# *Seal Beach National Wildlife Refuge Comprehensive Conservation Plan*

# *Appendices (Volume 2)*


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# *Compatibility Determination E-1*

# *Wildlife Observation, Interpretation, and Environmental Education*

**Compatibility Determination**
**(Final, September 2011)**

**Use:** Wildlife Observation, Interpretation, and Environmental Education

**Refuge Name:** Seal Beach National Wildlife Refuge (Orange County, California)

**Establishing and Acquisition Authorities:**
The Seal Beach National Wildlife Refuge (NWR or Refuge) was established under the authority of the National Wildlife Refuge System Administration Act of 1966, as amended (80 Stat. 927; 16 U.S.C. 668dd-668ee). Public Law 92-408, authorizing the establishment of the Seal Beach National Wildlife Refuge (NWR or Refuge), was signed by President Nixon on August 29, 1972. The law states, "The Secretary of the Interior shall administer the Refuge in accordance with the National Wildlife Refuge System Administration Act of 1966, as amended, and pursuant to plans which are mutually acceptable to the Secretary of the Interior and the Secretary of the Navy."

**Refuge Purposes:**
Seal Beach NWR purposes include:

> Preserve and manage the habitat necessary for the perpetuation of two endangered species, the light-footed clapper rail and California least tern, and preserve habitat used by migratory waterfowl, shorebirds, and other waterbirds (1974 Management Plan for Seal Beach National Wildlife Refuge, prepared pursuant to Public Law 92-408).

**National Wildlife Refuge System Mission:**
The mission of the National Wildlife Refuge 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" (National Wildlife Refuge System Administration Act of 1966, as amended).

**Descriptions of Use:**
Public access onto the Refuge is restricted in accordance with the military mission of Naval Weapons Station Seal Beach (NWSSB) and at all times is controlled at the discretion of the NWSSB Security Department. Public tours of the Refuge, which facilitate wildlife observation and interpretation, are currently offered once a month and special tours are periodically conducted to support the Refuge's objective of providing opportunities for wildlife observation, environmental education, and interpretation.

A three-hour public walking tour of the Refuge is currently offered on the last Saturday of each month. Reservations must be made in advance and attendance is generally limited to 50 people. These tours, which are led by Refuge staff and the Friends of the Seal Beach NWR, are conducted in cooperation with NWSSB. Visitors are introduced to the Refuge and the National Wildlife Refuge System at the Refuge Headquarters and are then lead on a guided tour of a portion of the Refuge. The tour includes a visit to the native plant garden and a walk along a six to eight-foot-wide pedestrian pathway that provides access from the Refuge Headquarters east along Bolsa Avenue to an existing observation deck, located about one half mile to the east. Spotting scopes and binoculars are provided on the observation deck to enhance the public's wildlife viewing experience. In addition, several temporary information stations are set up along the pathway to provide opportunities for visitors to learn about the range of wildlife species found on the Refuge. Signs identifying salt marsh plants and birds have been installed along the pathway, while other signs along the pathway and in the native plant garden interpret the natural and cultural history of the Refuge's salt marsh complex and associated upland and open water areas.

Periodic special tours of the Refuge also provide the public with opportunities to observe wildlife, gain an understanding of the importance of protecting wetlands along the Pacific Flyway, and learn about the natural history of the area in and around the Refuge. Requests to conduct these tours are submitted by the Refuge Manager to the Navy command office for approval in advance. Special tours may accommodate birding groups, youth service groups, school groups, or other interested parties. A special tour may also be a component of a larger off-site environmental education program that is implemented annually by the Friends of the Seal Beach NWR for local school students. The special guided tours can focus on a variety of topics including but not limited to the native plant garden, habitat restoration, tracking wildlife, endangered species management, walking along Bolsa Avenue to observe marsh habitat and the associated wildlife, or visiting specific birding spots around the Refuge.

The CCP also includes proposals to expand opportunities for wildlife observation and environmental education by increasing the number of tours conducted on the Refuge and seeking funds to design and build a two-level, 20-foot-high observation tower/bird blind along the east side of Kitts Highway across from the Refuge Headquarters.

The Refuge, together with NWSSB, would also promote opportunities for environmental education and connecting people with nature on the Refuge by supporting requests for visits to the Refuge by educational institutions, non-governmental organizations, and archaeological/historical societies. Expanded visitation to the Refuge would continue to utilize the pathways currently available for public access; no new trails are proposed.

**Availability of Resources:**
Due to the restrictions on public access imposed by NWSSB, it is necessary to have Service personnel present during all public use activities on the Refuge. In addition, to ensure that large groups are adequately supervised, assistance from additional personnel, usually

consisting of volunteers from the Friends of the Seal Beach NWR, is needed. Refuge staff currently consists of a Refuge Manager and a part time maintenance worker; therefore, Refuge personnel from elsewhere within the San Diego NWR Complex occasionally assist with public tours and events. Direct costs to provide opportunities for wildlife observation, interpretation, and environmental education are primarily in the form of staff time and maintenance. Table 1 describes the level of involvement by Refuge staff that is required annually to manage and maintain opportunities for public access on to the Refuge. Maintenance costs included in the table are based on FY 2010 costs.

Funding for new construction projects (i.e., elevated observation platform [$100,000], installation of video cameras [$14,000]) is not included in the current Refuge budget. Therefore, these projects will not be implemented until adequate funding is secured. Potential sources for funding include Federal cost share grants, interagency partnerships, state and private grants, and contributions from Friends groups.

**Table 1**
**Annual Staff Involvement and Maintenance Costs**
**Associated with Managing Wildlife Observation, Interpretation, and Environmental Education Opportunities on the Refuge**

| **Staff Responsibilities** | **Estimated Annual Administrative Time and Maintenance Costs** |
|---|---|
| Refuge Manager (GS 11) – Coordinate public tours, interface with NWSSB regarding public access, public outreach, Friends group coordination, conduct tours, permit/NEPA compliance, and construction management | (0.25 FTE*) |
| Maintenance Worker (WG 5) – Maintain refuge headquarters, native plant garden, pathway along Bolsa Avenue, interpretive and information signs, information kiosk, observation platform and observation deck | (0.1 FTE) |
| Other Refuge Complex Staff (GS varies) – Assist with public tours and occasional special events | (0.05 FTE) |
| Maintenance supplies and materials | $5,000 |

*FTE (full time equivalent)

**Anticipated Impacts of the Use:**
A number of studies have been conducted to evaluate the effects of wildlife observation and trail use on wildlife, including effects of disturbance on shorebirds and other avian species. Some of these studies are summarized in a literature review prepared for the Stillwater National Wildlife Refuge (*DeLong and Schmidt 2000*). In summarizing the findings of these studies, DeLong and Schmidt state, that wildlife observation can “negatively impact wildlife

by altering wildlife behavior, reproduction, distribution, and habitat."  Huffman (*1999*) in observing waterbird disturbance in South San Diego Bay documented disturbance to migratory birds as a result of pedestrian activity along the shoreline.  This disturbance was greatest during low tides when pedestrians left designated access ways to explore the mudflats.  Trulio and Sokale (*2008*) while conducting studies along the San Francisco Bay Trail found that the number of birds decreased at trail sites as trail use increased on higher use over lower use days.  Their results also seemed to support the proposal that disturbance to waterbirds might be less when trail users are not directly approaching foraging areas, such as when they are traveling along a trail that is parallel to foraging areas rather than extending through foraging areas.

Fernández-Juricic et al. (*2009*) found that overall tolerance of the State listed endangered Belding's savannah sparrow (*Passerculus sandwichensis beldingi*) to human disturbance varies depending upon the level of disturbance occurring in a given area, as well as between seasons.  In areas where there is little if any public use activities, alert and flight responses to human approaches were observed to be greater than those observed in higher use areas.  A trend for greater alert distance and flight distance was also observed in the non-breeding season (*Fernández-Juricic et al. 2009*).

Regularly scheduled monthly public tours of the Refuge are conducted along an established route that extends along Bolsa Avenue.  The trail parallels much of the marsh habitat and tends to be setback from tidal mudflat areas where the greatest concentrations of foraging shorebirds are observed.  As a result, disturbance to foraging avian species is relatively low.  In addition, the frequency of these tours would continue to be relatively low (less than once a week) even if the number of tours permitted on the Refuge were to increase over current conditions.  Most other special tours, if walking tours, would follow the same route as the monthly tours, so the affects to migratory and resident birds would be the same as described above.  Refuge visits associated with the local schools' environmental education programs are also conducted on the Refuge and normally use the existing pedestrian pathway along Bolsa Avenue and/or Refuge Headquarters.  These facilities are located an adequate distance from sensitive marsh habitat. Occasionally during walking tours the group is led off an established pathway to take advantage of interpretive opportunities.  Under these circumstances, Refuge staff would be present to ensure that there are no negative impacts to wildlife or vegetation.  This type of tour activity would only be conducted outside the breeding season if it is in close proximity to salt marsh habitat.

Special birding tours generally involve driving a group of 15 to 20 people to specific locations on the Refuge, including the existing observation platform, a roadside location near Perimeter Pond, the south end of 7$^{th}$ Street Pond, and Hog Island, to observe the various bird species present on the Refuge.  Additional stops may also be included.  These stops are generally made along the edge of existing roadways, some distance from shorebird foraging habitat.  Entry into the marsh habitat is not permitted and is controlled by guides who accompany the visitors during the tours.

The proposed elevated observation platform would be installed in a disturbed area adjacent to marsh habitat. Construction would occur outside the avian breeding season and future access to the facility would be via a trail through disturbed habitat. This facility would improve opportunities for wildlife observation, while minimizing the potential for disturbance to distance foraging birds.

Disturbance associated with the installation of video cameras at NASA Island and in the salt marsh would be minimized by conducting these activities outside the breeding season. Once installed, the cameras would provide the public with up-close views of bird nesting and foraging activities without the potential for disturbance.

No adverse effects to sensitive tidal, intertidal, or restored native upland habitat and the wildlife species supported by these habitats are anticipated as a result of the wildlife observation, interpretation, and environmental education activities proposed or currently occurring on the Refuge.

Endangered and Threatened Species: Human activity can have adverse impacts on endangered and threatened species, particularly when it disrupts bird nesting or foraging activities. NASA Island supports nesting habitat for the federally listed endangered California least tern (*Sternula antillarum*) and the adjacent open water areas in the Refuge's marsh complex provide foraging habitat for the breeding terns and their young. The marsh complex also provides year-round foraging habitat, as well as nesting habitat, for the federally listed endangered light-footed clapper rail (*Rallus longirostris levipes*).
No public uses are permitted in the vicinity of NASA Island during the breeding season to avoid any potential for disturbance to nesting terns. In addition, public access around potential clapper rail nesting habitat is avoided during the breeding season. The potential for human intrusion into clapper rail habitat is limited due to the nature of the Refuge's public use program and the Navy's security program, which requires that all visitors be accompanied by a guide.

No adverse effects to listed species are anticipated from the current proposals to provide opportunities for wildlife observation, interpretation, and environmental education on the Refuge.

**Public Review and Comment:**
Opportunities for wildlife observation, interpretation, and environmental education on the Seal Beach NWR were discussed at the scoping meetings held on April 3, 2007 to initiate the Comprehensive Conservation Plan (CCP) process. A Notice of Intent was published in the Federal Register on April 16, 2007 (72 FR 19016). At that time, written comments were solicited. At the scoping meetings, the public was encouraged to provide verbal comments or to send us written comments following the meetings. A CCP web page was established to provide the public with specific information regarding the CCP process and the comments

provided during public scoping. Planning Updates have also been prepared to summarize the progress of the CCP and to discuss specific issues related to the planning process.

The draft Compatibility Determination for Wildlife Observation, Interpretation, and Environmental Education was made available for public review and comment as Appendix A of the Seal Beach National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment (*USFWS 2011*). The public comment period began on March 24, 2011 and ended on May 11, 2011. No comments related to this Compatibility Determination were received.

**Determination:**

__Use is Not Compatible

_X_ Use is Compatible with the Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. Prior to constructing the proposed observation platform, construction plans and design specifications will be reviewed to ensure that the facility is sighted in a manner that avoids impacts to sensitive habitat and minimizes the potential for disturbance to wildlife.

2. All public activities on the Refuge will continue to be facilitated by Refuge staff, members of the Friends of the Seal Beach NWR, and/or Navy personnel and these activities will occur outside of sensitive habitat areas including areas with ground nesting birds during the breeding season.

**Justification:**

Providing opportunities for wildlife observation, interpretation, and environmental education on the Seal Beach NWR will enhance the public's appreciation of the wildlife resources supported within this Refuge and will support the Service's initiative for connecting people, particularly children, with nature. Through these activities, the Refuge has the opportunity to introduce the public to the importance of protecting coastal wetland habitats not only because these habitats support federally listed species, but because of the role these habitat play in supporting migratory birds, as well as fish and other marine organisms. All of these outcomes are consistent with the Refuge purposes of protecting listed species.

A review of the environmental consequences of implementing these uses is provided in Chapter 5 of the Seal Beach National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment (*USFWS 2011*). This analysis demonstrates that these uses would not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission, provided the stipulations to ensure compatibility are followed. Further, wildlife observation, interpretation, and environmental education are three of the six priority public uses of the System, as defined by the Act. Therefore, implementation of these programs would contribute to the fulfillment of the Refuge System mission, and the achievement of the goals established for the Refuge, particularly the goal to enhance public appreciation, understanding, and enjoyment of the Refuge's biological and cultural resources through outreach opportunities and quality wildlife-dependent recreation, including wildlife observation, environmental education, and interpretation.

**Mandatory Re-Evaluation Date:**

_X Mandatory 15-year Re-Evaluation Date (for priority public uses)

_ Mandatory 10-year Re-Evaluation Date (for all uses other than priority public uses)

**NEPA Compliance for Refuge Use Decision:**

_Categorical Exclusion without Environmental Action Statement

_Categorical Exclusion and Environmental Action Statement

_X Environmental Assessment and Finding of No Significant Impact

_ Environmental Impact Statement and Record of Decision

**References Cited:**

DeLong, Anita and Janet Schmidt. 2000. Literature Review: Effects of Human Disturbance on Wildlife with Emphasis on Wildlife-Dependent Recreation Relevant to Stillwater National Wildlife Refuge (Draft).

Fernández-Juricic, E., E. F. Zahn, T. Parker, and T. Stankowich. 2009. California's endangered Belding's savannah sparrow (*Passerculus sandwichensis beldingi*): tolerance of pedestrian disturbance. *Avian Conservation and Ecology - Écologie et conservation des oiseaux* 4(2): 1.

Huffman, Kathy. 1999. San Diego South Bay Survey Report – Effects of Human Activity and Water Craft on Wintering Birds in the South San Diego Bay.

Trulio, Lynne and Jana Sokale. 2008. Foraging Shorebird Response to Trail Use around San Francisco Bay. *Journal of Wildlife Management* 72(8):1775-1780.

U.S. Fish and Wildlife Service. 2011. Seal Beach National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment.

**Refuge Determination:**

Prepared by: ______________________________ 9/15/11

(Signature) (Date)

Project Leader Approval: ______________________________ 9/15/11

(Signature) (Date)

**Concurrence:**

Refuge Supervisor: ______________________________ 9/22/11

(Signature) (Date)

Assistant Regional Director, Refuges: ______________________________ 9/22/11

(Signature) (Date)

# *Compatibility Determination E-2*

# *Scientific Research*

**Compatibility Determination**
**(Final, September 2011)**

**Use:** Scientific Research

**Refuge Name:** Seal Beach National Wildlife Refuge (Orange County, California)

**Establishing and Acquisition Authorities:**
The Seal Beach National Wildlife Refuge (NWR or Refuge) was established under the authority of the National Wildlife Refuge System Administration Act of 1966, as amended (80 Stat. 927; 16 U.S.C. 668dd-668ee). Public Law 92-408, authorizing the establishment of the Seal Beach National Wildlife Refuge (NWR or Refuge), was signed by President Nixon on August 29, 1972. The law states, "The Secretary of the Interior shall administer the Refuge in accordance with the National Wildlife Refuge System Administration Act of 1966, as amended, and pursuant to plans which are mutually acceptable to the Secretary of the Interior and the Secretary of the Navy."

**Refuge Purposes:**
Seal Beach NWR purposes include:

> Preserve and manage the habitat necessary for the perpetuation of two endangered species, the light-footed clapper rail and California least tern, and preserve habitat used by migratory waterfowl, shorebirds, and other waterbirds (1974 Management Plan for Seal Beach National Wildlife Refuge, prepared pursuant to Public Law 92-408).

**National Wildlife Refuge System Mission:**
The mission of the National Wildlife Refuge 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" (National Wildlife Refuge System Administration Act of 1966, as amended).

**Descriptions of Use:**
The Seal Beach NWR receives periodic requests to conduct scientific research on the Refuge. Although research is not identified as a wildlife-dependent recreational use by the National Wildlife Refuge System Improvement Act of 1997, scientific research can benefit Refuge resources and facilitate informed management decisions. In so doing, scientific research

conducted on the Refuge would support Refuge purposes and the mission of the National Wildlife Refuge System. Based on the Refuge proposes, priority would be given to scientific research that contributes to the enhancement, protection, and management of listed species and their habitats.

Research applicants would be required to submit a proposal summarizing:

1) objectives of the study;
2) justification for the study;
3) detailed study methodology and schedule;
4) potential impacts to Refuge wildlife and/or habitats, including short- and long-term disturbance, injury, and mortality;
5) research personnel required and their qualifications/experience;
6) status of necessary permits (i.e., scientific collecting permits, endangered species permit);
7) costs to Refuge and Refuge staff time requested, if any; and
8) anticipated end products (i.e., reports, publications).

Research proposals would be reviewed by Refuge staff or others, as appropriate. The criteria listed below, and others as necessary, would be used to assess research proposals.

1) Research that would contribute to the enhancement, protection, and management of listed species and their habitats and research that could provide insight into current or future Refuge management would have higher priority than other requests.
2) Research that would conflict with other ongoing research, monitoring, or management programs would not be approved.
3) Research that is not Refuge-specific and can be conducted elsewhere is less likely to be approved.
4) Research that causes undue disturbance or is intrusive would likely not be approved. The degree and type of disturbance would be carefully weighed when evaluating a research request.
5) Research requests would be evaluated to determine if the study design adequately addresses the need to minimize disturbance to sensitive habitat and wildlife (for example, has consideration been given to location, timing, and/or scope of the study, the need to minimize the number of participants, study methods, the number of study sites, etc.).
6) If Refuge staffing limitations or logistical constraints make the monitoring of research activities difficult, requests to conduct research on the Refuge may be denied or postponed, depending on the circumstances.
7) The duration of a proposed research project would be evaluated to determine the full effect of the proposal on Refuge trust resources, as well as on Refuge staff time.

Open-ended research projects would not be approved. All projects would be reviewed annually to assess whether they continue to meet these criteria (and others as necessary), continue to operate as originally proposed, and are contributing to the objectives of the study.

Approved research projects would be conducted under a Refuge-issued Special Use Permit with case-specific stipulations.

**Availability of Resources:**
Adequate funding and staff exist to manage some level of scientific research at the Seal Beach NWR. As always, discretionary use of staff time would be weighed through a cost-benefit analysis. Direct costs to administer research activities are primarily in the form of staff time. Table 1 describes the level of involvement by Refuge staff that will be required annually to manage and monitor research activities on the Refuge, as well as the associated funding/annual costs (based on FY 2010 costs).

**Table 1**
**Annual Staff Involvement**
**Associated with Managing Scientific Research Uses on the Refuge**

| Staff Responsibilities | Annual Administrative/Management Costs (approximate) and Time |
|---|---|
| Deputy Project Leader (GS 13) – Review research proposals | (0.02 FTE*) |
| Refuge Manager (GS 11) – Review and oversight of research proposals; preparation of SUP; monitoring to ensure compatibility; report review; coordination of researcher access | (0.04 FTE) |
| **TOTAL COST AND FTE** | (0.06 FTE) |

*FTE (full time equivalent)

**Anticipated Impacts of the Use:**
Through the Special Use Permit process, project specific conditions can be placed on individual research proposals to ensure that the potential for impacts to Refuge resources are minimized. Some level of disturbance is expected with all research activities since most researchers will be entering areas that are normally closed to the public and may be collecting samples or handling wildlife. Many shorebird and marshbird species are sensitive to disturbance (Huffman 1999, Trulio and Sokale 2008, Fernández-Juricic et al. 2009); salt marsh habitats that support light-footed clapper rails (*Rallus longirostris levipes*) and Belding's savannah sparrows (*Passerculus sandwichensis beldingi*) are prone to degradation by foot traffic; and disturbance around California least tern (*Sternula antillarum*) nesting and foraging sites can have an adverse effect on reproductive success (Carney and Sydeman 1999). These and other impacts related to the implementation of scientific research on the

Refuge are summarized below and discussed in greater detail in Chapter 5 of the Seal Beach National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment (USFWS 2011).

Endangered and Threatened Species. Human activity can have adverse impacts on endangered and threatened species, particularly when it disrupts bird nesting or foraging activities (Carney and Sydeman 1999). NASA Island supports nesting habitat for the federally listed endangered California least tern and the adjacent open water areas in the Refuge's marsh complex provide foraging habitat for the breeding terns and their young. The marsh complex also provides year-round foraging habitat, as well as nesting habitat, for the federally listed endangered light-footed clapper rail.

To minimize disturbance to nesting and foraging terns, research activities in the vicinity of NASA Island during the breeding season would be scrutinized and appropriate restrictions would be imposed on research activities to ensure that no adverse effects to the nesting colony would occur. In addition, access around potential clapper rail nesting habitat would be avoided during the nesting season for all research projects that are not related to clapper rail management, and any research related to clapper rails would be evaluated to ensure that no adverse effects to the species or its habitat would occur as a result of the study design and/or implementation.

Including appropriate conditions in Special Uses Permits for scientific research projects would ensure that no adverse effects to listed species would result from the implementation of research projects on the Refuge.

Migratory and Resident Water-Dependent Birds. Human activity associated with scientific research projects may result in disturbance to the variety of bird species that utilize the Refuge's intertidal and subtidal habitats for foraging. Human disturbance occurring near mudflats and salt marsh habitats could disturb feeding and nesting birds, including Belding's savannah sparrows. Some level of disturbance is expected with all research activities, because most researchers would be entering areas that are normally closed to the public. However, the conditions to be included in the Special Use Permits that will be issued prior to allowing a specific research project to begin on the Refuge will ensure that impacts on wildlife and the habitats they depend on are reduced as much as possible.

**Public Review and Comment:**
Opportunities for scientific research on the Seal Beach NWR were discussed at the scoping meetings held on April 3, 2007 to initiate the Comprehensive Conservation Plan (CCP) process. A Notice of Intent was published in the Federal Register on April 16, 2007 (72 FR 19016). At that time, written comments were solicited. At the scoping meetings, the public was encouraged to provide verbal comments or to send us written comments following the meetings. A CCP web page was established to provide the public with specific information

regarding the CCP process and the comments provided during public scoping. Planning Updates have also been prepared to summarize the progress of the CCP and to discuss specific issues related to the planning process.

The draft Compatibility Determination for scientific research was made available for public review and comment as Appendix A of the Seal Beach National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment (USFWS 2011). The comment period began on March 24, 2011 and ended on May 11, 2011. No comments related to this Compatibility Determination were received.

**Determination:**

__ Use is Not Compatible

_X_ Use is Compatible with the Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

Concerns about protecting listed species and the overall integrity of the open water and salt marsh habitat on the Refuge require that Refuge staff closely review proposed research projects and that research activities and impacts be monitored. To minimize the potential for adverse effects to Refuge resources as a result of scientific research, the following measurers would be implemented:

1) All research requests must include a detailed description of the study proposal. At a minimum, the description should address the purpose of the research, the potential benefits to Refuge management and/or Refuge resources, the number of participants, the times of the year in which field studies and/or date collection would occur, how the studies

   or data collection will be implemented, the areas on the Refuge that would be accessed, any potential impacts to Refuge resources that could occur and the measures that would be implemented to minimize such impacts, and when study results would be made available to the Refuge Manager.

