.edu/goldspotted\_oak\_borer.html).

- Van Horn, M. A., R. M. Gentry, and J. Faaborg. 1995. Patterns of Ovenbird (Seiurus aurmoapillus) pairing success in Missouri forest tracts. Auk 112:98-106.
- Van Wormer, S. No date. A History of the Jamacha Valley. Unpublished report on file with USFWS, Reno, NV.
- Van Wormer, S. 1984. "Legal Hocus-Pocus" The Subdivision of Jamacha Rancho. The Journal of San Diego History. Spring 1984, Volume 30, Number 2.
- Vulliamy, B., S. G. Potts, and P. G. Willmer. 2006. The effects of cattle grazing on plant-pollinator communities in a fragmented Mediterranean landscape. Oikos 114(3):529–543.
- Waithman, J. D., R. A. Sweitzer, A. J. Brinkhaus, I. A. Gardner, D. Van Vuren, and W. M. Boyce. 1999. Range Expansion, Population Sizes, and Management of Wild Pigs in California. Journal of Wildlife Management 63:298-308.
- Walawender, M. J. No Date. Geologic History of San Diego County. San Diego Natural History Museum Website http://www.sdnhm.org/research/geology/geo\_intro.html. Accessed August 5, 2011.
- Warren, Claude N., Gretchen Siegler, and Frank Dittmer. 1993. Paleoindian and Early Archaic Periods. In Historic Properties Background Study for the City of San Diego Clean Water Program. On file with City of San Diego Clean Water Program and Mooney and Associates, San Diego.
- Weaver, K. L. 1998. Coastal sage scrub variations of San Diego County and their influence on the distribution of the California gnatcatcher. Western Birds 29:392-405.
- Webb, C. and J. Joss. 1997. Does predation by the fish *Gambusia holbrooki* (Atheriniformes: Poeciliidae) contribute to declining frog populations? Australian Zoologist 30(3):316-24.
- Weber, F. H., Jr. 1963. Mines and Mineral Resources of San Diego County, California. California Division of Mines and Geology County Report 3 and "Geology and Mineral Resources of San Diego County, California" Plate 1.
- Weiss, S. B. 1999. Cars, cows, and butterflies: Nitrogen deposition and management of nutrient-poor grasslands for a threatened species. Conservation Biology 13:1476-1486.
- West, B. C., A. L. Cooper, and J. B. Armstrong. 2009. Managing wild pigs: A technical guide. Human-Wildlife Interactions Monograph 1:1-55.
- Westendorf, Mike. 2011. Ask the Experts Farm and Pasture Management, Can horse manure pollute an aquifer. Rutgers New Jersey Agricultural Experiment Station, Equine Science Center. Mike Westendorf, Ph.D., PAS, Department of Animal Science, Extension Livestock Specialist. Last revised: 11/04/2011. Accessed at http://esc.rutgers.edu/ask\_expert/ate\_fpmmm.htm on March 7, 2012.
- Westman, W. E. 1981. Factors Influencing the Distribution of Species of Californian Coastal Sage Scrub. Ecology 62(2):439-455.

- White-Robinson, R. 1982. Inland and saltmarsh feeding of wintering Brent Geese in Essex. Wildfowl 33:113-118.
- Whitson, K. A. 2000. SANTEC/ITE Guidelines for Traffic Impact Studies (TIS) in the San Diego Region. Final Draft. March 2, 2000.
- Whittaker, D., and R. L. Knight. 1998. Understanding wildlife responses to humans. Wildlife Society Bulletin 26:312-317.
- Wilbur, S. 1980. Status report on the Least Bell's Vireo. Unpublished report to the U.S. Fish and Wildlife Service, Portland, Oregon.
- Winchell, C. 2009. Estimation of San Diego County California Gnatcatcher Population Size and Recovery Following the 2003 October Wildfires. U. S. Fish and Wildlife Service.
- Winchell, C. S., and P. F. Doherty Jr. 2008. Using California Gnatcatcher to test underlying models in habitat conservation plans. Journal of Wildlife Management **72:**1322–1327.
- Winchell, Clark S., and Paul F. Doherty, Jr. 2010. Using California Gnatcatcher to Test Underlying Models in Habitat Conservation Plans. Journal of Wildlife Management 72(6):1322-1327.
- Winter, K. 2002. Mountain Quail (*Oreortyx pictus*). In The Coastal Scrub and Chaparral Bird Conservation Plan: a strategy for protecting and managing coastal scrub and chaparral habitats and associated birds in California. California Partners in Flight. Available at http://www.prbo.org/calpif/ htmldocs/scrub.html.
- Wright, A. H. and A. A. Wright. 1949. Handbook of frogs and toads of the United States and Canada. Third Edition. Comstock Publishing Company, Ithaca, NY.
- Zedler, P. H. 1987. The ecology of Southern California vernal pools: a community profile. U.S. Fish and Wildlife Service Biological Report 85(7.11).
- Zedler, P. H. and C. Black. 1992. Seed Dispersal by a Generalized Herbivore: Rabbits as Dispersal Vectors in a Semiarid California Vernal Pool Landscape. Am. Midl. Nat. 128:1-10.
- Zeiner, D. C., W. F. Laudenslayer, Jr., K. E. Mayer, and M. White, eds. 1988-1990. California's Wildlife. Vol. I-III. California Department of Fish and Game, Sacramento, California.
- Zornes, M, and R. A. Bishop. 2009. Western Quail Conservation Plan. Edited by Scot J. Williamson. Wildlife Management Institute. Cabot, VT.
- Zouhar, K. J. K. Smith, S. Sutherland, M. L. Brooks. 2008. Wildland fire in ecosystems: fire and nonnative invasive plants. General Technical Report RMRS-GTR-42-vol. 6. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Page Intentionally Left Blank

# Appendix F-1: List of Preparers and Persons/ Agencies Consulted

## **Document Preparation**

#### U.S. Fish and Wildlife Service Preparers:

Victoria Touchstone	Refuge Planner/Principal Writer
Jill Terp	Refuge Manager/Writer/Reviewer
John A. Martin	Wildlife Biologist/Writer/Reviewer
Andy Yuen	Project Leader/ Reviewer
Slader Buck	Deputy Project Leader/Reviewer
Pek Pum	GIS Technician/Graphics
Lou Ann Speulda-Drews	Regional Historian/Historical Archaeologist/Reviewer

#### Consultants:

Carmen Zepeda-Herman	<b>RECON/Cultural Resource Review</b>
RECON	Vegetation Mapping
Dudek & Associates	Upland Game Surveys

### Persons/Agencies Consulted

Marco Buske	USFWS, Region 8 IPM Coordinator
Patricia Roberson	USFWS, Region 8 NEPA Coordinator
Fred Workman	USFWS, Zone Officer
Clark Winchell	USFWS, Carlsbad Fish and Wildlife Office
Alison Anderson	USFWS, Carlsbad Fish and Wildlife Office
Mark Pavelka	USFWS, Carlsbad Fish and Wildlife Office
Susan Wynn	USFWS, Carlsbad Fish and Wildlife Office
Betsy Miller	City of San Diego, MSCP
Karen Miner	California Department of Fish and Wildlife
Joyce Schlachter	Bureau of Land Management
Pete Famolaro	Sweetwater Authority
Lisa Coburn-Boyd	Otay Water District
Molly Dana	SDG&E
Mary Anne Vancio	County of San Diego, Dept. of Parks and Recreation
Sid Morris	Sycuan Band of the Kumeyaay Nation