2) Highly intrusive or manipulative research will generally not be permitted in order to protect Refuge resources.

3) Proposed research methods that have the potential to adversely affect Refuge resources will generally not be permitted. However, if the researcher can adequately demonstrate the need for the research and the overall benefits in terms of achieving Refuge purposes despite the potential for some adverse effects, the Refuge Manager

has the discretion to permit such research provided the researcher can identify potential impacts in advance of their occurrence. The researcher will also be required to develop mitigation measures to minimize potential impacts. Mitigation measures will be listed as conditions on the Special Use Permit.

4) Approval of research projects on the Refuge will be permitted at the discretion of the Refuge Manager who will consider the compatibility of the proposed research with Refuge purposes, the proximity of research activities to sensitive habitat and known nesting areas, the potential for impacts to Refuge resources, and the availability of Refuge staff to manage and monitor the research activities.

5) All research projects will be conducted under a Special Use Permit, which will have additional project-specific stipulations.

6) Special Use Permits will be valid for one year only. Renewals will be subject to review and approval by the Refuge Manager, who will consider the current status of the study, the researcher's compliance with the conditions outlined in the Special Use Permit, and the extent of anticipated or unanticipated impacts, if any, that occurred as a result of the specific research project.

7) Refuge staff may accompany researchers at any time to assess study methods and the potential for impacts to Refuge resources.

8) The Refuge Manager can suspend or modify conditions or terminate on-refuge research that is already permitted and in progress, should unacceptable impacts or issues arise or be noted.

9) Researchers will be responsible for acquiring and/or renewing any necessary State and Federal permits prior to beginning or continuing their project.

10) Research must adhere to current species protocols for data collection.

11) Research that does not involve birds will generally be conducted outside of the breeding season of the avian species using the Refuge.

Because the Naval Weapons Station Seal Beach Security Office is responsible for regulating all access onto Naval Weapons Station Seal Beach and thus onto the Refuge which is located within the base, Security Department approval must be obtained for all researcher access requests. Approval to access the Refuge is at the discretion of Security Office personnel.

**Justification:**
To be permitted on the Refuge, scientific research projects would be required to contribute to the enhancement, protection, use, preservation, and/or management of Refuge resources. The anticipated level of research to be conducted on the Refuge at any given time would be compatible because the Refuge would ensure that research proposals support the purpose of the Refuge and mission of the System. In view of the impacts research activities may have on the Service's ability to achieve the Refuge purpose, sufficient restrictions will be placed on the researcher to ensure that disturbance is kept to a minimum. This program as described is determined to be compatible.

**Mandatory Re-Evaluation Date:**

_ Mandatory 15-year Re-Evaluation Date (for priority public uses)

X Mandatory 10-year Re-Evaluation Date (for all uses other than priority public uses)

**NEPA Compliance for Refuge Use Decision:**

_ Categorical Exclusion without Environmental Action Statement

_ Categorical Exclusion and Environmental Action Statement

X Environmental Assessment and Finding of No Significant Impact

_ Environmental Impact Statement and Record of Decision

**References Cited:**


Carney, Karen M. and William J. Sydeman. 1999. A Review of Human Disturbance Effects on Nesting Colonial Waterbirds. *Waterbirds: The International Journal of Waterbird Biology* 22(1):68-79.

Fernández-Juricic, E., E. F. Zahn, T. Parker, and T. Stankowich. 2009. California's endangered Belding's savannah sparrow (*Passerculus sandwichensis beldingi*): tolerance of pedestrian disturbance. *Avian Conservation and Ecology - Écologie et conservation des oiseaux* 4(2):1. [online] URL: http://www.ace-eco.org/vol4/iss2/art1/.

Huffman, Kathy. 1999. San Diego South Bay Survey Report – Effects of Human Activity and Water Craft on Wintering Birds in the South San Diego Bay.

Trulio, Lynne and Jana Sokale. 2008. Foraging Shorebird Response to Trail Use around San Francisco Bay. *Journal of Wildlife Management* 72(8):1775-1780.

U.S. Fish and Wildlife Service. 2011. Seal Beach National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment.

**Refuge Determination:**

Prepared by: Vicki [signature] 9/15/11
(Signature) (Date)

Project Leader Approval: Andrew Yuen [signature] 9/15/11
(Signature) (Date)

**Concurrence:**

Refuge Supervisor: [signature] 9/22/11
(Signature) (Date)

Assistant Regional Director, Refuges: Margaret T. Kolar [signature] 9/22/11
(Signature) (Date)

## FINDING OF APPROPRIATENESS OF A REFUGE USE

### Written Justification

**Refuge Name:** Seal Beach National Wildlife Refuge

**Use:** Scientific Research

**Justification for Determining that this Use is an Appropriate Use for the Refuge:**

Although scientific research is not identified as a wildlife-dependent recreational use, the information provided as a result of selectively permitting such use on the Refuge can benefit Refuge resources and facilitate informed management decisions. Based on the Refuge proposes, priority would be given to scientific research that contributes to the enhancement, protection, and management of listed species and their habitats. All research applications would be reviewed to ensure that the research objectives and justification, study methodology, schedule, and anticipated end products would provide useful information to assist with resource management on the Refuge. Additionally, all proposal would be reviewed to ensure that implementation of the research proposal would not result in significant disturbance or other impacts to Refuge resources. Because sufficient restrictions can be placed on the researcher to ensure that disturbance and other potential impacts are kept to a minimum, in my professional judgment scientific research is an appropriate use on the Refuge.

Refuge Manager: ______________________

Date: 9/15/11

Refuge Supervisor: ______________________

Date: 9/22/11

**FINDING OF APPROPRIATENESS OF A REFUGE USE**

Refuge Name: Seal Beach National Wildlife Refuge

Use: Scientific Research

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| Decision Criteria: | YES | NO |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✓ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)? | ✓ | |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | ✓ | |
| (d) Is the use consistent with public safety? | ✓ | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | ✓ | |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | ✓ | |
| (g) Is the use manageable within available budget and staff? | ✓ | |
| (h) Will this be manageable in the future within existing resources? | ✓ | |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | ✓ | |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | ✓ | |

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate**_____ **Appropriate** ✓

Refuge Manager: Kirk Gilligan Date: 9/15/11

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

for Refuge Supervisor: Mark Pg Date: 9/22/2011

**A compatibility determination is required before the use may be allowed.**

**FWS Form 3-2319**
**02/06**

# *Compatibility Determination E-3*

# *Mosquito Management*

# Compatibility Determination
## (Final, September 2011)

**Use:** Mosquito Management

**Refuge Name:** Seal Beach National Wildlife Refuge (Orange County, California)

**Establishing and Acquisition Authorities:**
The Seal Beach National Wildlife Refuge (NWR or Refuge) was established under the authority of the National Wildlife Refuge System Administration Act of 1966, as amended (80 Stat. 927; 16 U.S.C. 668dd-668ee). Public Law 92-408, authorizing the establishment of the Seal Beach National Wildlife Refuge (NWR or Refuge), was signed by President Nixon on August 29, 1972. The law states that "The Secretary of the Interior shall administer the Refuge in accordance with the National Wildlife Refuge System Administration Act of 1966, as amended, and pursuant to plans which are mutually acceptable to the Secretary of the Interior and the Secretary of the Navy."

**Refuge Purposes:**
Seal Beach NWR purposes include:

> Preserve and manage the habitat necessary for the perpetuation of two endangered species, the light-footed clapper rail and California least tern, and preserve habitat used by migratory waterfowl, shorebirds, and other waterbirds (1974 Management Plan for Seal Beach National Wildlife Refuge, prepared pursuant to Public Law 92-408).

**National Wildlife Refuge System Mission:**
The mission of the National Wildlife Refuge 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" (National Wildlife Refuge System Administration Act of 1966, as amended).

**Description of Use:**
The Orange County Vector Control District (OCVCD) proposes to monitor and control mosquito populations on the Seal Beach NWR. Mosquito monitoring and control is not a wildlife-dependent recreational use, as defined in the National Wildlife Refuge System Improvement Act of 1997 (Act). The Act states that no use will be allowed on a Refuge unless it is first determined to be compatible with the purposes of the Refuge and mission of the National Wildlife Refuge System. This Act also mandates that a Comprehensive Conservation Plan (CCP) be prepared for all refuges. As part of the development of the CCP, we are required to develop new compatibility determinations, and where necessary conduct a determination of whether or not a proposed use is appropriate for implementation on the Refuge. In making these determinations, the Refuge Manager is required to use sound professional judgment based on many factors, including experience, knowledge, the best science available, and adherence to all applicable laws, regulations, and policies. This compatibility determination supersedes the compatibility determination for mosquito control on Seal Beach NWR prepared in September 1994.

The OCVCD currently conducts mosquito monitoring and control on the Refuge as part of their mandate to protect the public within their jurisdictional boundaries from mosquito-borne diseases. While mosquitoes are considered a nuisance because of their biting, some species are known vectors of serious diseases in California. Public concern over human health issues related to mosquito-borne disease has intensified on the west coast with the advance of West Nile Virus across the United States, and its detection in California in 2003. In Orange County, California, the mosquito-borne diseases of primary concern are West Nile Virus, St. Louis encephalitis, and western equine encephalitis.

OCVCD is issued a Special Use Permit (SUP) annually for the monitoring and control of mosquitoes on the Refuge. The pesticides permitted for use on the Refuge by the SUP must first be approved by the Service in accordance with Section 569 FW 1 of the Service Manual. This involves the preparation and approval of a pesticide use proposal (PUP). PUP records will provide a detailed, time-, site-, and target-specific description of the proposed use of the pesticide on the Refuge. The SUP then identifies which pesticides are approved for use on the Refuge and describes how and where they can be used. The SUP also describes how OCVCD is to notify the Refuge Manger prior to conducting any mosquito monitoring or control activities on the Refuge, identifies specific locations on the Refuge where these activities can occur, and outlines OCVCD's monitoring and data reporting requirements. The SUP also requires that OCVCD field staff meet with Refuge management and Navy Environmental staff prior to each year's nesting season (March 1 – September 15) to go over field protocols for avoidance and minimization of take to any trust resources, including listed species and their habitats and migratory birds.

Because the U.S. Fish and Wildlife Service (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. PUP records identify specific pesticides, including mosquito control products, approved for use on each Refuge, as well as details on target pests, products applied, application dates, rates, methods, number of applications, site description, sensitive habitats, and best management practices 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. Depending on the product, PUPs are reviewed and approved at the Refuge Manager, Regional Office, or Washington Office level.

Until now, mosquito management on the Refuge by OCVCD has been conducted in accordance with an annually approved SUP and the Compatibility Determination approved in 1994. However, future mosquito management on the Refuge will be subject to procedures and guidance provided in the Comprehensive Conservation Plan for the Seal Beach NWR (*USFWS 2011*), the conditions included in annually issued SUPs, and the stipulations provided in this updated Compatibility Determination. The procedures and guidance provided in the CCP include a phased approach to mosquito management involving mosquito monitoring, management, and control of mosquito larvae and pupae. The Refuge and OCVCD both advocate for an integrated approach to mosquito management that includes a range of tools to improve habitat conditions for estuarine wildlife while reducing threats to public health from mosquito species capable of transmitting disease to humans. It is the intent of the CCP to further define this approach to mosquito surveillance and control on the Seal Beach NWR.

Consistent with current practices, the Refuge and the Navy will continue to work with OCVCD on an annual basis to develop procedures for how surveillance, monitoring, and control activities shall be implemented on the Refuge in a given year. The details of this work on the Refuge will be outlined in the annual SUP issued to the OCVCD prior to the commencement of mosquito season. This coordination will ensure that permits are current, communication is continuous, and concerns related to mosquito populations and other biological resources of the Refuge are addressed. It is vital to the mission of the respective agencies that a positive and productive working relationship is maintained. PUPs for the mosquito control products to be used on the Refuge must be approved annually. In addition, Pesticide Use Reports will be prepared annually by the Refuge with data support from OCVCD. Mosquito management and control proposals by the OCVCD will be reviewed annually as part of the SUP process to determine if there is a need for any changes to the current procedures that would improve the outcome of the current practices. Any changes proposed for implementation through the SUP must comply with the requirements of NEPA and Section 7 of the Endangered Species Act (ESA). Existing NEPA and Section 7 compliance documents will be reviewed to determine if additional compliance is necessary to address proposed changes.

Because of the nature of mosquito-borne diseases, as well as the limited information available regarding the effects of these diseases on wildlife of the Refuge, the phasing approach presented in the CCP focuses on the implementation of mosquito management that protects both Refuge resources and human health. The CCP describes three phases of mosquito management on the Refuge: mosquito monitoring; control of mosquito larvae when sampling numbers indicate that control is warranted; and control of late instar larvae and pupae when sampling numbers indicate that control is warranted. The three phases are summarized below and presented in detailed in Chapter 3 of the Final CCP.

**Phase 1**. In Phase 1, areas with the potential to support mosquito breeding will be monitored by OCVCD throughout breeding season. Consistent mosquito monitoring is necessary to establish baseline information regarding mosquito production and locations of mosquito breeding areas on the Refuge. Monitoring is conducted annually by OCVCD to: 1) establish baseline data on species and abundance; 2) identify and map known mosquito breeding and/or harboring habitats; and 3) estimate relative changes in population sizes over time. The results of monitoring, including field observations, dip sample count data, and/or mosquitoes found in carbon dioxide traps are to be reported to the Refuge Manager on a weekly basis.

Mosquito monitoring is conducted in accordance with an annually issued Refuge SUP, which includes conditions related to how and where access for mosquito monitoring can occur, scheduling of monitoring activities, reporting monitoring results, and when the implementation of control methods (discussed under Phase 2) would be considered appropriate. Mosquito monitoring is limited to predesignated areas of the Refuge and all access into these areas is limited to walking. Any proposal to enter and monitor other areas of the Refuge requires review and approval by the Refuge Manager. In addition, all OCVCD personnel who will be present on the Refuge in a given year are required to meet with the Refuge Manager prior to the beginning of the mosquito monitoring season. At this meeting, OCVCD is provided with information on how to conduct mosquito monitoring in sensitive marsh habitat in a manner that will avoid disturbance to listed species and other wildlife and minimize trampling of marsh vegetation.

The primary technique for determining the extent of the larval population within a specific area is the dip count. The dip count technique involves the use of a 16 ounce dipper that is dipped into a pool of water. The water is then examined for the presence of mosquito larvae. The numbers of larvae in each dip, as well as the species of the larvae present, are recorded. The dipping technique is difficult to standardize, but on the Refuge, dips are generally taken once a week during the breeding season. Dip samples, which are often timed to be taken after higher high tides, are obtained around the eastern edges of the salt marsh habitat from pools of water left behind by the higher high tides. Dip samples are also taken from the eastern end of the Bolsa Cell where monthly higher high tides also leave behind stagnant pools of salt water. Dip samples are taken randomly throughout the site with up to twenty dip samples per site unless the count for treatment (e.g., generally around one larvae per ten dip samples) is achieved in a smaller number of dip samples.

Communication and cooperation are the essential elements needed to develop a reliable understanding of how best to address mosquito management on the Refuge. OCVCD would have the lead for mosquito monitoring, but all decisions related to how mosquito management would be implemented on the Refuge must be made in consultation with the Refuge Manager using monitoring data collected on and within the vicinity of the Refuge. The annual meetings, involving the Refuge, Naval Weapons Station Seal Beach, and OCVCD, that are held to assess the previous seasons monitoring and control efforts, if any, enable all participants to consider the need for adapting current management activities to better achieve the goal of effective mosquito management with minimal adverse effects to Refuge resources in subsequent years.

**Phase 2**. In Phase 2, mosquito monitoring indicates that the number of larvae documented on the Refuge exceed the criteria used by OCVCD (*2010*) to determine when treatment to control mosquito larvae should be considered. Under these circumstances, the Refuge Manager can allow the control of mosquito larvae on the Refuge in accordance with the conditions included in the current year's SUP. The criteria used by OCVCD (*2010*) to determine when treatment to control mosquito larvae should be considered are presented in Table 1. At present, only the species *Aedes taeniorhynchus* and *A. sqaminger* are known to breed on the Refuge.

**Table 1**
**OCVCD Criteria for Considering Pesticide Application to Control Immature Mosquito Populations**

| Mosquito Species | Criteria for Considering Treatment |
|---|---|
| *Culex* spp. | $\geq$ 2 immatures/20 dips |
| *Aedes* spp. | $\geq$ 2 immatures/10 dips |
| *Culiseta* spp. | $\geq$ 2 immatures/10 dips |

Source: (*Orange County Vector Control District 2010*)

In Phase 2, mosquito monitoring, which would continue throughout the breeding season, would be expanded to include an evaluation of the effectiveness of the mosquito control measures being implemented to control mosquito larvae populations on the Refuge. All larvicides proposed for use on the Refuge must be approved through the PUPs review process, included in the current year's SUP, and evaluated in compliance with NEPA, Section 7 of the ESA, and all applicable Refuge policies.

The larvicides approved for use on the Refuge as of 2011 include *Bacillus thuringiensis* var. *israelensis* (Bti), *Bacillus sphaericus* (Bs), and Altosid®, with the active ingredient methoprene. Methoprene based products are to be used on the Refuge only as a second line of defense and the locations where such products can be applied must be specifically approved by the Refuge Manager.

OCVCD had previously requested that an additional larvicide, Natular™, be considered for use on the Refuge to control mosquito larvae. This larvicide has the active ingredient spinosad, a product of bacterial fermentation that attacks the nervous system of the mosquito larvae causing paralysis and death. The potential effects of this larvicide on Refuge resources are summarized in this Compatibility Determination under "Anticipated Impacts of the Use" and discussed in greater detail in Chapter 4 of the Final EA (*USFWS 2011*).

Within one week of any pesticide application, OCVCD is required to provide the Refuge Manager with a report detailing the location of the application, the numbers of larvae per dip sample obtained at each control site, the species present, and the types and amount of pesticide applied. All pesticides must be applied in accordance with the product label. In addition, Best Management Practices (BMPs), which are included as conditions of the SUP, must be implemented during larvicide applications.

**Phase 3**. In Phase 3, control of mosquito larvae in the later instar stages and/or pupae would be considered on the Refuge when the number of such larvae or pupae exceeds established mosquito threshold treatment levels (see Table 1). When the appropriate conditions are present to warrant the use of a pupacide, monomolecular biodegradable film (e.g., Agnique MMF) is currently the only pupacide that would be considered for use on the Refuge. Because pupacides can negatively affect all aquatic invertebrates that require surface air, this type of mosquito control treatment requires careful consideration. Prior to the application of a pupacide on the Refuge, approval for its use must be obtained through the PUPS process and the SUP would need to be amended. The potential effects of monomolecular biodegradable film on Refuge resources have been evaluated in accordance with NEPA. These effects are summarized in this Compatibility Determination under "Anticipated Impacts of the Use" and discussed in greater detail in Chapter 5 of the draft Seal Beach NWR CCP/EA (*USFWS 2011*).

The use of adulticides on the Refuge has not been considered as part of this Compatibility Determination. In the event of a public health emergency, it may become necessary to control adult mosquitoes on the Refuge. The use of adulticides on the Refuge would require revisions to the current SUP and the preparation of a new Compatibility Determination for Mosquito Management, as well as additional NEPA and Endangered Species Act compliance, approval from the FWS Integrated Pest Management Coordinator through the PUPs review process; and coordination with the Navy Environmental Office staff on how, when, and where an adulticide could be applied on the Refuge.

**Availability of Resources:**
OCVCD will conduct all mosquito monitoring and control activities on the Refuge. Minimal funding from the Service will be needed to prepare annual SUPs and monitor OCVCD's activities, provided the majority of these activities occur within pre-approved locations on the Refuge. Direct costs to administer these activities are primarily in the form of staff time. Table 2 describes the

level of involvement by Refuge staff that is currently required annually to manage and monitor mosquito monitoring and control on the Refuge (based on FY 2010 costs).

| Table 2<br>Annual Staff Involvement in Managing Mosquito Monitoring and Control on the Refuge | |
|---|---|
| **Staff Responsibilities** | **Annual Administrative/Management Costs (approximate) and Time** |
| Deputy Project Leader (GS 13) – Review research proposals | (0.02 FTE*) |
| Refuge Manager (GS 11) – Review and oversight of OCVCD activities; preparation of SUP; monitoring to ensure compatibility; report review | (0.02 FTE) |
| **TOTAL COST AND FTE** | ( 0.04 FTE) |

*FTE (full time equivalent)

**Anticipated Impacts of the Use:**

Introduction

In our evaluation of potential impacts related to mosquito monitoring and control, we considered the discussion and direction provided in the Service's "Draft Mosquito and Mosquito-Borne Disease Management Policy" (Federal Register, Vol. 72, No. 198, 10/15/07). The proposed mosquito management policy of the National Wildlife Refuge System is described in this draft as allowing populations of native mosquito species to exist unimpeded unless they pose a specific wildlife and/or human health threat. According to the draft policy, pesticide treatments for mosquito population control on Refuge lands should only occur when local, current mosquito population monitoring data have been collected and indicate that refuge-based mosquito populations are contributing to a human or wildlife health threat. When these conditions are confirmed, management of mosquito populations on Refuge lands should employ effective means that pose the lowest risk to wildlife and habitats.

Our impact evaluation also took into account the direction provided in the Service's Biological Integrity, Diversity, and Environmental Health Policy (Service Manual Section 601 FW 3). This policy provides for the consideration and protection of the broad spectrum of fish, wildlife, and habitat resources found on Refuges. It also provides refuge managers with an evaluation process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions.

Overview of Impacts

Mosquito monitoring and control on the Seal Beach NWR has the potential to impact Refuge resources in a number of ways, including habitat degradation associated with required access into sensitive salt marsh habitat; wildlife disturbance, during monitoring and pesticide application; and direct and indirect impacts of pesticide use on mosquitoes and other Refuge species. Effective mosquito control results in the removal of a high percentage of one or more target species at least temporarily; however, there is the potential, depending upon the product being used, to adversely affect one or more non-target species. Any alteration of the ecological communities on the Refuge as a result of these activities could impact biological integrity and diversity through disruptions in food webs and other ecological functions.

Habitat Degradation/Wildlife Disturbance
Monitoring and control of mosquitoes requires OCVCD staff to enter sensitive salt marsh habitat areas to observe current site conditions; conduct dip samples in ponded water to identify the presence of mosquito larvae and/or pupae; examine traps for adult mosquitoes; and apply pesticides as needed. The result of this activity is some degree of vegetation trampling and soil compaction, which can impact habitat quality. Further, mosquito breeding season generally occurs at the same time as bird nesting season. As a result, access into vegetated areas can result in the inadvertent destruction of active bird nests and/or disturbance that causes nesting bird to temporarily abandon their nests making chicks or eggs vulnerable to predation. The Federally listed endangered light footed clapper rail and the state listed Belding's savannah sparrow, both of which nest on the Refuge, are particularly vulnerable to such disturbance since they nest on or near the ground.

To minimize the potential for disturbance and habitat degradation to the Federally endangered light-footed clapper rail, mosquito monitoring and control on the Seal Beach NWR is limited to six specific areas on the Refuge (see Figure 1). These areas, which have been identified by OCVCD as being mosquito problem areas, are generally unsuitable as nesting habitat for the light-footed clapper rail. For the most part, these areas are located around the perimeter of the salt marsh complex, and can only be accessed via foot traffic. Access into the main portion of the salt marsh complex requires prior approval by the Refuge Manager and any permitted access requires that Service personnel accompany OCVCD staff onto the site.

Direct and Indirect Effects of Pesticides Currently Approved for Use on the Refuge. The pesticides currently being used on the Refuge include Bti and methoprene. Bs has also been approved for use, but has not been used on the Refuge in several years. Both Bti and methoprene are widely used throughout the country to control mosquitoes, and are considered relatively safe in terms of non-target species; however, very few studies have been conducted to evaluate the long-term effects on non-target species, particularly short-lived aquatic insects and zooplankton.

Bti, which is applied in granular form on the Refuge, is specific to certain primitive dipterans (flies), particularly mosquitoes, black flies, and some chironomid midges. Bti is not known to be directly toxic to non-dipteran insects. The concentrations of Bti in water necessary to kill mosquito larvae vary with environmental conditions, but are generally 0.05-0.10 parts per million (ppm). The label recommended range of application rates under most conditions varies by a factor of 4 for most formulations (e.g., for granular formulations, 2.72-11.12 kg/ha (2.5-10 lb/acre)). For older larvae and water with a high organic content, higher application rates are recommended that may reach eight times the lowest rate (e.g., for granular formulations, the higher rate is 10-20 lb/acre). Mosquito control agencies use the recommended label rates, along with previous experience, to administer an effective dose. Efficacy is monitored by post-application reductions in mosquito larval density, but the actual concentration of Bti following an application is not measured. Thus, an insufficient concentration of Bti can be detected by low mortality of mosquito larvae, but an overdose (i.e., a concentration greater than necessary to kill mosquito larvae) of the pesticide will likely not be detected.

Bs, like Bti, a naturally occurring soil bacterium that can effectively kill mosquito larvae present in water. Bs is very effective in the control of mosquito larvae that occur in water rich in organic matter. It is effective against *Culex spp*. but is less effective against other mosquito species. Depending on the formulation and environmental conditions, Bs is generally effective from one to four weeks after application and there are very few environmental risks associated with its use. When used according to label rates, these products are not considered toxic to mammals, birds, fish, and most non-target invertebrates (insects and worms) (*Davis and Peterson 2008*). Indirect effects on the ecosystem as a result of multiple applications of these products have been documented in a few studies. These effects relate to disruptions in the invertebrate food web that can affect non-target wetland fauna (*Hershey et al. 1998, Poulin et al. 2010*).

Methoprene, which is occasionally used on the Refuge, is a synthetic mimic of a naturally produced insect hormone, juvenile hormone, which is active against a variety of insect species including horn flies, mosquitoes, beetles, tobacco moths, sciarid flies, fleas (eggs and larvae), fire ants, pharaoh ants, midge flies, and Indian meal moths. When an insect is exposed to methoprene, a hormonal imbalance in the development of the insect results, and it fails to properly mature into an adult. The insect eventually dies in the pupal stage. The most susceptible stages of development to methoprene are the later instars (for mosquitoes, third and fourth instars). In mosquito control applications, methoprene is applied directly to the larval breeding habitat. Larvae will continue to feed and may reach the pupal stage, but they will not emerge as adults. Methoprene is completely ineffective on mosquito pupae and adults. It is available in several formulations: liquid, granular, pellet, and briquette. OCVCD uses Altosid briquets and pellets on the Seal Beach NWR.

Various studies have been conducted to determine the effects of methoprene on non-target species. Although results appear to vary, the general conclusion is that methoprene applied at levels recommended on the label are not likely to be toxic to non-target species. For example, methoprene was found to have an effect on copepods, crabs, and shrimp, although these effects were generally observed at concentrations higher than those of operational rates (*Bircher and Ruber 1988, Marten et al. 1993, Hershey et al. 1998*). According to the latest U.S. Environmental Protection Agency (USEPA) R.E.D. fact sheet for methoprene (*USEPA 2001*), data generated under laboratory and field conditions indicate that methoprene mosquito product formulations, including slow release briquette formulations, have a maximal rate of release of ≤ 4 parts per billion (ppb). The typical amount of methoprene necessary for mosquito control is < 1.0 ppb. The initial concentrations of methoprene when applied to aquatic habitats may reach 4 to 10 ppb, but residual concentrations are approximately 0.2 ppb (*Ross et al. 1994*). Most non-target organisms support margins of safety of >200 ppb, therefore, exposure to methoprene would not be expected to reach levels which are toxic to aquatic non-target species either after acute or chronic exposure. Once methoprene is released into the aquatic environment, it is non-persistent with a half-life of about 30-40 hours. Studies have been conducted that indicate the sensitivity of some species in the order Coleoptera to methoprene (*Marten et al. 1993*). This is of concern because there are areas on the Refuge that support one or more species of tiger beetles (in the order Coleoptera). A search of the existing literature did not find any studies that evaluated the effect of methoprene on tiger beetles; therefore, the risk of using this product in areas where these organisms occur is unknown.

There are a number of studies that have focused on the short and long term effects of pesticides, such as Bti and methoprene, on non-target species and long-term non-target species diversity. The general conclusion of these studies is that an integrated approach to mosquito control is necessary to avoid long term detrimental effects on the environment that appear to be occurring as a result of the continuous (year after year) application of these types of pesticides within a given area (*Hershey et al. 1998, Walker et al. 2005, Tilquin et al. 2008, Poulin et al. 2010*).

<u>Direct and Indirect Effects of Pesticides Requested for Use on the Refuge</u>
The OCVCD has requested that the pesticides Agnique® and Natular™ be considered for use on the Refuge.

**<u>Agnique</u>.** As an invisible monomolecular biodegradable film (MMF) made from renewable plant oils, this product reduces surface tension on standing water. The presence of the film makes it difficult for mosquito larvae and pupae to attach to the surface of the water and ultimate leads to drowning. Agnique®, which employs a physical, as opposed to toxic, mode of action to control mosquito and midge larvae and pupae, is persistent for up to 22 days and is effective on all species of mosquitoes and chronomid midges that breed in standing water. This product can be applied using a backpack sprayer. Higher doses are required in areas with multidirectional winds in excess of ten miles per hour.

The USEPA considers this product to be "practically nontoxic." Acute toxicological tests were conducted to determine the effects of up to a 100 fold excess of a monomolecular film on the various life stages of long-nose killifish, fiddler crab, snail, and other species, and no acute effects on any life stage of these species were observed. In addition, no adverse effects to saltwort or cordgrass were observed as a result of exposure over a four-week period. This product does have the potential to adversely affect non-target species such as marsh boatman (*Trichocorixa reticulate*) that live on the water surface or other aquatic insects that require periodic contact with the air-water interface to obtain oxygen. No information is currently available regarding potential effects to these types of non-target species.

**<u>Natular</u>.** This product includes the active ingredient spinosad, a product of bacterial fermentation. Spinosad, classified as a "reduced-risk" compound by the EPA, triggers continuous involuntary nervous stimulus in mosquito larvae that leads to paralysis and death. It has low impact on human health, low potential for groundwater contamination, low pest resistance potential, and is nonpersistent. It is a broad-spectrum pesticide but is only active if ingested or contacted while in liquid form. The label for Natular ™ states that this product is toxic to aquatic organisms and non-target aquatic invertebrates may be killed in waters where this pesticide is applied. Spinosad shows slight toxicity to birds and moderate toxicity to fish. The liquid form of spinosad is highly toxic to marine mollusks on an acute basis (*Material Safety Data Sheet May 2002*) and the EPA categorizes this product as highly toxic to bees, with topical acute activity of less than 1 microgram per bee.

It also impacts species in the orders Lepidoptera and Coleoptera (*Thompson et al. no date*). Some spinosad products are used to kill fire ants, a soil dwelling species. The potential effect of spinosad-based products on native ants or other soil fauna is not known.

Effects to Endangered and Threatened Species. Human activity, such as that associated with mosquito monitoring and control, can have adverse impacts on endangered and threatened species, particularly when it disrupts bird nesting or foraging activities (*Carney and Sydeman 1999*). NASA Island supports nesting habitat for the Federally-listed endangered California least tern and the adjacent open water areas in the Refuge's marsh complex provide foraging habitat for the breeding terns and their young. The marsh complex also provides year-round foraging habitat, as well as nesting habitat, for the Federally-listed endangered light-footed clapper rail. To minimize disturbance to nesting and foraging terns and rails, mosquito monitoring and control is limited to specific locations on the Refuge (Figure 1) and within those locations, all activity must be conducted on foot. Specifics regarding where and how access can occur in and around the marsh is provided in detail in the SUP that is prepared annually for this use. No adverse effects to the listed species supported on the Refuge are anticipated as a result of continuing the current mosquito control practices on the Refuge, nor would any adverse effects be anticipated as a result of adding Agnique to the list of mosquito control products permitted for use on the Refuge. Natular is described as having a slight toxicity to birds. Because it would be applied in areas where the light-footed clapper rail has the potential to forage, the direct effects of this product on this species are unknown.

Light-footed clapper rails and Belding's savannah sparrow could also be affected by disturbance as portions of the habitats that support these species would be subject to human activity associated with monitoring and pesticide application.

Migratory and Resident Water-Dependent Birds. Mosquito monitoring and control activities may result in disturbance to a variety of bird species that utilize the Refuge's intertidal and subtidal habitats for nesting and/or foraging. Some level of disturbance (e.g., trampling of habitat, flushing a bird off an active nest) is expected with these activities, because access into portions of the marsh is necessary to monitor and implement appropriate mosquito control methods. However, actions such as prenesting season field orientation with OCVCD staff to discuss habitat sensitivity and precautions needed while walking through the salt marsh habitat and limiting the areas in which mosquito monitoring and control activities can occur, will help to minimize these potential impacts. To avoid harm to wildlife and habitats, access to traps and sampling stations will comply with the stipulations presented below and the conditions included in SUPs that are prepared annually for the OCVCD.

Direct effects to birds from the larvicides and pupacides proposed for use on the site are not anticipated as toxicity to birds from these products is generally considered slight to practically non-toxic. Indirect effects associated with these products include reducing mosquito populations and other non-target species that serve as the base of food chains for wildlife species. These effects are expected to be temporary and limited to the edges of the marsh.

Pesticide Toxicity and Other Effects to Non-target Organisms. For the most part, the areas on the Refuge where mosquito monitoring and control is permitted are located at the outer edges of the marsh complex, minimizing the negative effects of mosquito monitoring and control to the majority of the Refuge. These areas do however provide habitat for a variety of species, including birds, invertebrates, and small mammals. As described above, Bti and Bs are not expected to impact mammals, birds, most invertebrates, and plants. There is however the potential for this products to kill midge larvae (family chironomidae). Chironomid (non-biting midge) larvae can be abundant in wetlands and provide a significant contribution to the food base of wildlife, including birds (*Batzer et al. 1993, Cooper and Anderson 1996, Cox et al. 1998*).

When applied as recommended on product labels, the presence of methoprene in the environment would not be expected to reach levels which are toxic to aquatic non-target species and methoprene is considered practically non-toxic to birds. Studies do however indicate the sensitivity of some species in the order Coleoptera to methoprene (*Marten et al. 1993*). No studies have been conducted to determine if this sensitivity includes species of the genus *Cicindela* (tiger beetles), therefore, the risk of using this product in areas that support these organisms is unknown. As a result, the use of this product should only be used on the Refuge only as a second line of defense and the locations where it can be applied must be specifically approved by the Refuge Manager. Similar to Bti and Bs, there is a concern that the use of methoprene could impact the availability chironomid larvae and other non-target invertebrates that contribute to the food base for birds and other wildlife.

Agnique is considered to be "practically nontoxic." Studies show no effects on the various life stages of long-nose killifish, fiddler crab, snail, or plants, and this monomolecular film is not known to cause direct chronic or acute avian toxicological effects to birds. This product is potentially lethal to any aquatic insect that lives on the water surface or requires contact with the air-water interface. As a result, its use on the Refuge could have adverse indirect effects on the avian food base, but these effects are considered minimal.

Spinosads, such as Natular, are identified as toxic to aquatic organisms and the liquid form of spinosad is highly toxic to marine mollusks on an acute basis. Intertidal habitat extends almost to the edges of the Refuge; therefore, the use of this product even in the areas currently designated for mosquito control could adversely affect the marine organisms present in these estuarine habitats. Additionally, studies indicate that Natular is toxic to bees and can adversely affect species in the orders Lepidoptera and Coleoptera. One of the objectives of the Refuge habitat enhancement proposals is to improve native pollinator abundance and diversity on the Refuge. In addition, the Refuge supports several native salt marsh butterfly species. The effect of this product on these organisms is unknown.

**Public Review and Comment:**
A Notice of Intent to prepare the CCP was published in the Federal Register on April 16, 2007 (72 FR 19016). At that time, written comments were solicited regarding management of the Refuge. Public scoping meetings were also held to solicit public comment. A CCP web page was established to provide the public with specific information regarding the CCP process and the comments provided during public scoping. Planning Updates have also been prepared to summarize the progress of the CCP and to discuss specific issues related to the planning process.

The draft Compatibility Determination was made available for public review and comment as Appendix A of the Seal Beach NWR Draft Comprehensive Conservation Plan and Environmental Assessment (*USFWS 2011*). Based upon verbal comments provided by OCVCD during the public comment period, the proposal to approve a Mosquito Management Plan was withdrawn and has been replaced with a three phased approach to mosquito management, as described in Chapter 3 of the Final CCP (*USFWS 2011*) in association with annually issued Special Use Permits. The use of adulticides on the Refuge is not being considered at this time. A step-down Mosquito Management Plan will be reinitiated at such time as the Service approves a final Mosquito and Mosquito-Borne Disease Management Policy for the Refuge System.

**Determination:**

__Use is Not Compatible

_X_ Use is Compatible with the Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

Integrated Pest Management

- Mosquito control techniques will stress the use of physical and biological control as much as practicable prior to the use of chemical control.
- Future restoration proposals will be designed to minimize the potential for ponding of tidal waters and areas currently subject to ponding will be targeted for restoration and/or enhancement to eliminate habitat favorable to mosquito production.

Coordination of Mosquito Management Activities

- OCVCD will coordinate all activities with the Refuge Manager.
- OCVCD will meet annually with Refuge and Navy Environmental Office staff to review the activities and results of the previous year and discuss the monitoring and possible control plans for the upcoming year.
- A Refuge SUP will be prepared annually for the OCVCD that will include all appropriate BMPs as described in the Final CCP, as well as special conditions related to location, timing, extent of mosquito monitoring, and stipulations for carrying out all mosquito control under the guidance of the approved PUPs.
- Prior to each year's mosquito breeding season, OCVCD field staff will meet with Refuge Management and the Navy Environmental Office staff to go over field protocols for avoidance and minimization of take to any trust resources including migratory birds and listed species and their habitats.
- At the beginning of the mosquito breeding season, OCVCD will provide a firm schedule of seasonal activities to the Refuge Manager. If activities are proposed that differ from the schedule, OCVCD will call the Refuge Manager at least two business days prior accessing the Refuge.
- Motorized access into habitat areas will be prohibited; all access must be on foot.
- Access for mosquito monitoring and control will be limited to specific locations on the Refuge, as described in the annually issued SUP in order to avoid adverse effects to listed and other trust species and their habitats.

- Access into any areas other than those pre-approved in the annually issued SUP must be approved by the Refuge Manager, and the Refuge Manager or a representative designated by the Refuge Manager must be present while OCVCD staff is in the area to insure that no adults, nests, eggs, or young of listed species will be negatively affected by the monitoring or control activity.
- Within one week of any pesticide application, OCVCD will provide a written record to the Refuge Manager and Navy Biologist documenting the dates of mosquito sampling and treatment, the treatment site number, mosquito species present, abundance per species, and name and amount of product applied.
- OCVCD will review the past year's pesticide proposals and submit any changes in the pesticides or formulations of pesticide that they expect to use in the upcoming year. This information should be made available at or before the time of the annual meeting.
- Mosquito monitoring and control on the Seal Beach NWR must comply with the description of use and activities and all conditions included in the ESA Section 7(a) (2) evaluation prepared to accompany the final CCP (*USFWS 2011*) for the Refuge.

<u>Pesticides Considered for Application on the Refuge</u>

- The use of the larvicides Bti, Bs, and Altosid will be permitted for use when OCVCD criteria for treatment are exceeded (refer to Table 1).
- Altosid can only be used on the Refuge in its solid form (e.g., briquets, pellets) and can only be applied in those locations that have been specifically approved by the Refuge Manager.
- Natular will not be permitted for use on the Refuge due to potential adverse effects to nontarget species including marine and estuarine organisms and native pollinators.
- If larviciding actions are ineffective and late instar non-feeding larvae or pupae are present at densities that exceed OCVCD criteria for treatment and these density represent a public health threat to nearby human populations, then Agnique will be permitted for use on the Refuge if approved for use through the PUPS process.

<u>Pesticide Application on the Refuge</u>

- OCVCD staff will apply all approved mosquito control products in accordance with approved PUPs and the product label. Where specific BMPs developed as part of the PUP approval are more restrictive than the label, the PUP requirements shall apply.
- OCVCD will be required to minimize the use of pesticides and continually investigate formulations and compounds that are least damaging to fish and wildlife populations.
- The BMPs described in Section 3.7.4 of the Final CCP, included in the SUP, and required through the PUPS approval process shall be implemented at all times on the Refuge.

**<u>Justification</u>:**

Mosquitoes are a natural component of most wetland ecosystems; however, we also recognize they may represent a threat to human and/or wildlife health. Management of mosquito larvae and pupae on the Refuge may therefore be permitted when monitoring indicates that sampling thresholds have been exceeded. The manner in which we manage mosquito populations on the Refuge must meet the Service's statutory obligations to protect the biological integrity of the Refuge while also meeting our policy obligations and our social obligation to protect the health and well-being of the human communities surrounding the Refuge. These obligations affect the decisions we make regarding when and how mosquito control can be implemented on the Refuge.

OCVCD has been monitoring and controlling mosquitoes on the Refuge and surrounding Naval Weapons Station for several decades. In the past, control was as much a response to complaints from surrounding residents as it was to reducing the threat of certain vector-borne diseases. Public complaints still drive some control effects, however, the association between mosquitoes and diseases have heighten the concern of vector control districts with respect to mosquito control. The result is increased pressure to actively manage mosquito populations on refuge lands, particularly those Refuges that are located in urban areas.

To more thoroughly address mosquito management on the Refuge, Chapter 3 of the Final CCP (*USFWS 2011*) provides guidance for when and how to monitor and control mosquito populations on the Seal Beach NWR. The CCP addresses the need for mosquito control management and documentation of management actions on the Refuge to protect listed plants, fish, and wildlife and to ensure the health and welfare of surrounding human populations. Adherence to the stipulations provided above will ensure that the proposed use is compatible and will not materially interfere with or detract from fulfilling the Refuge purposes and the Refuge System mission.

**Mandatory Re-Evaluation Date:**

_ Mandatory 15-year Re-Evaluation Date (for priority public uses)

X Mandatory 10-year Re-Evaluation Date (for all uses other than priority public uses)

**NEPA Compliance for Refuge Use Decision:**

_ Categorical Exclusion without Environmental Action Statement

_ Categorical Exclusion and Environmental Action Statement

X Environmental Assessment and Finding of No Significant Impact

_ Environmental Impact Statement and Record of Decision

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**Refuge Determination:**

Prepared by: ______________ (Signature) 9/26/11 (Date)

Project Leader Approval: Andrew Yuen (Signature) 9/26/11 (Date)

**Concurrence:**

Refuge Supervisor: ______________ (Signature) 9/30/11 (Date)

Assistant Regional Director, Refuges: Margaret J. Kolar (Signature) 9/30/11 (Date)

## FINDING OF APPROPRIATENESS OF A REFUGE USE

### Written Justification

**Refuge Name:** Seal Beach National Wildlife Refuge

**Use:** Mosquito Management

### Justification for Determining that this Use is an Appropriate Use for the Refuge:

Mosquitoes are a natural component of most wetland ecosystems; however, we also recognize they may represent a threat to human and/or wildlife health. Management of mosquito populations on the Seal Beach NWR is considered appropriate when mosquito populations pose a threat to the health and safety of the public or a wildlife population.

The Orange County Vector Control District (OCVCD) has been monitoring and controlling mosquitoes on the Refuge and surrounding Naval Weapons Station Seal Beach for several decades. In the past, this control was as much a response to complaints from surrounding residents and personnel on Naval Weapons Station Seal Beach as it was to reducing the threat of certain vector-borne diseases. Public complaints still drive some control effects, however, the association between mosquitoes and diseases have heighten the concern of OCVCD with respect to mosquito control.

To more thoroughly address mosquito management on the Refuge, the Final Comprehensive Conservation Plan (CCP) includes a three phased approach to mosquito monitoring and control. This phased approach to mosquito management is described in Chapter 3 of the Final CCP. The CCP addresses the need for mosquito management on the Refuge and provides measures that are to be included in annually issued Special Use Permits to protect listed species, as well as other native plants, fish, and wildlife support by the Refuge. Adherence to the phasing requirements described in the Final CCP, as well as the implementation of Best Management Practices and detailed protection measures related to coordination, communication, access, and reporting will ensure that the implementation of mosquito monitoring and control on the Refuge will not materially interfere with or detract from fulfilling the Refuge purposes and the Refuge System mission. OCVCD will conduct mosquito control activities. Minimal funding from the Service will be needed to prepare and monitor the SUP.

Based on the guidance provided in the Final CCP for implementing mosquito monitoring and control on the Seal Beach NWR, in my professional judgment this use is an appropriate use on the Refuge.

Refuge Manager: Andrew Yuen Date: 9/26/11

Refuge Supervisor: [signature] Date: 10/3/11

**FINDING OF APPROPRIATENESS OF A REFUGE USE**

Refuge Name: Seal Beach National Wildlife Refuge

Use: Mosquito Management

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

| **Decision Criteria:** | **YES** | **NO** |
|---|---|---|
| (a) Do we have jurisdiction over the use? | ✓ | |
| (b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)? | ✓ | |
| (c) Is the use consistent with applicable Executive orders and Department and Service policies? | ✓ | |
| (d) Is the use consistent with public safety? | ✓ | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | ✓ | |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | ✓ | |
| (g) Is the use manageable within available budget and staff? | ✓ | |
| (h) Will this be manageable in the future within existing resources? | ✓ | |
| (i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources? | | ✓ |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future? | ✓ | |

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate**_____ **Appropriate** ✓

Refuge Manager: Andrew Yuen Date: 9/26/11

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: [signature] Date: 10/3/11

**A compatibility determination is required before the use may be allowed.**

**FWS Form 3-2319**
**02/06**

# *Appendix F*

# *Finding of No Significant Impact and Environmental Assessment*

# Seal Beach National Wildlife Refuge

## *Finding of No Significant Impact and Environmental Assessment*

**Prepared by:**
U.S. Fish and Wildlife Service
Pacific Southwest Region
Refuge Planning Office
2800 Cottage Way, W-1832
Sacramento, CA 95825

and

San Diego National Wildlife Refuge Complex
Post Office Box 2358
Chula Vista, CA 91912

September 2011

**U. S. Department of the Interior**

**Fish and Wildlife Service**
**Region 8 - Pacific Southwest Region**

**FINDING OF NO SIGNIFICANT IMPACT**
**Environmental Assessment for the**
**Seal Beach National Wildlife Refuge Comprehensive Conservation Plan**
Orange County, California

The U.S. Fish and Wildlife Service (Service) has completed the Comprehensive Conservation Plan (CCP) and Environmental Assessment (EA) for the Seal Beach National Wildlife Refuge (NWR or Refuge). The CCP will guide Refuge management for the next fifteen years. The CCP/EA (*USFWS 2011*), herein incorporated by reference, describes the Service's proposals for managing the Refuge and the associated effects of this management on the human environment under three alternatives, including the no action alternative.

## Decision

Following comprehensive review and analysis, the Service selected Alternative C for implementation because it is the alternative that best meets the following criteria:

- Achieves the mission of the National Wildlife Refuge System (Refuge System);
- Ensures that the Refuge will be administered in accordance with the Refuge System Administration Act of 1966, as amended, and pursuant to plans which are mutually acceptable to the Secretary of the Interior and the Secretary of the Navy, as per the legislation authorizing the establishment of Refuge;
- Achieves the purposes of the Refuge;
- Will be able to achieve the Service's vision and goals for the Refuge;
- Maintains and restores the ecological integrity of the Refuge's habitats and populations;
- Addresses the important issues identified during the scoping process;
- Addresses the legal mandates of the Service and the Refuge;
- Is consistent with the scientific principles of sound fish and wildlife management; and
- Facilitates priority public uses which are compatible with the Refuge's purposes and the mission of the Refuge System, as well as the mission of Naval Weapons Station Seal Beach.

## Alternatives Considered

Following is a brief description of the alternatives for managing Seal Beach NWR, including the selected plan (Alternative C). For a complete description of each alternative, see the EA.

### Alternative A (No Action)

Under Alternative A, the Refuge would continue to be managed as it has in the recent past. The focus of the Refuge would remain the same: maintain current habitat management practices and continue to manage and provide habitat for the Federal endangered California least tern and light-footed clapper rail, migratory birds, and other wildlife. The Refuge would continue to offer wildlife-dependent recreation opportunities for wildlife observation, interpretation, and environmental education. Current staffing and funding levels would remain the same.

*Alternative A was not selected for implementation because it does not include proposals to:*

*1) improve conditions for the Refuge's listed species;*
*2) improve existing habitat quality for migratory birds and other wildlife;*
*3) restore disturbed uplands to productive wildlife habitat;*
*3) seek funding to monitor water quality, sea level rise, and associated habitat changes within the Refuge;*
*4) implement an Integrated Pest Management Plan; and*
*5) improve opportunities for wildlife observation.*

**Alternative B**

Under this Alternative, the wildlife and habitat management activities described in Alternative A would be expanded to include new activities intended to: protect and aid in the recovery of the California least tern and light-footed clapper rail; increase our understanding of the array of species present within the Refuge; broaden our understanding of the affects of sea level rise and climate change on Refuge trust resources; and restore disturbed areas of the Refuge to functional salt marsh and wetland/upland transition habitat. Opportunities for wildlife-dependent recreation uses would be the same as those provided under Alternative A.

*Although the implementation of Alternative B would result in the achievement of several of the Refuge goals and objectives, this alternative was not selected for implementation because it lacks the full set of actions necessary to achieve the Refuge's endangered species and public use objectives.*

**Alternative C (Selected Plan)**

Alternative C further expands upon the management activities described in Alternatives A and B, by including additional wildlife and habitat management actions to support listed species, coastal habitats, and migratory birds; providing a greater focus on the restoration of native upland and wetland/upland transition habitat to provide refugia for rails and shorebirds during high tides; and expanding opportunities for wildlife observation. Proposals to expand existing facilities for visitors, including additional restrooms and the construction of a maintenance building, are also included under Alternative C. The addition of one full time equivalent wildlife biologist would be needed to fully implement the proposals included in Alternative C and additional funding, which could come from a variety of sources, would be needed to fund the restoration, monitoring, and facilities improvement proposals included in Alternative C.

*Alternative C was selected for implementation because it considered the alternative that would most effectively achieve Refuge purposes, goals, and objectives, particularly those related to the recovery and protection of Federally listed species and the enhancement of public appreciation, understanding, and enjoyment of Refuge resources.*

## Effects of Refuge Management on the Human Environment

As described in the EA, implementing the selected alternative (Alternative C) will have no significant impacts on any of the environmental resources identified. A summary of the impacts analysis and conclusions is provided below.

**Topography/Visual Quality**
Of the proposals included in the selected alternative, only the restoration proposals and the proposal to construct an elevated observation platform would have any effect on the existing topographic and visual character of the area. Those areas proposed for restoration would be excavated to achieve elevations capable of supporting the desired coastal habitats (i.e., low marsh, mid marsh, high marsh, upland/wetland transition). Because the topography on the lands proposed for excavation is generally flat, the proposal to lower the elevations in these areas by five feet or less would result in minor changes to the existing landform and temporary, minor adverse effects to visual quality. As native coastal vegetation becomes established within the excavated areas, changes to the landform will no longer be evident and the visual character would change from non-native weedy vegetation to native upland, wetland/upland transitional, and salt marsh vegetation. Landform changes are therefore considered minor and the effects to the visual character of the area would be beneficial, but minor in scope.

The elevated observation deck would be constructed along Kitts Highway in the general vicinity of other existing structures including the Refuge headquarters and various Navy buildings; therefore, the proposed structure would not fundamentally alter the current visual character of the area.

**Geology/Soils**
The potential for temporary surface erosion and sedimentation resulting from habitat restoration, culvert replacement, concrete debris removal, improvements to cordgrass habitat, removal of the drop tower, and construction of the elevated observation platform would be avoided or minimized through the implementation of best management practices such as those outlined in Section 5.8.3 (Conservation Measures to be Incorporated into Future Projects) of the Final CCP. Such measures could include the installation of silt fencing, cofferdams, straw wattles, and filter fabric during construction and the revegetation of disturbed areas with appropriate native vegetation to protect exposed soil.

**Mineral and Agricultural Resources**
The habitat and public use proposals included in the selected plan would have no effect on the adjacent oil production area or the Navy's adjacent agricultural leases.

**Hydrology/Water Quality**
Restoration of the remaining disturbed upland areas on the Refuge to native coastal habitats would reestablish to some extent the historic hydrologic conditions of these areas. However, because of the highly managed nature of Port of Long Beach restoration ponds (i.e., Forrestal Pond, Case Road Pond, 7$^{th}$ Street Pond, and Perimeter Pond), which rely on various culverts and water structures to convey tidal waters to the restored areas, any proposed changes to the hydrology in these areas will require further analysis during restoration planning to ensure that restoration or replacement of failing culverts will not result in increased scour or notable changes in the tidal regime. The effects of implementing restoration will be further evaluated in future step-down restoration plans and associated NEPA compliance. To avoid impacts to water quality related to erosion and sedimentation, future projects would be required to incorporate appropriate BMPs into overall the project design, as described above under Geology/Soils.

The potential for impacts to water quality as a result of the implementation of the Refuge's Integrated Pest Management (IMP) Plan would be avoid through adherence to the BMPs for storage and application of pesticides that are included in the IMP Plan (Appendix D of the Final CCP).

**Climate Change/Sea Level Rise**

Over the next 15 years, it is likely that the effects of sea level rise (e.g., higher high tide elevations, increases in the frequency of surface flooding due to higher high tides that occur during storm events) will become more evident. However, the effects of sea level rise over the next 15 years are not anticipated to adversely affect Refuge resources. In an effort to better understand how Refuge resources could be affected by sea level rise, several strategies are proposed to assist Refuge staff in identifying changes related to sea level rise, including annually tracking of changes in tidal elevations within various areas of the Refuge and establishing benchmarks for determining when specific actions should be taken to address the effects of sea level rise on Refuge resources. To avoid impacts to new facilities as a result of sea level rise, the predictions of the Sea Level Affecting Marshes Model (SLAMM) will be taken into consideration when selecting the site for the proposed elevated observation platform.

**Air Quality**

Management actions such as habitat restoration, culvert replacement, concrete debris removal, and installation of a new observation platform would result in temporary, localized adverse impacts to air quality related to fugitive dust and tailpipe emissions generated by construction equipment (e.g., land excavators, motor graders, dump trucks, excavator with a hydraulic hammer). Impacts related to fugitive dust would be minimized through the implementation of BMPs such as watering prior to and during excavation, installing wind fencing as necessary, covering excavated material, and stopping work during high wind conditions. The various activities that would generate tailpipe emissions are relatively small projects that would take place over a period of one to two months and are therefore not expected to generate emissions in excess of current air quality standards. BMPs have also been included in the IPM Plan to minimize potential impacts to localized air quality as a result of pesticide use.

**Greenhouse Gas Emissions**

Temporary increases in greenhouse gas (GHG) emissions would result from the implementation of proposed construction activities such as restoration, culvert replacement, and construction of new facilities (i.e., restrooms, maintenance building). The overall GHG emissions generated by the two or three construction vehicles operating over a one to two month period to implement these projects would be relatively low compared to the other activities occurring within the Orange County air basin. Therefore, the GHG emissions anticipated to result from the implementation of the selected plan are not expected to represent a significant direct or indirect impact on the environment.

To reduce the total GHG emissions generated from the operation and maintenance of the Refuge, as vehicles are replaced, new vehicles will be selected that have better fuel economy. In addition, where ever 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.

**Contaminants**
Coordination with the Navy prior to implementing restoration projects or other projects involving excavation or surface disturbance will be conducted to ensure that issues related to Installation Restoration Program/Munitions Response Program sites are adequately addressed.

**Vegetation**
The selected plan requires that various measures be implemented to protect sensitive vegetation, including restricting all public use to established trails and roads; incorporating conditions into Special Use Permits that regulate access in sensitive habitat areas; and delineating project construction areas with temporary fencing to avoid inadvertent entry into adjacent habitat areas. The selected plan also includes various proposals to benefit native vegetation on the Refuge, as well as proposals to replace non-native vegetation with appropriate native upland and wetland vegetation. As a result, no significant adverse affects to vegetation are anticipated.

**Wildlife**
The implementation of some actions could result in temporary disturbance to wetland and upland birds. To minimize the effects of this disturbance, construction activity will only be permitted outside of the breeding season, and other activities that must be implemented during the breeding season, such as listed species monitoring and predator control, will be conducted in the manner that limits the amount of time an individual can be present in the area and restricts access in habitat areas to foot traffic. In addition, construction boundaries will be delineated with fencing to ensure that areas outside the construction footprint are not impacted. Benefits to migratory and resident birds will be realized following the conversion of non-native upland areas to native wetland and upland/wetland transition vegetation.

Mosquito control is conducted on the Refuge by the Orange County Vector Control District (OCVCD) during the summer. Because this activity is conducted during the breeding season, there is a potential for impacts to nesting birds. To minimize the potential for such impacts, stipulations are included in the Refuge Special Use Permit issued to the OCVCD that limit the locations and extent of activities permitted in sensitive habitat areas.

The selected action originally included a proposal to implement a mosquito management plan on the Refuge; however, that proposal has been withdrawn until the Service approves a final Mosquito and Mosquito-Borne Disease Management Policy for the Refuge System. The elimination of this proposal does not alter the conclusions of the EA because the Refuge will continue to issue an annual Special Use Permit to the OCVCD that will include stipulations for how, where, and when mosquito management can be implemented on the Refuge. Mosquito control would be limited to the control of larvae and pupae. The use of adulticides on the Refuge is not addressed in the Final EA. In the event of a public health emergency, it may become necessary to control adult mosquitoes on the Refuge. Under such circumstances, the Service would assist OCVCD to expeditiously work through the necessary documentation and approval processes (i.e., revisions to the current SUP, preparation of a new Compatibility Determination for Mosquito Management, NEPA and Endangered Species Act compliance, FWS Integrated Pest Management Coordinator approval of the specific pesticide) required to control adult mosquitoes on the Refuge.

Public uses occur along existing trails located outside the Refuge's salt marsh vegetation and all public activities on the Refuge are conducted in the presence of Refuge staff and volunteers. As a result, no adverse effects to wildlife or wildlife habitat from the proposed public use program are anticipated.

**Federal Endangered and Threatened Species**

Many of the management actions included in the selected plan (e.g., predator management, elimination of potential predator perches, nest site preparation, installation and maintenance of artificial nesting platforms, monitoring, habitat restoration) focus on the recovery and protection of listed species, particularly the endangered California least tern and light-footed clapper rail. The implementation of these actions will benefit the Refuge's listed species. Also, during the 2011 nesting season, the first documented nesting of western snowy plover, a Federally listed threatened species, occurred on NASA Island. The actions taken to protect the chicks and eggs of nesting California least terns would also benefit nesting western snowy plovers should they return to this site in subsequent years. The selected plan includes measures that must be implemented to avoid or minimize the potential for impacts to listed species. Such measures include limiting must activities proposed within the Refuge's wetland habitat to outside of the breeding season. Where this is not possible (such as for mosquito management), avoidance of known nesting sites is required. Other measures include minimizing access into salt marsh habitat throughout the year and ensuring that construction and maintenance activities are confined to approved project footprints with adjacent sensitive areas clearly delineated to avoid intentional or inadvertent encroachment into these areas.

Temporary disturbance of nesting terns can occur when site monitors enter or get close to the nesting area. This disturbance can cause adult terns to momentarily leave the nest, putting chicks or eggs at risk of predation. To reduce the potential for disturbance, monitoring protocols, such as limiting the number and duration of visits to the nesting site, are implemented throughout the nesting season. Past experience has 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.

Although most activities implemented on the Refuge occur on the edges of the marsh, some activities, such as the inspection or replacement of light-footed clapper rail nesting platforms or conducting rail counts, require access into sensitive marsh habitat. To minimize disturbance to rails and vegetation, access into these areas is often obtained through the use of canoes or a small boat with a quiet electric trolling motor. The protocols to be followed when working in rail habitat will ensure that no significant adverse impacts to rails will occur as a result of Refuge management activities.

The selected plan also includes conservation measures to ensure the protection of sea turtles present on the Refuge and requires future consultation with NOAA National Marine Fisheries Service for projects that have the potential to affect turtles. Conservation measures include: conducting a presence/absence survey for turtles prior to and during any proposed construction; using impingement barrier structures, rock filters, or other types of exclusion structures around temporary water intake structures to prevent turtle entrainment; prohibiting the placement of any materials into subtidal habitat that have the potential for entangling sea turtles; and considering potential turtle movement in the design and sizing of culverts and water control structures. The incorporation of these measures into future construction project specifications would avoid any adverse effects to sea turtles.

In accordance with Section 7(a)(2) of the Endangered Species Act of 1973, the Service has conducted a biological evaluation to determine whether the actions proposed in the selected plan may affect federally listed and proposed species or proposed or designated critical habitat. Based on this evaluation, the Service has determined that the approval and implementation of the Final Comprehensive Conservation Plan for the Seal Beach NWR and approval of the Integrated Pest Management Plan that was prepared in conjunction with the CCP may affect the listed species present on the Refuge, but are not likely to adversely affect these species. The biological evaluation also concludes that because the CCP is a programmatic document requiring future site-specific step-down planning, subsequent Section 7 consultation will be conducted for all future actions on the Refuge that may affect listed, proposed, or candidate species.

The Service is also in Section 7 consultation with NOAA National Marine Fisheries Service regarding the effects of implementing the CCP at Seal Beach NWR on the endangered eastern Pacific green sea turtle; however, more time is needed to complete this informal consultation. No new activities under the CCP will be initiated until this consultation is complete. In addition to the conservation measures identified in the EA and incorporated into the proposed action, the Service will also implement any reasonable and prudent measures, and terms and conditions NOAA National Marine Fisheries Service feels are necessary to concur with the Services' determination that implementation of the CCP may affect eastern Pacific green sea turtles, but is not likely to adversely affect this species.

**Cultural Resources**

Cultural resource surveys have been conducted for all of the upland areas within the Refuge; however, the intertidal areas have not been surveyed. The previously conducted surveys identified one site within the Refuge and several sites on the adjacent Navy lands. Because these surveys only address surface deposits, there remains a potential for cultural resources to be present below the surface of the Refuge's few upland areas, as well as within the unsurveyed intertidal areas. Therefore, to avoid adverse effects to cultural resources, prior to implementing ground disturbing activities, a map of the potential area of effect will be submitted to the Service's Cultural Resources Program, as well as appropriate Navy cultural resources staff. Based on all of the available information, the Service and Navy cultural resources staff will determine the form of Tribal and State Historic Preservation Officer (SHPO) consultation that may be required, as well as the type of measures to be implemented to avoid adverse impacts to cultural resources.

**Land Use**

The Refuge is located entirely within the boundaries of Naval Weapons Station Seal Beach and is not located adjacent to any uses that could be adversely affected by activities occurring on the Refuge. Additionally, the activities conducted on the Refuge are coordinated with the Navy to ensure compatibility with the mission of the Naval Weapons Station.

**Public Safety**

The Refuge is located within the boundaries of a Naval Weapons Station; therefore, there are activities occurring in proximity to the Refuge that can pose a safety hazard to Refuge staff and the public if they enter restricted or closed areas. Such locations include the area to the south and east of the existing small arms range and buffer areas around ordnance storage and handling sites, referred to as ESQD Safety Arcs. Only essential personnel are permitted within ESQD Safety Arcs and no access is permitted in areas adjacent to the firing range when it is in use (i.e., "hot"). Coordination with the Navy is also required for activities proposed in Installation Restoration Program/Munitions Response Program sites. Adherence to Navy rules and/or conditions related to these areas would avoid any adverse effects related to public safety.

**Traffic Circulation**

Some short term increases in truck traffic on adjacent public roadways would occur as a result of proposed restoration, culvert replacement, and concrete removal projects. To minimize the number of trips generated during these activities, efforts would be made to dispose of graded material within the boundaries of Naval Weapons Station Seal Beach. When material must be trucked off the site, appropriate traffic control measures such as scheduling truck trips to occur outside of peak traffic periods, would be implemented to minimize the potential for impacts to traffic circulation.

Increasing the Refuge staff by one would generate approximately four additional trips per work day, while the expansion of the public use programs, which could increase the number of weekends in which trips to and from the Refuge would be generated, would result in an estimated 50 to 60 trips generated per weekend day when a public event is occurring on the Refuge. Although the number of weekend days per year in which trips would be generated by Refuge activities would increase, the number of trips generated per any weekend day would remain the same. Therefore, the volume of traffic generated by Refuge uses would remain low and the majority of the trips would continue to occur during non-peak hours. No observable effects on the local and regional transportation system as a result of implementing the selected plan are anticipated.

**Public Utilities/Easements**

To avoid any potential for adversely affecting public utilities and easements as a result of implementing major management actions on the Refuge, such as habitat restoration, Refuge staff would coordinate with appropriate Navy personnel, including the Public Works Department, during the development of construction plans and site specific restoration plans. This would ensure that any potential adverse effects to utilities and easements would be avoided.

**Vectors/Odors**

The habitat restoration proposals identified in the selected alternative would be designed to ensure that ponding as a result of higher high tides would not be facilitated, thereby reducing the potential for creating breeding areas for salt marsh mosquitoes. Measures to reduce such areas in existing salt marsh habitat would also be implemented to further reduce the number of areas suitable for mosquito breeding. The Refuge will continue to work with OCVCD to ensure compatible control of mosquito larvae and pupae on the Refuge. In the event of a public health emergency related to mosquito-borne disease found on the Refuge, the Service would work with OCVCD to address this issue.

Given Anaheim Bay's status as a reasonably well-flushed coastal salt marsh, characterized by healthy levels of dissolved oxygen, odors do not appear to be a problem at present for nearby residents and visitors. No actions proposed by the selected alternative would alter this current condition.

**Economics/Employment**

The selected alternative includes several proposals that would generate jobs, at least on a temporary basis, within the local area. Carrying out the proposed habitat restoration projects would inject approximately $3 million into the local economy, temporarily increasing employment and expenditures. However, in the context of the multi-billion dollar Orange County economy, which includes nearly 1.5 million workers, this effect would be negligible.

**Environmental Justice**

The proposed wildlife and habitat management activities would have no effect on individuals located outside of the Refuge boundary; therefore, there would be no disproportionate adverse impacts on any residents in the region, particularly minority or low-income residents.
The continuation and possible expansion of the Refuge's existing public use program, which involves both on-Refuge and off-Refuge activities, would provide additional opportunities for the surrounding public to visit the Refuge and/or learn more about the resources protected on the Refuge at local events or in the classroom.

**Cumulative Effects**

An analysis of the interaction of activities proposed for the Seal Beach NWR with other actions occurring over a larger spatial reference and a temporal reference of about 15 years (the intended life of this CCP) was conducted as part of the EA (refer to section 4.9 of the EA) and no significant cumulative impacts were identified.

## Public Review

The draft CCP/EA was available for public review and comment between March 24, 2011 and May 11, 2011 and a public meeting was held on April 6, 2011. The document was distributed to Federal, State, and local agencies, Tribal governments, State Clearinghouse, Seal Beach Public Library, and interested organizations and individuals. It was also available for review on-line at the Seal Beach NWR CCP webpage.

The Refuge received five letters as a result of the public review process and also met with the Orange County Vector Control District to discuss their issues related to the draft Mosquito Management Plan. The Final CCP/EA has been modified to meet and address, as appropriate, the concerns that were raised in the comment letters and during the meeting with OCVCD, including withdrawal of the draft Mosquito Management Plan until such time as the Service approves a final Mosquito and Mosquito-Borne Disease Management Policy. Mosquito management would however continue to be implemented on the Refuge in accordance with annually issued Special Use Permits and consistent with the findings of the Compatibility Determination prepared for mosquito management as part of the CCP process.

The planning process incorporated numerous opportunities for public involvement in the development and review of the CCP. This included two scoping meetings, one public workshop, three planning updates, a CCP webpage announcing various opportunities for public comment, and public review and comment on the draft CCP/EA and accompanying step-down plans. The details of the Service's public involvement program are described in the Final CCP.

## Conclusions

Based on review and evaluation of the information contained in the supporting references, I have determined that implementing Alterative C of the EA for the management of the Seal Beach National Wildlife Refuge is not a major Federal action 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 National Wildlife Refuge Complex, 1080 Gunpowder Point Drive, Chula Vista, California 91910 (telephone 619/467-9150 ex. 103). These documents are available to the public and can be found on the Internet at http://www.fws.gov/sandiegorefuges/ (once at the site, click on Seal Beach NWR CCP in the Refuge Planning box located at the upper left-hand corner of the page). A final planning update will be sent to interested and affected parties notifying them of this decision.

## Supporting References

U. S. Fish and Wildlife Service. 2011. Seal Beach National Wildlife Refuge Final Comprehensive Conservation Plan and Environmental Assessment. Region 8. Sacramento, California.

U.S. Fish and Wildlife Service. 2011. Intra-Service Section 7 Biological Evaluation Form for the Seal Beach National Wildlife Refuge Comprehensive Conservation Plan.

Acting

Regional Director, Pacific Southwest Region
Sacramento, California

9.30.2011
Date

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# 1 Purpose and Need for the Action

## 1.1 Introduction

Seal Beach National Wildlife Refuge (NWR or Refuge) encompasses approximately 965 acres of coastal wetlands and uplands in northwestern Orange County, California (see Figure 1-1). The Refuge, which is managed by the U.S. Fish and Wildlife Service (Service) as part of the National Wildlife Refuge System (NWRS or Refuge System), is located entirely within the boundaries of Naval Weapons Station Seal Beach (Figure 1-2). The tidally influenced wetland habitat protected within the Refuge supports thousands of migratory birds that travel along the Pacific Flyway and provides habitat for listed species, including the California least tern (*Sternula antillarum browni*) and light-footed clapper rail (*Rallus longirostris levipes*), both of which nest on the Refuge.

This Comprehensive Conservation Plan (CCP) has been prepared to describe the desired future conditions of the Seal Beach NWR. It is also intended to provide long-range guidance and management direction to achieve the purposes for which the Refuge was established; to help fulfill the mission of the National Wildlife Refuge System; to maintain and, where appropriate, restore the ecological integrity of the Refuge and the Refuge System; and to meet other mandates.

## 1.2 Purpose and Need for the Plan

The purpose and need for the Seal Beach 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. The CCP, when completed, is intended to provide a 15-year management plan for addressing the conservation of fish, 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/or management needs for the Refuge, as well as any issues affecting the management of Refuge resources and public use programs, are identified; and 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, other species, 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 that current and future uses of the Refuge 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.

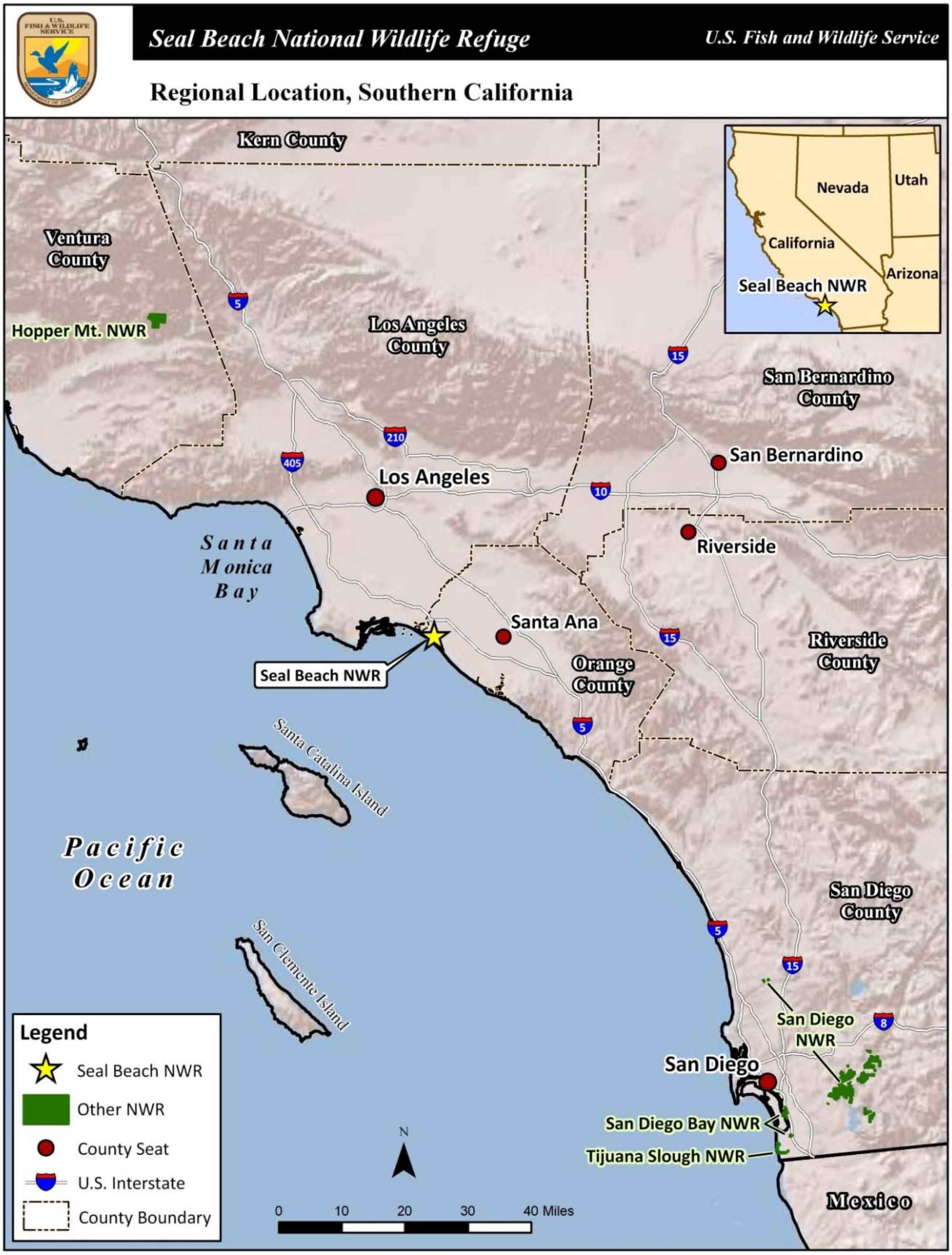


**Figure 1-1. Regional Vicinity Map of Seal Beach National Wildlife Refuge**

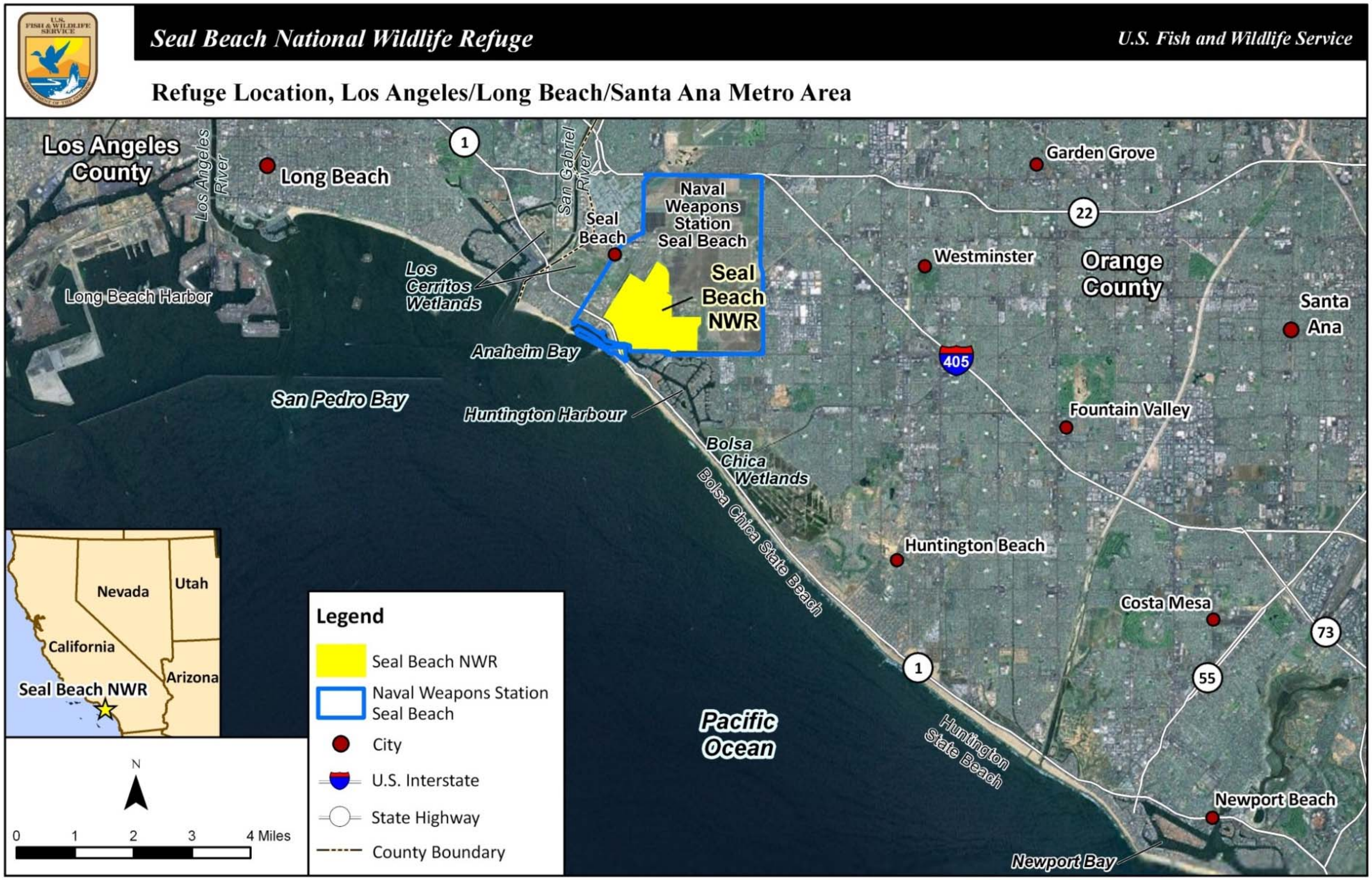


**Figure 1-2. Location Map of Seal Beach National Wildlife Refuge**

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.

Prior to developing a CCP for the Refuge, the plans available to direct management on the Seal Beach NWR were limited to: the *General Plan for Use of U.S. Navy Lands and Waters for Wildlife Conservation and Management,* approved in 1973; *Management Plan for the Seal Beach NWR*, approved in 1974; and the *Endangered Species Management and Protection Plan*, approved in 1991. Although general direction is provided in these plans, there is no overarching management plan in place that describes the future strategies that should be implemented to address current and future changes in Refuge conditions, such as sea level rise, or for achieving Refuge purposes. The CCP represented the first comprehensive management plan for the Refuge.

The purpose of the CCP is to set forth Refuge goals and objectives, which are based on specific Refuge purposes, Federal laws, NWRS goals, and Service policies, and will describe the strategies to be implemented to achieve these goals and objectives. The CCP addresses all activities that will occur on the Refuge; however, the noted management activities or strategies may be broadly stated. In such cases, the Refuge staff will prepare detailed step-down plans to describe how a management strategy, such as habitat restoration, will be implemented. As such, 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 developed for the Seal Beach NWR following CCP approval include a habitat management plan, habitat restoration plans, and a mosquito management plan.

## 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, it is the Service that 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.

### 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 553 national wildlife refuges and other units of the Refuge System and 37 wetland management districts. The majority of refuge 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 ), 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 carefully 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

Legal mandates and Service policies govern the Service's planning and management of the NWRS. A list and brief description can be found at the "Division of Congressional and Legislative Affairs, USFWS" Web site (http://www.fws.gov/laws/Lawsdigest.html). In addition, the Service has developed policies to guide NWRS planning and management. These policies can be found at the "NWRS Policies Web site" (http://www.fws.gov/refuges/policiesandbudget/refugepolicies.html). The main sources of legal and policy guidance for the CCP and EA are described in this section.

### 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 NWRS is derived from 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). Section 4(a)(3) of the Improvement Act states, "With respect to the National Wildlife Refuge System, it is the policy of the United States that – (A) each refuge shall be managed to fulfill the mission of the 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 Refuge Administration Act, as amended, clearly establishes wildlife conservation as the core NWRS mission. House Report 105-106, accompanying the Improvement Act, states that "the fundamental mission of our Refuge System is wildlife conservation: wildlife and wildlife conservation must come first." In contrast to other systems of public lands, which are managed on the sustained–yield basis for multiple uses, the NWRS is a primary-use network of lands and waters. First and foremost, refuges are managed for fish and wildlife, plants and their habitats. In addition, units of the NWRS are legally closed to all public access and use, including economic uses, unless and until they are officially opened through an analytical, public process called the refuge compatibility process. With the exception of refuge management activities, which are not economic in nature, all other uses are subservient to the NWRS' primary wildlife management responsibility and they must be determined compatible before being authorized.

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. These policies are summarized in the following text.

## Compatibility Policy

The Improvement Act states "the Secretary shall not initiate or permit a new use of a Refuge or expand, renew, or extend an existing use of a Refuge, unless the Secretary has determined that the use is a compatible use and that the use is not inconsistent with public safety." The Improvement Act also states that "compatible wildlife-dependent recreational uses [hunting, fishing, wildlife observation and photography, or environmental education and interpretation] are the priority general public uses of the System and shall receive priority consideration in Refuge planning and management; and when the Secretary determines that a proposed wildlife–dependent recreational use is a compatible use within a refuge, that activity should be facilitated, subject to such restrictions or regulations as may be necessary, reasonable, and appropriate."

In accordance with the Improvement Act, the Service has adopted a Compatibility Policy (*Service Manual, Part 603 FW 2*) that includes guidelines for determining if a use proposed on a national wildlife refuge is compatible with the purposes for which the refuge was established. A compatible use is defined in the policy as a proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the NWRS mission or the purposes for which the Refuge was established. The Policy also includes procedures for documentation and periodic review of existing refuge uses.

When a determination is made as to whether a proposed use is compatible or not, this determination is provided in writing and is referred to as a compatibility determination. An opportunity for public review and comment is required for all compatibility determinations. Compatibility determinations prepared concurrently with a CCP are included in the public review process for the draft CCP and associated NEPA document. The Refuge has completed draft compatibility determinations for wildlife observation, interpretation and environmental education, as well as mosquito control and research. These compatibility determinations are available for review and comment in Appendix E of the CCP.

## Appropriate Use Policy

Refuges are, first and foremost, national treasures for the conservation of wildlife. Through careful planning, consistent system-wide application of regulations and policies, diligent monitoring of the impacts of uses on wildlife resources, and preventing or eliminating uses not appropriate to the Refuge System, the conservation mission of the Refuge System can be achieved, while also providing the public with lasting opportunities to enjoy and appreciate the resources protected within the Refuge System. The Appropriate Use Policy (*Service Manual, Part 603 FW* 1) provides a national framework for determining appropriate refuge uses and outlines the procedures refuge managers must follow when deciding if a new or existing use is an appropriate use on the refuge. If an existing use is not appropriate, the refuge manager will eliminate or modify the use as expeditiously as practicable. If a proposed use is not determined to be appropriate, the use will not be allowed, and a compatibility determination will not be prepared.

To be considered appropriate, a proposed or existing use on a refuge must meet at least one of the four conditions described here. All uses determined to be appropriate are also reviewed for compatibility.

1) The use is a wildlife-dependent recreational use as identified in the Improvement Act (i.e., hunting, fishing, wildlife observation and photography, and environmental education and interpretation).
2) The use contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997.
3) The use involves the take of fish and wildlife under State regulations. (States have regulations concerning take of wildlife that includes hunting, fishing, and trapping. Take of wildlife under such regulations is considered appropriate; however, the refuge manager must determine if the activity is compatible before allowing it on a refuge.)
4) The use has been found to be appropriate after considering the following criteria:
   a) The Service has jurisdiction over the use. (If the Service does not have jurisdiction over the use or the area where the use would occur, no authority exists to consider the use.)
   b) The use complies with all applicable laws and regulations (e.g., Federal, State, tribal, and local). (Uses prohibited by law are not appropriate.)
   c) The use is consistent with applicable Executive orders and Department and Service policies. (If a use conflicts with an applicable Executive order or Department or Service policy, the use is not appropriate.)
   d) The use is consistent with public safety. (If a use creates an unreasonable level of risk to visitors or refuge staff, or if the use requires refuge staff to take unusual safety precautions to assure the safety of the public or other refuge staff, the use is not appropriate.) e) The use is consistent with refuge goals and objectives in an approved management plan or other document. (If a use, either itself or in combination with other uses or activities, conflicts with a refuge goal, objective, or management strategy, the use is generally not appropriate.)
   f) The use has been previously considered in a refuge planning process or under this policy and was rejected as not appropriate. (Unless circumstances or conditions have changed significantly, the use need not be considered further.)

g) The use would not divert management efforts or resources away from the proper and reasonable management of a refuge or the implementation of a wildlife-dependent recreational use. (A use, other than a wildlife-dependent recreational uses [i.e., hunting, fishing, wildlife observation and photography, and environmental education and interpretation], that diverts available resources is generally not appropriate.)
h) The use will be manageable in the future within existing resources. (If a use would lead to recurring requests for the same or similar activities that will be difficult to manage in the future, then the use is not appropriate. However, if the use can be managed so that impacts to natural and cultural resources are minimal or inconsequential, or if clearly defined limits can be established, then the use may be further considered.)
i) The use contributes to the public's understanding and appreciation of the refuge's natural or cultural resources, or is beneficial to the refuge's natural or cultural resources. (If this is not the case, such a use would generally be considered not appropriate.)
j) The use can be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality, compatible, wildlife-dependent recreation into the future. (If this is not the case, such a use would generally be considered not appropriate.)

This Policy also states that if, during preparation of the CCP, a previously approved use can no longer be considered appropriate on the refuge, the reasons for this determination must be clearly explained to the public and a description of how the use will be eliminated or modified must also be provided.

Although a refuge use may be both appropriate and compatible, the refuge manager retains the authority to not allow the use or to modify the use. For example, on some occasions, two appropriate and compatible uses may be in conflict with each other. In these situations, even though both uses are appropriate and compatible, the refuge manager may need to limit or entirely curtail one of the uses in order to provide the greatest benefit to refuge resources and the public.

## Biological Integrity, Diversity and Environmental Health Policy

Section 4(a)(4)(B) of the Improvement Act states, "In administering the System, the Secretary shall . . . ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans . . ." This legislative mandate represents an additional directive to be followed while achieving refuge purposes and the NWRS mission. The Improvement Act requires the consideration and protection of a broad spectrum of fish, wildlife, plant and habitat resources found on a refuge. To implement this mandate, the Service has issued the Biological Integrity, Diversity and Environmental Health Policy (*Service Manual, Part ,601 FW 3*), which provides policy for maintaining and restoring, where appropriate, the biological integrity, diversity, and environmental health of the NWRS. This policy provides a refuge manager with an evaluation process to analyze his/her refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate, and in concert with refuge purposes and the NWRS mission, to restore lost or severely degraded resource components. Within section 3[3.7B] of the policy, the relationships among biological integrity, diversity, and environmental health; the NWRS mission; and refuge purposes are explained as follows, "…each refuge will be managed to fulfill refuge purpose(s) as well as to help fulfill the System mission, and we will accomplish these purposes(s) and our mission by ensuring that the biological integrity, diversity, and environmental health of each refuge are maintained and where appropriate, restored."

When evaluating the appropriate management direction for refuges, refuge managers will use sound professional judgment to determine their refuge's contribution to biological integrity, diversity, and environmental health at multiple landscape scales. Sound professional judgment incorporates field experience, an understanding of the refuge's role within an ecosystem, and the knowledge of refuge resources, applicable laws, and best available science, including consultation with resource experts both inside and outside of the Service.

The priority public uses of the NWRS are not in conflict with this policy when they have been determined to be compatible. The directives of this policy do not envision or necessitate the exclusion of visitors or the elimination of visitor use structures from refuges; however, maintenance and/or restoration of biological integrity, diversity, and environmental health may require spatial or temporal zoning of visitor use programs and associated infrastructures. General success in maintaining or restoring biological integrity, diversity, and environmental health will produce higher quality opportunities for wildlife-dependent recreational uses.

## Wilderness Stewardship Policy

The Wilderness Stewardship Policy, described in Part 610 FW 1 – 5 of the Service Manual, provides an overview and foundation for implementing the National Wildlife Refuge System Administration Act of 1966, as amended, and the Wilderness Act of 1964. In the Wilderness Act, Congress called for the establishment of a National Wilderness Preservation System to secure an "enduring resource of wilderness" for the American public. Wilderness, as defined in Section 2(c) of the Wilderness Act, is an area that ". . . generally appears to have been affected primarily by the forces of nature with the imprint of man's work sustainably unnoticeable . . . has outstanding opportunities for solitude or a primitive and unconfined type of recreation . . . [and] has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition…"

The Wilderness Stewardship Policy provides refuge managers with guidance on conducting wilderness reviews on Refuge System lands to determine if these lands should be recommended for wilderness designation. It also establishes policy for managing wilderness study areas and recommended and proposed wilderness. The Policy also prescribes how refuge managers will preserve the character and qualities of designated wilderness while managing for refuge establishing purpose(s).

Part 610 FW 4 of the Service Manual describes the wilderness review process, a process that must be followed when identifying and recommending for congressional designation Refuge System lands and waters that merit inclusion in the National Wilderness Preservation System. Wilderness reviews are to be conducted as part of a scheduled CCP or CCP revision but can also be conducted at any time if significant new information becomes available, ecological conditions change (including the restoration of significant acreage to natural conditions so that area now meets the definition of wilderness), or major refuge expansion occurs. The process must include interagency and tribal coordination, public involvement, and National Environmental Policy Act (NEPA) compliance. A wilderness review has been conducted for the Seal Beach NWR as part of the CCP process.

### 1.4.2 National Environmental Policy Act of 1969

As the basic national charter for the protection of the environment, the National Environmental Policy Act (NEPA) 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 all of 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 Seal Beach 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 (Department Manual, Part 516). To comply with CEQ NEPA regulations and ensure the NEPA process to be integrated into the CCP process at the earliest possible time, a draft EA was integrated directly into the draft CCP document for the Seal Beach NWR. Once the CCP was finalized, the EA was separated from the Final CCP. The EA is now included in the CCP as an Appendix (Appendix F) to the Final CCP. The EA consists of the following sections: a Finding of No Significant Impact (FONSI); Chapter 1, Purpose and Need; Chapter 2, Alternatives, including the Proposed Action; Chapter 3, Affected Environment; Chapter 4, Environmental Consequences; Appendix F-1, List of Preparers; Appendix F-2, Distribution List; Appendix F-3, Response to Comments; and Appendix F-4, Glossary of Terms.

## 1.5 The Comprehensive Conservation Plan Process

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 assessing alternatives
- Identifying preferred alternative plan
- Draft CCP and EA
- Revising draft documents and releasing final CCP
- Implementing the CCP
- Monitoring/feedback

Figure 1-3 shows the overall CCP steps and process in a linear cycle, but the planning process is actually a non-sequential movement among the steps, with many revisions occurring during plan development.

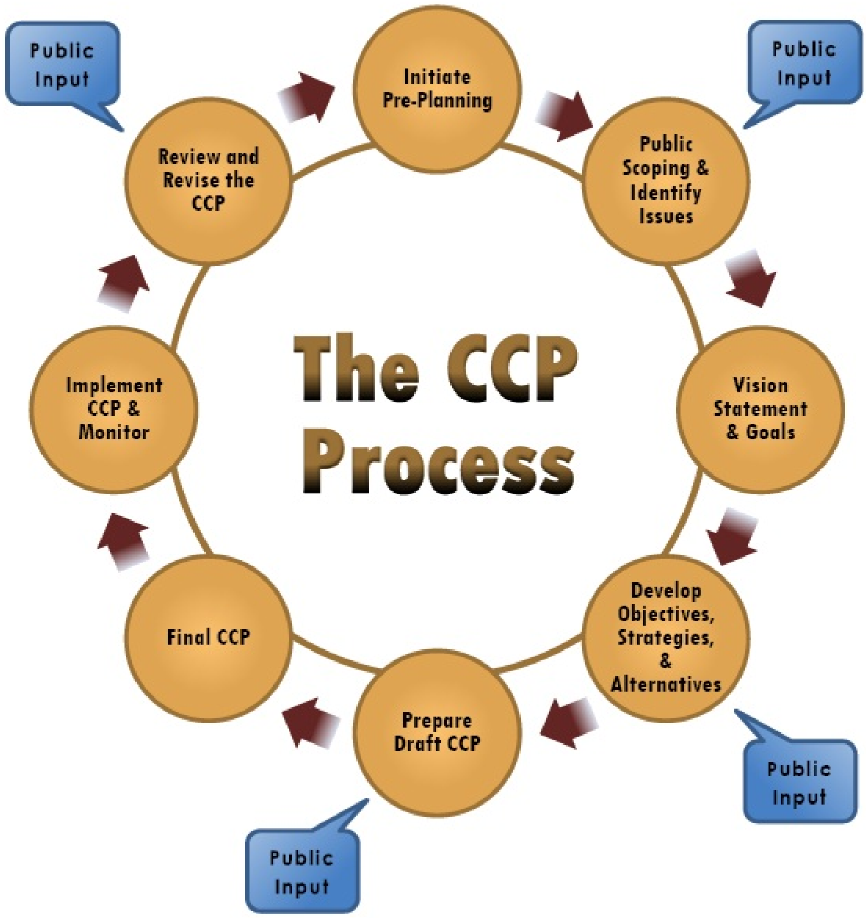


**Figure 1-3. Comprehensive Conservation Planning Process**

### 1.5.1 Preplanning

Preplanning for this CCP began in October 2006 with the establishment of a core planning team. The team consists of the Refuge Manager, a Refuge planner, and other members of the San Diego NWR Complex, as well as Environmental Program staff at Naval Weapons Station Seal Beach. Appendix A of the CCP 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. The State did, however, participate as part of an extended planning team.

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.

### 1.5.2 Public Involvement in Planning

Public involvement is an essential component of the CCP and NEPA process. The Service initiated the CCP planning effort for Seal Beach NWR in the *Federal Register* on April 16, 2007. In March 2007, in anticipation of the *Federal Register* notice, a newsletter or "planning update" was distributed to various agencies, organizations, tribes, and members of the public to describe the planning process and request input regarding the future management of the Refuge. The Service also held two public scoping meetings in April 2007 to further develop and ascertain Refuge planning issues. Once the issues were compiled, a second planning update was prepared that provided interested parties with the results of the initial scoping process.

The draft CCP/EA was released for public review and comment on March 24, 2011 and a public meeting was held on April 6, 2011. Comments on the draft CCP/EA was due on May 11, 2011. A Notice of the Availability of the draft CCP/EA was published in the *Federal Register*, and copies of the document and/or a planning update describing how to obtain a copy of the draft document for review was distributed to Federal, State, and local agencies, tribal governments, State Clearinghouse, Seal Beach Public Library, and interested organizations and individuals. Copies of the document were also provided to the California State Clearinghouse for distribution to various State agencies. The draft CCP/EA was also available for review online at the Seal Beach NWR CCP webpage.

The Refuge received two comment letters and met with the Orange County Vector Control District (OCVCD) to discuss issues related to the draft Mosquito Management Plan. The Final CCP and EA have been modified, as appropriate, to address concerns raised in the comment letters and by OCVCD, including postponing completion of the draft Mosquito Management Plan until such time as the Service approves a final Mosquito and Mosquito-Borne Disease Management Policy.

### 1.5.3 Public Scoping

The planning team identified issues, concerns, and opportunities internally and through discussions with other federal, State, and local agency representatives, wildlife and habitat professionals, and other key contacts. In addition, a variety of issues, concerns, and recommendations were received during the public scoping process that focused on topics such as wildlife and habitat management, listed species management, wildlife-dependent recreation, research, Refuge operations, and expansion of the Refuge boundary. Public scoping comments were received in writing via regular mail, by email, and verbally at the public scoping meetings.

All of this input was compiled by the Service and taken into consideration during the development of management alternatives. This input was also used to further refine Refuge goals. A summary of the key issues and comments compiled during the public scoping process is provided here.

#### Habitat Management

Comments and recommendations on managing wildlife habitat ranged from improving the quality of the existing Refuge habitats to expanding the diversity of habitats within the Refuge. Suggested actions for improving the quality of the Refuge's cordgrass habitat included raising the existing elevations within the marsh and restoring seasonal freshwater flows within the marsh. Other recommendations included monitoring ongoing erosion along the edges of the marsh, controlling invasive plant and animal species within the marsh and adjacent upland areas, and monitoring water quality and tidal elevations within the marsh. Protecting salt pan habitat to support the various tiger beetle species found on the Refuge was also proposed.

#### Threatened and Endangered Species Management

Comments related to listed species included implementing actions to increase fledgling success for the California least tern and reestablishing the endangered plant salt marsh bird's-beak (*Cordylanthus maritimus maritimus*) on the Refuge. Suggestions were also made about expanding nesting habitat on the Refuge for the least tern and western snowy plover.

### Wildlife-Dependent Recreational Use

Comments regarding public use focused primarily on expanding access onto the Refuge for wildlife observation and interpretation and implementing actions that would improve opportunities for wildlife observation, such as the installation of a boardwalk along the marsh and the construction an observation tower near the Refuge office.

### Research

Research projects that provide information relevant to Refuge management were encouraged.

### Refuge Operations

The comments related to Refuge operations focused on the need for additional staff to implement Refuge activities, achieve Refuge goals, and support the Friends of Seal Beach NWR group.

### Expansion of the Refuge Boundary

Two proposals to expand the current Refuge boundary were suggested during public scoping process. These included expanding the Refuge management responsibilities to include management of the Los Cerritos wetlands, located to the north of Naval Weapons Station Seal Beach, and incorporating Oil Island into the Refuge once it is no longer needed for oil extraction.

## 1.5.4 Management Concerns/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 concerns include a number of factors (e.g., climate change, sea level rise, subsidence, and the inadvertent release of non-native terrestrial and marine species into the Refuge environment) that cannot be altered by actions undertaken by Refuge staff; instead Refuge management actions must be evaluated from time to time to adapt to these changing conditions. Other concerns that can be addressed through enhanced Refuge management actions include mammalian and avian predation of listed species and the need to increase the availability of upland refugia for marsh birds and shorebirds during periods of high tide. All of these challenges, which are described in greater detail in the following text, were considered during the development of the alternatives presented in Chapter 2 of this appendix.

### Climate Change/Sea Level Rise

Increasing carbon dioxide and other greenhouse gas emissions from anthropogenic sources have undeniably altered the temperature over the last century. Such temperature changes can have different consequences worldwide from sea-level rise to greater meteorological fluctuations. The Service recognizes that a changing climate will impact natural resources on refuges and has been charged by the Secretary of the Interior (Secretarial Order 3289) to include climate change in our planning processes. Anticipated impacts may include: species range shifts, species extinctions, phenological changes, and increases in primary productivity. This challenge is especially important at the Seal Beach NWR because a sea level rise of only a few inches could have significant adverse effects on the quality of the cordgrass-dominated salt marsh habitat and other intertidal habitats present within the Refuge. Intertidal habitats could slowly convert to subtidal habitat, eliminating habitat essential to the light-footed clapper rail, Belding's savannah sparrow, and other intertidal-dependent species. At present there are only limited areas of upland habitat within the Refuge that could be made available for conversion to intertidal habitat as sea level rises. The effects of climate change and sea level rise on Refuge resources, facilities, and management activities are critical components of all Refuge management decisions.

Addressing the effects of climate change and sea level rise will require coordination among a variety of agencies at all levels of government. To adequately address issues such as identifying opportunities for accommodating new intertidal habitats along the southern California coast that will support the diversity and abundance of intertidal-dependent species currently present will involve a significant commitment of time and resources. The coastal refuges of southern California (i.e., Tijuana Slough, San Diego Bay, and Seal Beach National Wildlife Refuges), as well as other protected coastal habitats along the southern California coast, will be important components of a future strategy for ensuring the adequate availability of intertidal habitats to support listed species, migratory birds, and estuarine fisheries. Additional discussion of climate change and sea level rise is provided in Chapter 4 of the CCP.

### Subsidence

Both subsidence and rebound of the marsh plain within Anaheim Bay has been documented in studies conducted between 1968 and 1994. Based on the results of these studies, there appears to be a net reduction in the elevation of the marsh plain between 1968 and 1994 of between 0.18 to 0.4 feet across the marsh. The reasons for subsidence in this area is likely related to a combination of oil extraction activities in the area and historic extraction of groundwater for agriculture and other uses. Additional details regarding the effects of subsidence on Refuge habitats are provided in Chapter 4 of the CCP.

### Invasive Species

Non-native plant and animal species and other organisms introduced into areas where conditions are favorable for their establishment have the potential to outcompete native species when natural predators and/or competitors are not present. 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 such as common periwinkle (*Littorina littorea*), fountain grass (*Pennisetum setaceum*), fire ants (*Solenopsis sp.*), marine killer algae (*Caulerpa taxilfoia*), and West Nile virus have the potential to harm native species or degrade habitat quality on the Refuge. Efforts to control invasive species on the Refuge are coordinated between the Service and Naval Weapons Station Seal Beach. More information about the various invasive species that could threaten the habitat quality on the refuge is provided in Chapter 4 of the CCP.

### Predation of Listed Species

The Refuge's California least tern and light-footed clapper populations are vulnerable to predation from both mammalian and avian predators. Predation has a direct effect on the total population of rails on the Refuge, as well as on the number of least tern chicks that are successfully fledged from NASA Island each year. Predators occurring on the Refuge range from coyotes (*Canis latrans)*, raccoons (*Procyon lotor)*, and other mammals to crows (*Corvus brachyrhynchos*), various raptors, and great blue herons (*Ardea herodias*). Predation of young least tern chicks by gull-billed terns (*Sterna nilotica vanrossemi*) has been well-documented in southern San Diego County for several years; however, it was not until the 2009 nesting season that predation of a least tern by a gull-billed tern was documented in Orange County. The range of the gull-billed tern appears to be expanding northward and gull-billed terns were observed depredating least terns at Seal Beach NWR in 2009 and again in 2010 (pers. comm. Kirk Gilligan). In 1991, the Service and Naval Weapons Station Seal Beach approved an Endangered Species Management and Protection Plan (described in greater detail in Chapter 3 of the CCP), which addresses predator control on the Refuge. This plan does not however address predation issues related to gull-billed terns, which are protected under the Migratory Bird Act.

## Contaminants

Pesticides, metals, industrial chemicals such as dioxins and PCBs, and other toxic chemicals can be carried into coastal wetlands by the tides or by surface waters carrying storm water and urban runoff from upstream. Other pollutants may be dispersed by aerial deposition. Once present within the wetland, wildlife can be exposed to these contaminants through dermal contact, inhalation, or ingestion. Fish, invertebrates, and plants provide pathways for transporting contaminants from sediments and surface waters to other species. Fish, in particular, tend to accumulate contaminants in concentrations higher than those present in the sediments from which they were exposed. Bioaccumulation can occur through direct exposure to contaminated sediments or through dietary intake of other exposed organisms and has the potential to adversely affect Refuge resources, even at relatively low concentration levels. The effects, which can sometimes be hard to detect, may impair reproduction, damage the nervous system, inhibit nutrient uptake, or diminish an organism's overall health. Low concentrations of multiple pollutants can also have synergistic effects that have yet to be identified.

## Refuge Access

The Refuge is situated within the boundaries of Naval Weapons Station Seal Beach, which provides challenges with respect to public access onto the Refuge. Because the mission for Naval Weapons Station Seal Beach is to provide ordnance loading, storage, and maintenance support to the U.S. Pacific Fleet and other Department of Defense and Homeland Security organizations, security is a primary issue at this location. As a result, the Navy controls all public access onto the Refuge, and there may be periods when public access is prohibited for an extended period of time, as was the case following the events of September 11, 2001. Currently, all public access onto the Refuge is reviewed and approved by the Navy and supervised by Refuge staff.

## Opportunities

Despite the issues and threats described, opportunities exist for protecting the Refuge's habitat quality, listed species populations, and other trust species. These opportunities include: 1) forming partnerships with other State, local, and regional agencies to address water quality issues upstream of the Refuge, as well as in the adjacent harbor areas; and 2) working cooperatively with the Navy and others to reduce the potential for introducing invasive terrestrial and marine organisms into Anaheim Bay and its surrounding environs. Responses to the effects of climate change and sea level rise are somewhat more difficult to address at the Refuge level. Adaptive management provides an important tool for adjusting current management practices to address changing circumstances. However, more fully addressing the effects of climate change and sea level rise on coastal resources will require regional or even nationwide initiatives.

## 1.6 Seal Beach National Wildlife Refuge

### 1.6.1 Location

The 965-acre Seal Beach NWR, which is entirely within Naval Weapons Station Seal Beach, is located in the northwest corner of Orange County between the City of Seal Beach to the northwest and the City of Huntington Beach to the southeast (refer to Figures 1-1 and 1-2). The Refuge is situated in an area that is generally bordered to the southwest by Pacific Coast Highway, to the west by Seal Beach Boulevard, to the north by Westminster Avenue, and to the east and southeast by the Bolsa Chica flood control channel. The habitats within the Refuge are buffered from surrounding urban development on the north, east, and west by Naval Weapons Station Seal Beach, while the boating and residential development associated with Sunset Harbour Marina and the community of Huntington Harbour occur immediately to the south of the Refuge's coastal salt marsh habitat (refer to Figure 1-2).

### 1.6.2 Physical Setting

Located along the coast of southern California, Seal Beach NWR protects a remnant of what was once a vast wetland complex extending inland along the southern California bight from the Los Angeles and San Gabriel Rivers to the Santa Ana River. Marine and terrestrial wildlife thrived in the San Pedro, Los Alamitos, Anaheim, Bolsa, and Newport Bay estuaries. The Refuge protects all of what remains of Anaheim Bay's historical intertidal salt marsh complex (approximately 750 acres). These coastal wetlands are characterized by long tidal channels that transport ocean waters deep into the salt marsh habitat; tidal flats that are exposed during low tides; and large expanses of cordgrass-dominated salt marsh habitat. Another 116 acres of the Refuge support restored subtidal and intertidal ponds constructed in the early 1990s as part of a Port of Long Beach mitigation project. The remaining lands within the Refuge include several upland areas, some natural and some filled in the past to support military activities, as well as an area of muted salt marsh habitat.

The Seal Beach NWR is an important stopover and wintering location within the Pacific Flyway, providing relatively undisturbed habitat for thousands of migratory birds including shorebirds, waterfowl, and raptors. The Refuge supports several federally and/or State listed endangered or threatened avian species, including the California least tern, light-footed clapper rail, and Belding's savannah sparrow (*Passerculus sandwichensis beldingi*), all of which nest and raise their young on the Refuge. The federally listed endangered eastern Pacific green turtle (*Chelonia mydas)* has also been observed within the Refuge.

### 1.6.3 Ecosystem Context

To the extent possible, the CCP will assist in meeting conservation goals established in existing national and regional plans, California's Wildlife Action Plan, and other landscape-scale plans covering the same watershed or ecosystem in which the Refuge resides (602 FW 3.3). With respect to landscape-scale planning, the Seal Beach NWR is included within the California Geographic Area, one of 21 Geographic Areas that were developed by aggregating Bird Conservation Regions (BCRs), biologically based units representing longstanding partnerships that facilitate conservation planning and design at landscape scales. Seal Beach NWR is included within the California Landscape Conservation Cooperative (LCC). LCCs are applied conservation science partnerships between the Service and other Federal agencies, states, tribes, non-governmental organizations (NGOs), universities, and stakeholders within a geographically defined area. The LCCs will do work that will inform resource management decisions and actions to address landscape-scale stressors, such as habitat fragmentation, genetic isolation, invasive species, and water scarcity, all of which are accelerated by climate change. LCCs will reflect the principles and practices of adaptive management in all of their activities, especially in developing conservation strategies, evaluating their effectiveness, and revising them. This iterative process of information sharing will help scientists and resource managers deal with uncertainties on the landscape and provide tools to compare and contrast the implications of management alternatives.

The California Geographic Area will be divided into several subunits. Seal Beach NWR will be included within the Coastal Southern Subunit, which 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, and managers). In addition, 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.

Also from an ecosystem context, the Seal Beach NWR provides essential foraging and resting habitat for migratory birds traveling along the Pacific Flyway during migration and protects Essential Fish Habitat for various fish species managed under the Pacific Groundfish and Coastal Pelagic Species Fishery Management Plans. The Refuge, which is located between the Los Cerritos wetland complex to the north (partially in Los Angeles County) and the Bolsa Chica wetlands to the south, is one of only seven remaining wetland complexes along the Orange County coast.

Additional ecosystem planning efforts that address the resources managed within the Seal Beach NWR are described in the following text. Regional plans that address resource management at the local level are described in greater detail in Chapter 4 of the CCP.

### Sonoran Joint Venture Bi-national Bird Conservation

The Sonoran Joint Venture is a partnership of diverse organizations and individuals from the southwestern United States and northwestern Mexico that share a common commitment to bird conservation within the region. The Strategic Plan for the Sonoran Joint Venture presents a regional strategy to protect, conserve, restore, and enhance bird populations and their habitats. The strategic plan and the joint venture's actions in general are intended to address and integrate the conservation recommendations of the North American Waterfowl Management Plan, the Partners in Flight North American Landbird Conservation Plan, the U.S. Shorebird Conservation Plan, and North American Waterbird Conservation Plan for the areas included within this joint venture. For more information about these bird conservation plans, refer to Chapter 4 of the CCP.

Seal Beach NWR is located within the Californian Coast and Mountains Region of the Sonoran Joint Venture Bird Conservation Plan. Orange County coastal wetlands, which include Anaheim Bay, are identified in the plan as a focus area (e.g., 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 plan for the coastal wetland areas in this region are the protection of the remaining coastal wetland habitat, including eelgrass beds; the protection of existing avian nesting colonies, the development of education programs; and the promotion of sustainable fisheries (Sonoran Joint Venture Technical Committee 2006).

### California Wildlife Action Plan
Seal Beach NWR is located within California's South Coast Region as designated by the California Wildlife Action Plan (California Department of Fish and Game 2007). The Plan's conservation actions that apply to the management of the Seal Beach NWR include protecting and restoring coastal wetlands; eradicating or controlling invasive species; considering effects to resources related to global warming; promoting wildlife and natural resources conservation education; and protecting sensitive species and important wildlife habitats on Federal lands.

### Watershed Management
The Refuge is also included within the planning area for the North Orange County Integrated Regional Watershed Management Plan (Orange County 2009). This plan addresses water management objectives for the watershed, as well as recommends strategies for achieving these objectives. The plan also addresses issues related to water supply, water quality, flood control, ecosystem restoration, and climate change. An important component of plan implementation is obtaining funding for projects that will benefit water and habitat quality throughout the watershed, as well as achieve other watershed objectives.

## 1.6.4 Refuge Purpose and Authority
Legislation authorizing the establishment of the Seal Beach NWR was signed by President Richard M. Nixon on August 29, 1972. Public Law 92-408 (86 Stat. 633) states, "The Refuge shall consist of certain lands, to be determined by the Secretary of the Interior with the advice and consent of the Secretary of the Navy, within the United States Naval Weapons Station Seal Beach, California." It goes on to state that "The Secretary of the Interior shall administer the refuge in accordance with the National Wildlife Refuge System Administration Act of 1966, as amended (80 Stat. 927; 16 U.S.C. 668dd – 668ee), and pursuant to the plans which are mutually acceptable to the Secretary of the Interior and the Secretary of the Navy."

Following the approval of the *General Plan for Use of U.S. Navy Lands and Waters for Wildlife Conservation and Management* by the Secretary of the Navy and the Secretary of the Interior in 1973, and the approval of a subsequent Management Plan by the Commanding Officer of Naval Weapons Station Seal Beach and Service's Regional Director in May 1974, the Refuge was officially established on July 11, 1974, when the Notice of Establishment was published in the *Federal Register* (39 FR 25522).

The establishment legislation (86 Stat. 633) states that lands to be included in the Seal Beach NWR are to be administered in accordance with the National Wildlife Refuge System Administration Act of 1966, as amended, and pursuant to plans that are mutually acceptable to the Secretary of the Interior and the Secretary of the Navy. Additional details regarding the refuge purposes are found in the Report from the Committee on Merchant Marine and Fisheries that accompanied House of Representative Bill 10310 (H.R. 10310). This report states that the purpose of the legislation to establish the Seal Beach National Wildlife Refuge is "to protect and preserve a salt water marsh and estuarine habitat valuable for migratory waterfowl and other wildlife in the State of California." Additional direction related to refuge purposes is provided in the *Management Plan for Seal Beach National Wildlife Refuge*, prepared in 1974 per the requirements of the establishment legislation. The Management Plan includes two principal objectives of the Refuge: 1) preservation and management of habitat necessary for the perpetuation of two endangered species, the light-footed clapper rail and California least tern; and 2) preservation of habitat used by migratory waterfowl, shorebirds, and other waterbirds.

## 1.7 Refuge Vision and Goals

### Vision Statement

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).

Our vision for the future of the Seal Beach NWR is:

> *Tidal channels meandering through a sea of cordgrass deliver moisture and nourishment to support a healthy marsh ecosystem. As the quiet calm of the morning is interrupted by the clacking of a light-footed clapper rail, school children and other visitors, standing on the elevated observation deck, point with excitement in the direction of the call hoping for a glimpse of the rare bird. Shorebirds dart from one foraging area to another, feasting on what appears to be an endless supply of food hidden within the tidal flats. California least terns fly above the tidal channels searching for small fish to carry back to their nests on NASA Island. A diverse array of marine organisms, from tube worms and sea stars to rays and sharks, and even an occasional green sea turtle, thrive within the tidal channels and open water areas of the Refuge's diverse marsh complex, while Nelson's sparrows and other upland birds find food and shelter within the native upland vegetation that borders the marsh.*

### Refuge Goals

Goals define general targets in support of the Refuge vision. 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 Seal Beach NWR are as follows.

Goal 1: Support recovery and protection efforts for the federally and State listed threatened and endangered species and species of concern that occur within the Seal Beach NWR.

Goal 2: Protect, manage, enhance, and restore coastal wetland and upland habitats to benefit migratory birds, as well as other native fish, wildlife, and plant species.

Goal 3: Enhance public appreciation, understanding, and enjoyment of the Refuge's biological and cultural resources through outreach opportunities and quality wildlife-dependent recreation, including wildlife observation, environmental education, and interpretation.

Goal 4: Further strengthen the management partnerships between the Seal Beach National Wildlife Refuge and Naval Weapons Station Seal Beach, while preserving our respective missions.

# 2 Alternatives, Including the Proposed Action

## 2.1 Introduction

An important step in the planning process is the development and analysis of alternatives. Alternatives are developed to identify and analyze different ways to achieve the purposes of the Seal Beach National Wildlife Refuge (NWR or Refuge), contribute to the mission of the National Wildlife Refuge System (NWRS or Refuge System), meet Refuge goals, and resolve issues identified during scoping and throughout the Comprehensive Conservation Plan (CCP) planning process. The development of alternatives is also an important component of the National Environmental Policy Act (NEPA) process, and compliance with NEPA for this CCP has been accomplished through an integrated draft CCP and environmental assessment (EA), which addressed both the requirements of NEPA and the CCP process. Upon completion of the public review process, the two documents were separated, to include a Final CCP and the EA. Some changes have been made to the EA in response to comments received during the public review process. Where the text has been changed to address public comments, the old text has been removed and the new text has been underlined.

The purpose of this chapter is to describe the process that was followed to develop a range of management alternatives for the Seal Beach NWR; provide detailed descriptions of each alternative; identify the proposed action; compare the way in which each alternative addresses identified issues; summarize the similarities among the alternatives; and present alternatives that were considered, but eliminated from detailed study.

## 2.2 Alternative Development Process

The alternatives development process for the Seal Beach 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 Seal Beach NWR were all taken into consideration during alternatives development. Also influencing this process were the Refuge purposes, as well as the vision, goals, and objectives.

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 this alternative accurately because the No Action Alternative 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 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 two 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 here.

## 2.3 Current Refuge Management

### 2.3.1 Background

The Seal Beach NWR is located entirely within the boundaries of Naval Weapons Station Seal Beach, with the majority of the Refuge land and water owned by the U.S. Navy (Figure 2-1). The only exceptions are three larger tidal channels located near the south end of the Refuge. These three areas, depicted on Figure 2-1, are held by the State of California as State tidelands and leased to the Service for management as part of a national wildlife refuge. Oil Island and two access roads that serve Oil Island are excluded from the Refuge.

### 2.3.2 Existing Management Plans

The first management document prepared for the soon-to-be-established Seal Beach NWR was the "General Plan for the Use of U.S. Navy Lands and Waters for Wildlife Conservation and Management, Seal Beach National Wildlife Refuge." This plan was jointly signed by the Secretary of the Interior and the Secretary of the Navy in 1973. The purpose of the plan was to identify the lands and waters within Naval Weapons Station Seal Beach that: 1) were available for fish and wildlife conservation; 2) were consistent with the primary and collateral purposes of the Naval Weapons Station; and 3) provided value in carrying out the National Migratory Bird Management Program. The plan stated that the specified area would be managed by the Department of the Interior for the conservation and management of migratory birds and other fish and wildlife in accordance with the National Wildlife Refuge System Administration Act of 1966, as amended, and pursuant to plans that were mutually acceptable to the Secretary of the Interior and the Secretary of the Navy. The plan further stated that the necessary details related to the management of the Refuge would be covered in a cooperative agreement to be mutually agreed to and signed by the Regional Director of the Service and the Secretary of the Navy, or his authorized representative. Finally, the plan allows for adjustments in the boundaries of the "refuge" so long as they are mutually agreed upon by the Regional Director and the Secretary of the Navy, or his authorized representative.

In accordance with the General Plan, the "Management Plan for the Seal Beach NWR" was approved in 1974 by the Regional Director of the Service and the Commanding Officer at Naval Weapons Station Seal Beach. The management plan amended the Fish and Wildlife Cooperative Plan that the Navy had prepared in cooperation with the California Department of Fish and Game in 1969. The 1974 Management Plan included the following objectives:

- Preserve and manage the habitat necessary for the perpetuation of two endangered species, the light-footed clapper rail and the California least tern, and
- Preserve habitat used by migrant waterfowl, shorebirds, and other waterbirds.

The Management Plan prohibits hunting and fishing on the Refuge and assigns law and security enforcement to the Navy. Management of the Refuge by the Service is described as primarily for natural estuarine or salt marsh habitat. Per the management plan, any habitat manipulation requires approval by Naval Weapons Station Seal Beach, and any non-routine activities involving Refuge visitation require prior contact with the Station Commander or his representative. Support for limited ecological studies/research on the Refuge is also included in the plan.

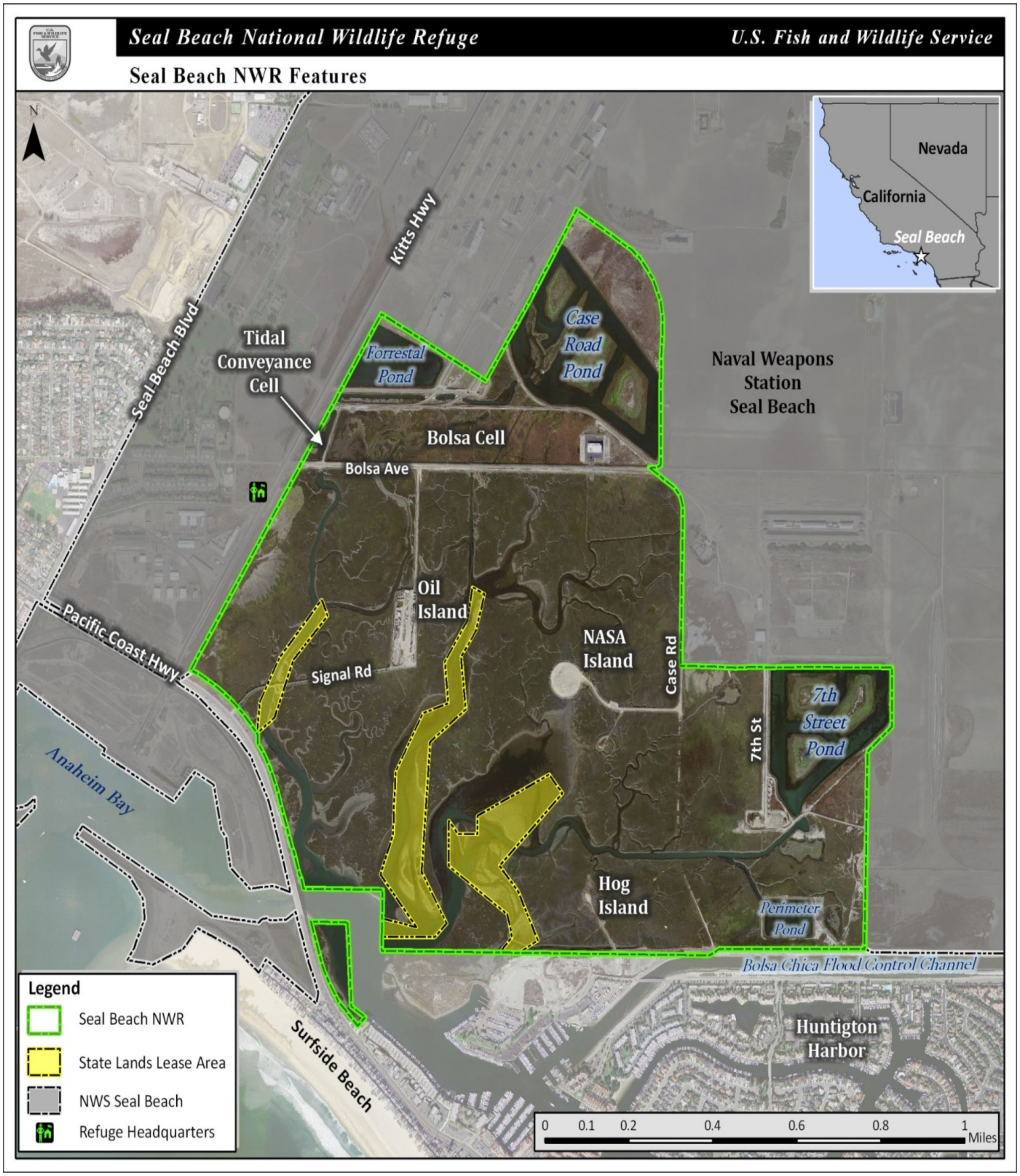


**Figure 2-1. Seal Beach National Wildlife Refuge – Land Status**

The Endangered Species Management and Protection Plan, approved in 1991, is the other plan that continues to provide direction to the Refuge Manager for setting management priorities. The objective of this plan is to create and maintain a more naturally balanced ecosystem, requiring minimum human intervention to support and protect endangered species. The plan calls for the implementation of the following actions on the Refuge and the adjacent lands within the Naval Weapons Station: 1) species monitoring, particularly nocturnal, predatory species, California least terns, and light-footed clapper rails, to determine abundance and population trends; 2) studying the population dynamics and habitat use of the California least tern and light-footed clapper rail; 3) implementing predator control activities, including lethal take and relocation, to protect listed species particularly during the nesting season; 4) habitat management; 5) restoration and enhancement; 6) evaluation and remediation as necessary of contaminated sites; and 7) public education.

### 2.3.3 Coordination with Naval Weapons Station Seal Beach

As a refuge that overlays Naval Weapons Station Seal Beach, management of the Seal Beach NWR must be consistent not only with the Refuge purposes and goals and the mission of the NWRS, but also with the mission of Naval Weapons Station Seal Beach. Unlike the "wildlife first" mission of the NWRS, the mission for Naval Weapons Station Seal Beach is to provide ordnance loading, storage, and maintenance support to the U.S. Pacific Fleet and other Department of Defense and Homeland Security organizations. While the primary focus of the activities at Naval Weapons Station Seal Beach are directed toward achieving this mission, there are also various actions taken at Naval Weapons Station Seal Beach to conserve the Station’s natural resources. Existing laws and regulations, such as the Sikes Improvement Act of 1997 (Sikes Act), provide guidance for achieving a balance on military lands between ensuring the continued support of the military mission and protecting natural resources.

The “General Plan for Use of U.S. Navy Lands and Waters for Wildlife Conservation and Management, Seal Beach National Wildlife Refuge” states that the Secretary of the Interior shall administer the lands and waters identified by the Navy as available for fish and wildlife conservation and management purposes pursuant to plans that are mutually acceptable to the Secretary of the Interior and the Secretary of the Navy. As such, coordination with Naval Weapons Station Seal Beach to ensure that management is consistent with the primary and collateral purposes of the Station is an essential part of the Refuge management program at Seal Beach NWR. The Refuge Manager coordinates habitat and wildlife management and public use activities with the Commanding Officer and various appropriate departments at Naval Weapons Station Seal Beach. Coordination occurs most often with the Environmental Programs and Services Department, Public Affairs Office, Security Department, and Facilities Department. The Naval Weapons Station Seal Beach also provides funding for some of the management actions implemented on the Refuge.

To continue cooperative management within the Refuge, the Service has been coordinating with staff from Naval Weapons Station Seal Beach in the development of this CCP. At the same time, Naval Weapons Station Seal Beach, in accordance with the Sikes Act, has been coordinating the completion of the Integrated Natural Resources Management Plan (INRMP) for Naval Weapons Station Seal Beach. The purposes of a CCP and an INRMP are similar in many ways. Both provide a framework for managing natural resources on lands owned or controlled by the entity preparing the plan. Just as CCPs are required for all Refuges, the Sikes Act has committed the Department of Defense to develop INRMPs for all of its military installations. An INRMP is intended to help installation commanders manage their natural resources in a manner that is consistent with sustainability of those resources and to ensure continued support of the military mission. At Naval Weapons Station Seal Beach, the INRMP is ecosystem based and is developed in cooperation with the Service and the California Department of Fish and Game.

Other coordination occurs with various offices at Naval Weapons Station Seal Beach involving security, pesticide use, restoration proposals, endangered species issues, cultural resource management, munitions, and contaminants. The use of pesticides on the Refuge is reported through the Navy Online Pesticide Reporting System in accordance with their Integrated Pest Management Program; ecological risk assessments and clean-up actions that could affect Refuge resources are coordinated with the Carlsbad Fish and Wildlife Office's Contaminants Program and the Navy's Installation Restoration Program/Munitions Response Program. In addition, the Refuge Manager serves as a member of the Restoration Advisory Board for Installation Restoration Program/Munitions Response Program site activities.

### 2.3.4 Current Refuge Management

The Management Plan for the Seal Beach NWR, the Endangered Species Management and Protection Plan, and applicable recovery plans and bird conservation plans provide the basis for the current management activities being implemented on the Refuge. From the late 1980s to today, Refuge management has involved monitoring of listed species; implementation of predator management; control of invasive upland plants; maintenance of NASA Island to optimize conditions for least tern nesting; repair or replacement of light-footed clapper rail nesting platforms; maintenance and, where necessary, replacement of culverts that facilitate tidal flow within the main marsh and adjacent restored wetlands; and planting of native upland plants in disturbed upland areas.

The majority of the wildlife and habitat management activities being conducted on the Refuge are directed primarily at the protection and management of the federally listed endangered California least tern and light-footed clapper rail, both of which nest on the Refuge. However, these and other activities conducted on the Refuge also provide benefits to the other native species that are supported on the Refuge.

The Refuge Manager is also responsible for ensuring the protection of cultural resources; coordinating issues related to contaminants with the Navy and the Service's Environmental Contaminants Program; and coordinating with the Navy on activities occurring on the Refuge related to public use. A detailed description of the wildlife and habitat management activities currently being implemented on the Refuge, as well as the Refuge's current public use program, are described under Alternative A - No Action.

## 2.4 Proposed Management Alternatives

Before the process of developing alternatives began, the planning team reviewed and evaluated both the comments received during the initial phases of the CCP planning process, including scoping, as well as the issues, management concerns, threats, and opportunities presented in Chapter 1 of this appendix. Through further analysis of the issues and general public comment, the team developed various objectives for achieving Refuge goals, the mission of the NWRS, and other mandates. Based on the objectives and an analysis of the types of strategies that might be implemented to achieve the objectives, a range of draft alternatives were developed for how the Refuge should be managed over the next 15 years. These draft alternatives were further refined during the analysis of environmental consequences.

As a result of this process, three management alternatives, including a No Action alternative and two action alternatives, were developed for evaluation in the draft CCP/EA. The three alternatives differ in the extent and focus of wildlife and habitat management actions to be implemented on the Refuge and in the types and levels of public use opportunities to be provided. Management Alternative "C" represents the proposed action. Following consideration of the comments received during public review of the draft CCP/EA, Alternative C was altered to remove the draft Mosquito Management Plan from consideration. Instead, mosquito management on the Refuge would continue to be implemented by the Orange Vector Control District (OCVCD) under a Special Use Permit (SUP), which is issued annually by the Refuge Manager. Once the Service has approved a final Mosquito and Mosquito-Borne Disease Management Policy for the Refuge System, preparation of a Mosquito Management Plan for the Refuge will be reinitiated. This plan may include changes to current mosquito management practices on the Refuge. For example, further consideration will be given to the criteria used to determine when treatment of immature mosquito populations is necessary and when and how control of adult mosquitoes can occur.

### 2.4.1 Summary of Alternatives

The three management alternatives evaluated for the Seal Beach NWR are summarized here and described in greater detail in the sections that follow.

**Alternative A - No Action**

Under this alternative, past and present management activities would remain unchanged. Current conservation and management actions would continue per available funding, and wildlife observation, interpretation, and environmental education would continue at current levels. This alternative represents the baseline from which other "action" alternatives will be evaluated.

**Alternative B – Maximize Salt Marsh Restoration, Continue Current Public Uses**

Under this alternative, current wildlife and habitat management activities would be expanded to include evaluation of current baseline data for fish, wildlife, and plants on the Refuge; identification of data gaps; implementation of species surveys to address data gaps as staff time and funding allows; and support for new research projects that would benefit Refuge resources and Refuge management. Also proposed is the restoration of approximately 22 acres of intertidal habitat (salt marsh and intertidal mudflat) and 15 acres of wetland/upland transition habitat. Pest control would be implemented in accordance with an Integrated Pest Management program and mosquito monitoring and control would be guided by annual Special Use Permits. No changes to the current public use program are proposed.

**Alternative C (Proposed Action) - Optimize Upland/Wetland Restoration, Improve Opportunities for Wildlife Observation**

The majority of the management activities proposed in Alternative B would also be implemented under this Alternative. The primary difference between Alternatives B and C is that under Alternative C, a larger portion of the areas to be restored would consist of upland and wetland/upland transition habitat. Under this alternative, approximately 12 acres would be restored to upland habitat, approximately 10 acres would be restored to wetland/upland transition habitat, and approximately 15 acres would be restored to intertidal habitat. In addition, Alternative C includes limited expansion of the current public use program, including expanded opportunities for wildlife observation.

### 2.4.2 Similarities Among the Alternatives

Although there are differences among the range of alternatives presented for managing the Seal Beach NWR, the alternatives also include various features and management components that would be part of the CCP regardless of the alternative selected for implementation.

#### 2.4.2.1 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.

- *Monitoring of Listed Species* – Annual monitoring of California least terns and light-footed clapper rails would continue, per available funding. Monitoring involves site visits during the nesting season for both species to record numbers of pairs and nests and to estimate the numbers of chicks fledged. Fall high tide and spring call counts for rails are also conducted.

- *Management of NASA Island to Support California Least Tern Nesting* – Site preparation prior to the nesting season would continue at NASA Island, as would measures to reduce the potential for predation by mammalian and avian species.

- *Actions to Improve the Reproductive Success and Genetic Diversity of the Refuge's Light-footed Clapper Rail Population* – Nesting platforms installed in the marsh improve the rails' potential to successful raise their young. Annual inspection, maintenance, and replacement of these platforms would continue under all alternatives. In addition, periodic releases of captive-bred rails would continue to ensure genetic diversity within the population.

- *Mosquito Monitoring and Control* – Under all alternatives, the OCVCD would monitor and manage mosquito populations on the Refuge for public health and safety purposes <u>per the conditions included in annually issued SUPs and the stipulations included in the Compatibility Determination for mosquito management</u>.

- *Invasive Plant Species Control* – Periodic control of invasive plant species, involving the use of Service approved herbicides, would be conducted in upland and upland transition areas of the Refuge. Service approved pesticides (which include herbicides) would be used under all alternatives. 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.

- *Upland Habitat Enhancement* – In disturbed upland areas, such as along existing roadways, appropriate native plant material (i.e., specimen plants or seeds) would be installed following invasive plant species control to enhance habitat quality in these areas.

- *Trash and Debris Removal* – Periodic volunteer events to remove trash and debris from upland and upland transition areas, as well as along the edges of the marsh, would continue to be held under all alternatives.

- *Culvert Maintenance* – Culverts would continue to be periodically inspected, cleaned, and/or replaced to ensure that adjacent wetland areas are receiving adequate tidal flow.

- *Coordination with Naval Weapons Station Seal Beach* – The Service would continue to coordinate with personnel at Naval Weapons Station Seal Beach to ensure that the mission of both the Navy and NWRS are being met.

- *Support for the Friends of Seal Beach NWR* - The Service would continue to support the activities of the Friends of Seal Beach NWR, who assist in management activities, tending of a native plant garden, and public outreach.

- *Environmental Contaminants Coordination* – The Refuge Manager would continue to work with the Navy and 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 offsite sources.

- *Predator Management* – Predator management would continue to be implemented in accordance with the Endangered Species Management and Protection Plan, approved by the Service and Navy 1991.

- *Protection of Cultural Resources* – Recorded and any yet to be discovered cultural resources located within the Refuge would be managed in accordance with existing Federal laws and Service and Navy policies. The Refuge Manager would continue to consider the effects of all proposed actions on cultural resources and, prior to implementing any ground-disturbing projects, would consult with Service and Naval Weapons Station Seal Beach cultural resources personnel, and, when appropriate, the State Historic Preservation Officer, federally recognized Tribes, and interested parties.

- *Wildlife Observation* – Opportunities for wildlife observation would continue to be provided.

- *Interpretation and Environmental Education* – The Friends would continue to assist in the implementation of on- and off-Refuge environmental education programs, and interpretive signs and presentations would be available at the Refuge.

- *Facilitation of Scientific Research* – Under any alternative, scientific research activities would be encouraged, provided the activities are consistent with Refuge purposes and the mission of the NWRS.

#### 2.4.2.2 Features Common to All Action Alternatives

- *Endangered Species Management* – To aid in the recovery of the light-footed clapper rail and California least tern, the Refuge Manager will work with the Naval Weapons Station Seal Beach to reduce the number of perching opportunities for avian predators around the marsh. Additionally, the Refuge Manager will implement a study to better understand the habitat qualities and species dynamics of the natural rail nesting areas located between Hog Island and Perimeter Pond in order to determine if these conditions can be replicated elsewhere on the Refuge.

- *Integrated Pest Management (IPM)* – Pest management on the Refuge would be implemented through an integrated pest management approach. The IPM Plan (Appendix G of the Final CCP) presents a comprehensive, environmentally sensitive approach to managing pests that includes a combination of strategies that pose the least hazard to people, property, and the environment.

- *Replacement of the Western Culverts in the Bolsa Cell* – The deteriorating culverts at the western end of the Bolsa Cell would be removed, and a new water control structure would be installed near the center of the levee to improve tidal exchange and allow for better regulation of water levels within the cell.

- *Removal of Concrete and Other Debris* – Remnants of concrete structures and other debris would be removed from the marsh per available funding.

- *Expanded Invasive Plant Control* – Through a coordinated effort with Naval Weapons Station Seal Beach, invasive plant control would be implemented on Navy lands around the perimeter of the Refuge. Partnering with the Naval Weapons Station Seal Beach, the Refuge Manager would also seek to actively control aggressive invasive weed species growing along agricultural fields and around weapons magazines on the NWS.

- *Document the Health of the Refuge's Cordgrass Habitat* – A field study documenting the current health of the cordgrass stands within the Refuge would be initiated per available funding. The study would also include an evaluation of those factors that could be inhibiting optimum plant health, density, and height.

- *Increase Efforts to Inventory Refuge Species* – Directed searches for tiger beetles, an inventory of native plant species, vertebrate and invertebrate surveys, and updated fish species data for Anaheim Bay would be implemented by Refuge staff or others as funding for these studies is identified.

- *Implement Water Quality Monitoring* – A water quality monitoring program to regularly collect data regarding the basic physical parameters of the waters within the Refuge would be implemented per available funding.

- *Monitor Tidal Channel Bathymetry and Channel Bank Stability* – Tidal channel bathymetry and channel bank stability would be monitored annually to determine changes related to erosion and/or sedimentation.

- *Expand Opportunities of Research* – Research projects that are consistent with Refuge purposes and the mission of the NWRS would be identified for implementation on the Refuge to benefit Refuge resources and improve management effectiveness.

- *Monitor Changes Related to Climate Change and Sea Level Rise* – Funding and partnerships would be sought to routinely monitor and record tidal elevations, changes in habitat quality and/type over time, and changes in avian and fish species composition to better understand and address the effects of climate change and sea level rise on Refuge resources.

- *Improve the Quality of Runoff Entering the Marsh* – Through the formation of a multiple agency partnership, measures to reduce water pollution levels in the Bolsa Chica and East Garden Grove-Wintersburg flood control channels would be designed and implemented.

- *Restore Native Habitat* – Habitat restoration would be implemented on approximately 37 acres of disturbed upland within the Refuge. The types of habitats to be restored vary among the two action alternatives.

### 2.4.3 Detailed Description of the Alternatives

#### 2.4.3.1 Alternative A - No Action

The No Action Alternative (Figure 2-2) proposes no changes to current management or public use activities on the Refuge. However, as is the case today, if the Navy were to determine that the mission of Naval Weapons Station Seal Beach could be compromised by the public use activities currently occurring on the Refuge, these activities could be curtailed or eliminated.

**Wildlife and Habitat Management**

The majority of the wildlife and habitat management activities occurring on the Refuge are being implemented in accordance with the approved Endangered Species Management and Protection Plan (Protection Plan) (USFWS and Navy 1991). The primary objective of this plan was and continues to be the establishment of a more naturally balanced ecosystem to support the endangered species and other native wildlife occurring within the Refuge and surrounding Naval Weapons Station Seal Beach. To achieve this objective, two important milestones had to be achieved: 1) eliminate the non-native population of red fox on the Refuge and adjacent Station; and 2) reestablish a coyote population to maintain a healthy predator balance. Both of these milestones have been achieved. Other plan components include: species population monitoring; endangered species studies; endangered species protection; predator control; habitat restoration and enhancement; monitoring and researching environmental quality; public use and education; and staff and funding. The Protection Plan, which is incorporated by reference into the EA, serves as the Refuge's "step-down" plan for predator management, which is discussed in greater detail in subsequent text.

Refuge clean-ups involving volunteers and Refuge staff are organized periodically to remove trash and other debris from the edges of the marsh and adjacent uplands. Refuge staff works with the Navy to have more significant debris, such as old pieces of pipe, tires, and large pieces of wood that have been pushed into the Refuge by high tides, removed from the marsh.

Concrete debris located to the southeast of NASA Island has been identified as remnants of a structure associated with a "plugged and abandoned dry hole" as listed on the California Division of Oil, Gas, and Geothermal Resources website. This is actually the site of an abandoned oil well that was drilled in 1929. It was abandoned and capped in 1930 by CalResources LLC. The total depth of the drill hole is 4,573 feet, of which 972 feet is metal casing filled with cement. Although there was a requirement to remove all visible structures as part of the original abandonment process, the concrete associated with the well is still present on the site. The area affected by the abandoned well is less than 500 square feet in size.

The current responsible party for this site has been identified and has agreed to remove the remaining structures. Removal and clean-up will require the use of heavy equipment to break up an estimated 1,400-1,600 metric tons of concrete and to load trucks that will haul the concrete material to an appropriate off-Refuge disposal site. Where footings go below the surface of the ground, several feet of the concrete located below the surface will be removed and the disturbed area will be filled with clean material to reestablish the historic marsh elevation. In addition, the well pipe head may be lowered to beneath ground level as part of this project. Any vegetation or dirt currently on top of concrete will be salvaged and replaced upon completion of project. Temporary dams and dewatering may be required to limit the tidal flow into the work area while removing the footings. Once all of the structures are removed and the proper elevations have been achieved, native salt marsh vegetation appropriate to this site will be planted to accelerate site restoration.

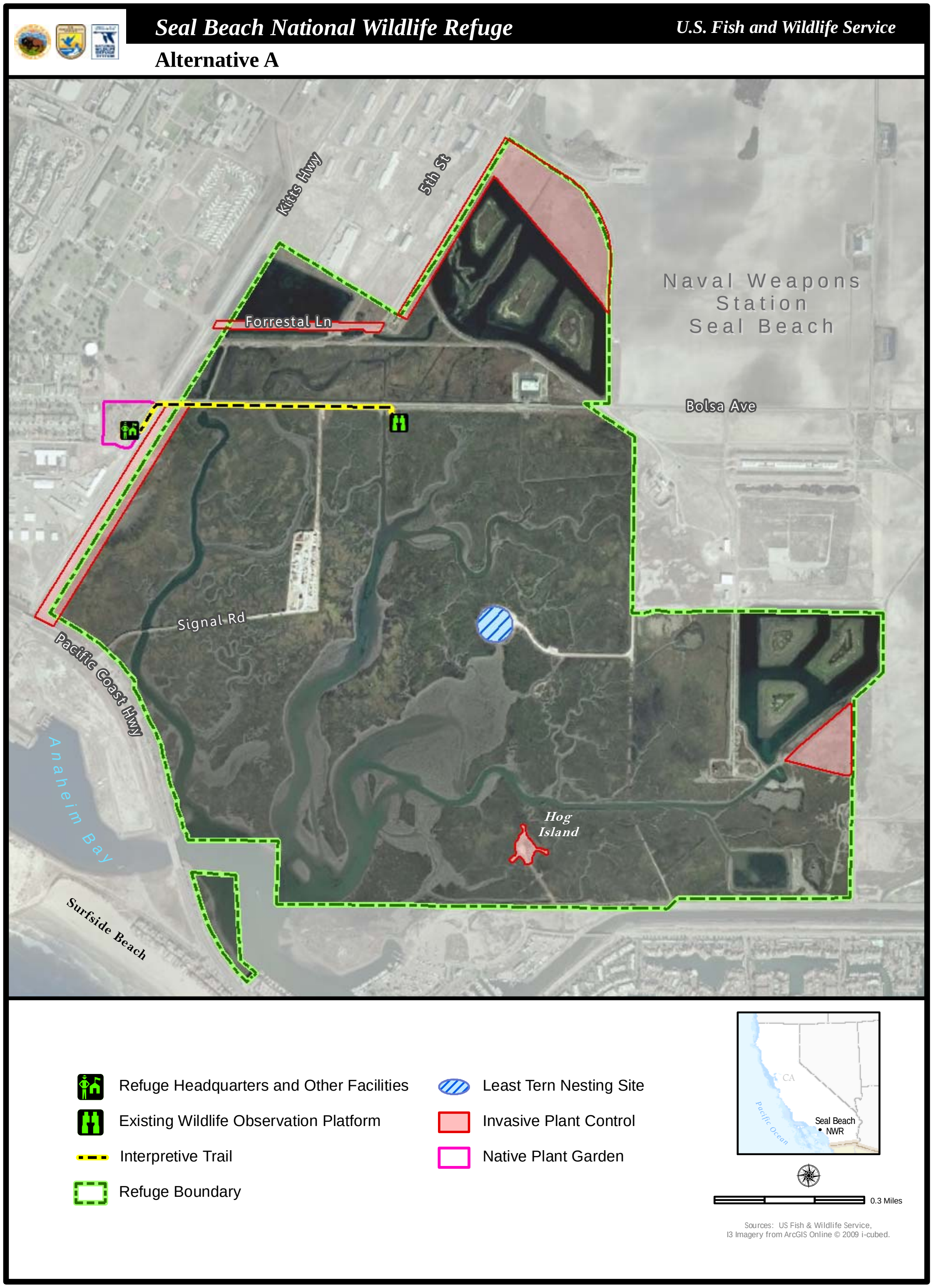


**Figure 2-2. Alternative A – No Action**

Work at the site will be limited to September 15 through February 1 to avoid impacts to nesting least terns and light-footed clapper rails. Any work lighting will be fully shielded to prevent light from spilling into adjacent habitat areas, and best management practices (BMPs) will be implemented to protect water quality and habitat. These conditions will be outlined in a Refuge Special Use Permit to be issued to the contractor prior to commencement of any work on the site. Similar conditions will likely be required by Naval Weapons Station Seal Beach, which will also need to approve this work. The project will also be required to comply with the provisions of the Clean Water Act, the Endangered Species Act, the Coastal Management Act, and NEPA.

Endangered, Threatened, and Sensitive Species Management. A number of actions are implemented on the Refuge specifically to protect and aid in the recovery of the California least tern and light-footed clapper rail. These include annual pre-nesting site preparation, predator management, and population monitoring. Population monitoring is conducted to determine species abundance and ongoing population trends on the Refuge and endangered species studies are conducted per available funding to study population dynamics and habitat use by least terns and clapper rails.

For the California least tern, annual pre-nesting site preparation involves killing weedy vegetation at the NASA Island nesting site through the use of chemical or mechanical means; cleaning up any debris and/or trash; improving substrate quality when necessary by spreading additional clean, light sand and shell fragments over some or all of the site; inspecting and repairing the electrified perimeter fence; and addressing any erosion problems around the outer edges of the nesting site. In 2007, approximately 40 percent of NASA Island was mechanically scraped, and clean light sand was deposited over the prepared area. Volunteers then assisted in manually removing vegetation from the remainder of the site. This was followed in 2008 by the placement of crushed oyster shells on those areas of the site that were recently covered in clean sand. Vegetation growing on the site is normally killed in late winter through use of approved herbicides or salt water treatments.

California least tern monitoring begins at NASA Island when the first least terns are observed on the Refuge, which is generally between April and early May of each year. Monitoring is conducted one day per week until the terns leave the nest site, which usually occurs in late July or August each year. To monitor the nesting terns, terra cotta tiles are placed inside the colony for grid marking. These tiles also provide protection for tern chicks from avian predators. The grid spacing is generally set at 30 feet. This grid assists the tern monitors in recording and mapping tern nests. Monitoring data provide information about the number of adults present at the nesting site, as well as the numbers of nests, chicks, and successful fledges, and information about adult, chick, and/or egg mortality and/or predation. This monitoring data are provided to the California Department of Fish and Game (CDFG) for inclusion in the statewide California Least Tern Annual Report and are also maintained at the Refuge Headquarters for use in comparing population levels and productivity from year to year and over extended periods of time.

To reduce the potential for predation by avian predators, particularly crows, ravens, and gulls, a predator monitoring program is implemented annually on the Refuge during the nesting season. This program, often referred to as the Eyes on the Colony Program, involves the use of volunteers and/or contractors who are stationed at a lookout site a short distance from the nesting colony. From this location, they can observe the activities going on at the nesting site. When participants observe potential avian predators in the vicinity of the nesting colony, they take actions to haze (scare off) the potential predators from entering the site. Participants stay in contact with the Refuge Manager to provide updates on site conditions and nesting activity, as well as to report potential threats or apparent evidence of predation activity.

Pre-nesting season preparation for the light-footed clapper rail involves conducting annual inspections of, and when necessary, repairs to the clapper rail nesting platforms that have been placed within the marsh. Navy contractors and Refuge volunteers assist the Refuge Manager in this task. The design of these platforms is continually being improved to ensure that the rails have safe and secure locations to nest and take refuge during higher high tide events that occur throughout the year. Each year, a number of new platforms are placed within the marsh to replace old or damaged platforms. From 2003 to 2008, the total number of nesting platforms located within the Refuge was between 79 and 82 (Hoffman 2009).

Light-footed clapper rail monitoring involves annual fall high tide counts and spring call counts. Fall high tide counts are conducted at least once a year in the fall during daytime 6.7-foot or higher tides in order to estimate the overall Refuge population. Spring call counts are conducted annually during early phases of rail breeding, usually in March or April, in order to estimate population size, composition, and breeding status. Monthly monitoring of clapper rail nesting platforms and natural nesting areas are conducted throughout the nesting season by Navy contractors, generally February through July or August of each year. Monitoring is conducted to identify nest locations and to gather information about breeding success, predation, signs of the presence of predators in the area, and any other breeding biology information that could be useful in adapting current management and/or monitoring techniques. Rail sightings are also recorded during the Refuge's monthly high tide and low tide bird counts.

To reduce disturbance to rails, public access on the Refuge is generally limited to areas located away from potential rail habitat. Activities such as trash and debris clean-ups that occur along the edge of the marsh are conducted outside of the clapper rail nesting season.

Over the past several years, captive-bred light-footed clapper rails have been released on the Refuge in an effort to increase the genetic diversity of the rail population. Additional releases may occur in the future if monitoring indicates that low population levels warrant such action.

Another important management activity implemented to protect least tern and clapper rail adults, chicks, and eggs is predator management. Implemented throughout the nesting season in accordance with the Endangered Species Management and Protection Plan (USFWS and Navy 1991), predator management involves monitoring for signs of the presence of potential predators in the vicinity of least tern and light-footed clapper rail nesting habitat areas, and implementing predator control as necessary to protect listed species. The details of the Refuge's predator management plan are discussed in detail in this section.

Management actions to support the State endangered Belding's savannah sparrow include limiting human disturbance in and around the marsh during the nesting season; minimizing disturbance in occupied Belding's habitat throughout the year; and accommodating the State-wide Belding's savannah sparrow survey that is conducted approximately every five years.

<u>General Site Management</u>. General site management involves the control of invasive plant species, native plant installation, and trash and debris removal. These activities result in improved wetland and upland habitat quality that benefit the array of species supported on the Refuge. Invasive plant removal includes both mechanical and chemical control methods, with control focused on invasive, weedy plant species present in the Refuge's upland and upland transition areas, including the upland area north of the Case Street Pond, the area southeast of

the 7th Street Pond, Hog Island, and all other upland edges bordering the salt marsh. 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).

All herbicides used on the Refuge must be reviewed and approved as part of the Service's Pesticide Use Proposal System (PUPS). The PUPS identify specific pesticides approved for use on each Refuge, and includes details on target pests, products applied, application dates, rates, methods of use, number of applications, site description, sensitive habitats, and best management practices to avoid impacts to sensitive resources. 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, rates, methods of use, number of applications, site description, sensitive habitats, and best management practices to avoid impacts to sensitive resources. Pesticide use on the Refuge also conforms to the requirements of the Navy's approved Integrated Pest Management Plan for Naval Weapons Station Seal Beach, which requires that all pesticides used on the Refuge be approved by the Navy prior to initial use. Additionally, the details of pesticide application on the Refuge are to be documented in the Navy Online Pesticide Reporting System.

The herbicides currently approved for use on the Refuge include Aquamaster and Glyphosate Pro 4, with the active ingredient glyphosate; Habitat, with the active ingredient imazapyr; and Surflan AS, with the active ingredient oryzalin. Table 2-1 provides information regarding the specific uses and application of each of these pesticide products on the Refuge.

Mechanical methods used to remove invasive plants can include digging by hand, a nylon filament trimmer (weed "whacker"), chain saw, uprooting the plant with a jack, or hand pulling, among other mechanical methods. The areas where weed removal occurs are generally seeded or planted with native plant species.

Other management activities include protecting and maintaining existing native upland plant restoration areas near Hog Island, Kitts Highway, Bolsa Avenue, the eastern edge of the 7th Street Pond, and to the north of Case Street Pond; supporting the Navy's efforts to conduct eelgrass surveys in Anaheim Bay; and cooperating in assessing the performance of the Refuge's tidal mitigation areas using the California Rapid Assessment Method. Also implemented when funding can be secured is the maintenance, and where necessary replacement, of existing culverts to enhance or restore tidal flow within the main marsh and adjacent restored wetlands.

Night mammal surveys are conducted on the Refuge and the adjacent Naval Weapons Station in partnership with the Naval Weapons Station Seal Beach. These surveys are conducted to assess the population of potential mammalian predators that could adversely affect listed species. Volunteers also conduct monthly high tide and low tide bird counts; the National Audubon Society conducts its annual Christmas bird count; and a variety of research projects (e.g., round stingray surveys, *Trematode* surveys, ghost shrimp study, invasive snail [*Littorina littorea*] surveys) are conducted on the Refuge that provide relevant information about Refuge resources or data that can benefit Refuge management. These scientific investigations require a Special Use Permit from the Refuge Manager.

| Table 2-1<br>Current Pesticide Use Information for the Seal Beach NWR | | | | |
|---|---|---|---|---|
| **PRODUCT NAME** | **GLYPHOSATE PRO 4** | **AQUAMASTER** | **HABITAT** | **SURFLAN AS** |
| | | | | |
| **Active Ingredient** | Glyphosate<br>(post-emergent herbicide) | Glyphosate<br>(post-emergent herbicide) | Imazapyr<br>(pre- and post-emergent herbicide) | Oryzalin<br>(pre-emergent herbicide) |
| **Target Pests** | Non-native, invasive broadleaf weeds/grasses | Non-native, invasive broadleaf weeds and shrubs | Perennial pepperweed, Brazilian pepper tree, other invasive shrubs/trees | Non-native, invasive annual grasses, broadleaf weeds, and woody shrubs |
| **Treatment Site** | terrestrial | terrestrial areas immediately adjacent to wetlands | terrestrial | terrestrial |
| **Treatment Area Size** | 30 acres | 30 acres | 5 acres | 30 acres |
| **Application Method**<br>**Application Rate**<br>**Application Equipment** | Foliar (low volume)<br>5% solution<br>ATV sprayer | Foliar (low volume)<br>2% solution<br>ATV sprayer<br><br>Foliar (low volume)<br>5% solution<br>ATV sprayer | Foliar (low volume)<br>5% solution<br>Backpack Sprayer<br><br>Cut Surface<br>66% solution<br>Hand-held | Soil application<br>2 quarts/acre<br>ATV sprayer<br><br>Soil application<br>4quarts/acre<br>ATV sprayer |
| **Applications/year** | 2 applications/year | 2 applications/year | 2 applications/year | 3 applications/year |
| **Best Management Practices** | Only apply when wind speeds are less than 10 mph;<br>Do not apply during inversion conditions;<br>Follow label instructions;<br>Calibrate application equipment; and<br>Monitor site prior to application | Only apply when wind speeds are less than 10 mph;<br>Do not apply during inversion conditions;<br>Follow label instructions;<br>Monitor site prior to application;<br>Provide buffer between sensitive areas and application area | Only apply when wind speeds are less than 10 mph;<br>Do not apply during inversion conditions;<br>Follow label instructions;<br>Calibrate application equipment; and<br>Monitor site prior to application | Only apply when wind speeds are less than 10 mph;<br>Do not apply during inversion conditions;<br>Follow label instructions;<br>Calibrate application equipment; and<br>Monitor site prior to application |

Predator Management. Monitoring for the presence of mammalian and avian predators that could pose a threat to the California least tern nesting colony and/or the light-footed clapper rail population on the Refuge is an important component of the Refuge's wildlife and habitat management program. Predator management continues to be implemented in accordance with the Endangered Species Management and Protection Plan (USFWS and Navy 1991), which addresses predator management throughout Naval Weapons Station Seal Beach, including the Refuge.

The Endangered Species Management and Protection Plan (USFWS and Navy 1991) is a comprehensive plan that includes species population monitoring, endangered species studies, endangered species protection, predator control, habitat management, habitat restoration and enhancement, and monitoring and researching environmental quality. An objective of the plan is to establish a more naturally balanced ecosystem within the Refuge and Naval Weapons Station Seal Beach that is supportive of endangered species and other native wildlife. The principal means for providing endangered species protection on the Refuge involves habitat modification and population management. All methods used for controlling predators on the Refuge are implemented in conformance with government regulations and have been approved subject to Service and U.S. Department of Agriculture, Animal Damage Control guidelines and requirements.

Predator management on the Refuge includes indirect and direct control of predators. Indirect control includes maintenance of barriers and fencing around NASA Island and the "Eyes on the Colony" volunteer program. Direct control includes live capture and release off-site, live capture and euthanizing, shooting, and toxicant application.

In general, predator species are controlled based on location, seasonality, and number of predator signs or sightings. The following factors are considered before implementing control of a particular predator: the nature and degree of threat to endangered species; the estimated population of the predator species; location of the predator sightings and signs to endangered species habitat; the season during which the predator is present; and the level of vulnerability of endangered species to the particular predator species. Based on the specific criteria associated with these factors, various actions are taken to assure that endangered species protection and population objectives are achieved while avoiding excessive removal of predatory animals.

The control of mammalian and avian species with the potential to harm the Refuge's listed species is currently conducted by the Refuge Manager. In the past, this activity has been implemented by an outside contractor who maintains regular contact with the Refuge Manager. At the end of each breeding season, a predator management report describing the monitoring and control methods implemented during the past year is prepared and kept on file in the Refuge Headquarters. Control methods can range from harassing potential avian predators to keep them away from nesting areas to rare instances in which lethal control of known problem individuals is the only remaining option. To reduce the need for lethal control, a number of actions are taken to reduce the potential for predation. These actions include the installation of an electrified fence around NASA Island, placement of terra cotta tiles in the nesting area to provide some protection for chicks from avian predators, hazing of avian predators at the tern nesting colony, and placement and continual maintenance of nesting platforms in the marsh to provide safe refuge for light-footed clapper rails year-round, and particularly during the nesting season.

Predator management generally starts one month before anticipated nesting, which is about March 1 for the California least tern, and continues until all nests are fledged. Predator management surveys are conducted regularly during the nesting season and consist of routine walks around the Refuge noting tern activity, looking for evidence of potential mammalian or avian predator activity in proximity to listed species habitats (e.g., actual sightings, tracks, scat, holes or digging), inspecting the integrity of the electric fencing around NASA Island, looking for signs of any illegal public access, and checking any traps for content. Endangered species monitoring also assists the Refuge Manager in identifying potential predator problems before they elevate to the point that lethal take would be necessary. Night mammal surveys are conducted monthly on the Refuge and portions of the Naval Weapons Station Seal Beach.

From these counts, the Refuge Manager can obtain information about the range of potential predators present in the immediate area and develop a general understanding of the number of each potential predator species that may present.

Predator control methods for predatory mammals on the Refuge include live trapping and shooting of feral cats, opossums, striped skunks, coyotes, and red fox. Manual live capture methods such as box-type mammal traps, handheld capture poles, padded leg-hold traps, or other manual techniques may be employed. All traps are inspected in accordance with State Fish and Game Code and Service policy. When suitable relocation sites or facilities are available, captured animals are transported and released to those locations. In the absence of suitable relocation sites, captured predatory animals are euthanized at the trap site. Trapped animals that do not pose a threat to listed species because of the time of year, the total estimated number of that species on the Naval Weapons Station Seal Beach, or other factors are released at the trap site or, if appropriate for the long-term protection of listed species, to an area on the station that is well away from the marsh. Problem avian predators are generally live-captured and released at an appropriate distant off-site location. Lethal removal of predatory birds occurs in rare cases when a problem predator cannot be trapped, there is an imminent threat to endangered species, or it returns after release away from the Refuge and continues to prey on endangered species. The techniques for avian predator control are implemented in accordance with agency policies for safety and humane treatment of animals.

The common raven *(Corvus corax)* and American crow (*Corvus brachyrhynchos*) are documented predators of least tern chicks and eggs. In recent years limited numbers of ravens (three individuals in 2007) have had to be lethally removed. Another potential way to control crows and ravens is the use of DRC-1339. Although proposed for use in the approved predator management plan for this Refuge, DRC-1339 has never been used on the Refuge. DRC-1339 is a pesticide used to control corvid (i.e., crow and raven) populations. It is injected into chicken eggs, which are then secured onto strategically placed elevated bait stations in the vicinity of endangered species nesting areas. Ingestion of the pesticide is lethal to the crow or raven. Specific baiting and pre-baiting activities are conducted to eliminate the possibility of attracting non-target species.

**Public Use Program**

Although the Refuge Improvement Act requires that the six wildlife-dependent recreational uses of the NWRS (hunting, fishing, wildlife observation, photography, environmental education, and interpretation) receive priority consideration in refuge planning, the fact that this Refuge is located on a military weapons station necessarily limits the types of activities permitted to occur here. Currently, the Refuge provides opportunities for wildlife observation, interpretation, and environmental education.

Public Access. Public access on the Refuge is restricted to guided tours and outings in accordance with Naval Weapons Station Seal Beach's military mission. Currently, a public tour of the Refuge is offered once a month and special tours are periodically conducted to support the Refuge's objective of providing opportunities for wildlife observation, interpretation, and environmental education.

Wildlife Observation and Interpretation. A three-hour public walking tour of the Refuge is offered on the last Saturday of each month. Reservations must be made in advance and attendance is generally limited to 50 people. These tours, which are led by Service staff and the Friends of the Seal Beach NWR, are conducted in cooperation with Naval Weapons Station Seal Beach. Visitors enjoy videos in the visitor contact station that describe the resources on the Refuge and provide an overview of the National Wildlife Refuge System. The tours also include a visit to the native plant garden and a walk along Bolsa Avenue to an existing observation platform. Along the way, an information station is set up where visitors can learn about the aquatic organisms supported within Anaheim Bay.

A six- to eight-foot-wide pedestrian pathway, consisting of compacted decomposed granite, provides access from the Refuge Headquarters east along Bolsa Avenue to an existing observation deck, located about a half of a mile east of the intersection of Bolsa Avenue and Kitts Highway. The observation deck is located on the south side of Bolsa Avenue and provides the public with views into the marsh. Spotting scopes, binoculars, and interpretive signage with information about the habitats and species protected on the Refuge are provided on the observation deck during the tours to enhance the public's experience.

Other opportunities for wildlife observation and interpretation include periodic special tours for birding groups, girl and boy scout groups, and other interested groups, as well as volunteer opportunities related to habitat restoration, weed removal, and general clean-up. These volunteer opportunities are often associated with National Public Lands Day, International Migratory Bird Day, or other State or nationwide annual events.

<u>Environmental Education</u>. Special tours of the Refuge are also held for school groups of all ages. An additional Refuge-related off-site environmental education program, implemented by the Friends of Seal Beach NWR, serves about 500 students annually.

<u>Wildlife Photography</u>. Cameras are not permitted on Naval Weapons Station Seal Beach without written permission from the Navy. Occasionally, the Navy will grant permission for Refuge staff or Refuge volunteers to take photographs of Refuge resources to help promote wetland conservation and increase public awareness of the birds and habitats protected on the Refuge.

<u>Hunting and Fishing</u>. To avoid conflicts with the mission of Naval Weapons Station Seal Beach, hunting and fishing are prohibited on the Refuge.

**<u>Refuge Operations</u>**

Under this alternative, the Refuge would continue to be managed by one full-time Refuge Manager and one part-time maintenance worker. Additional assistance would be available from Refuge Complex staff.

The Refuge Headquarters, which consists of a small military building identified by Naval Weapons Station Seal Beach as Building Number 226, is located outside the Refuge boundary near the southwest corner of Kitts Highway and Bolsa Avenue. The building includes two small offices spaces, storage areas, a single restroom, and a moderately-sized assembly area where Refuge information and interpretive displays are provided for public viewing. Video presentations for approximately 25 people can also be accommodated in the assembly area. Just to the south of the Refuge Headquarters are small storage sheds and outdoor storage areas for Refuge equipment and tools. In addition, a native plant garden, developed and maintained by the Friends of Seal Beach NWR, is located to the north, west, and southwest of the Refuge Headquarters. An interpretive kiosk has been constructed adjacent to the Refuge Headquarters to provide visitors with additional information about the Refuge. Neither the Refuge Headquarters nor the native plant garden is located within the Refuge boundary.

**Environmental Contaminants Coordination**

As illustrated in Figure 2-1, the U.S. Navy owns the majority of the lands and waters included within the Refuge boundary. As a result, the Navy is responsible for the identification, assessment, characterization, and clean-up or control of contaminated sites within the Refuge, as well as throughout Naval Weapons Station Seal Beach. In 1985, the Navy conducted an assessment of Naval Weapons Station Seal Beach, which included the Refuge, and identified eight sites within the Refuge boundary (U.S. Navy 2007). Of the eight sites, only three have yet to be fully remediated. For two of the sites, remediation is the responsibility of the Navy, while the third site, Oil Island, is the responsibility of the facility operator, Breitburn Energy Corporation. Chapter 4 of the CCP provides further information about these sites and their remediation.

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 is currently conducting a multiple-year contaminants study on the light-footed clapper rail population at the Seal Beach NWR involving analysis of blood, feathers, and nonviable eggs.

The Refuge will continue to coordinate with the Naval Weapons Station Seal Beach, as well as with the Service's Contaminants Program, to ensure that potential contaminants issues are appropriately addressed as part of the overall management plan for the Refuge.

**Cultural Resource Management**

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. The Navy, as the landowner, also has responsibilities for insuring the protection of cultural resources within the Refuge. In accordance with its responsibilities, the Navy has initiated cultural resource surveys for various projects on Naval Weapons Station Seal Beach. In addition, as part of the CCP process, a Cultural Resources Review was conducted for the Refuge to provide the Refuge Manager with pertinent information about the cultural resources on the Refuge, as well as to provide guidance on how to ensure the long-term protection of known and unknown cultural resources within the Refuge boundary. As a result of these surveys and reviews, all of the areas within the Refuge that are accessible have been surveyed for archaeological resources. The Refuge's inaccessible wetlands have not been surveyed.

Because there is the potential for undiscovered cultural resources to be present beneath the surface within previously surveyed and yet to be surveyed areas within the Refuge, any ground-disturbing activities proposed within the Refuge boundary are reviewed by the Service's Cultural Resources Program for compliance with Section 106 of the Historic Preservation Act. The review process involves the preparation of a Request for Cultural Resources Compliance 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 result in only minor impacts to subsurface materials could fall under the Service's programmatic agreement with the State Historic Preservation Office (SHPO), while other projects requiring greater ground disturbance would require SHPO review and concurrence.

**Volunteers and Partners**

The Friends of Seal Beach NWR group is an essential part of the Refuge management team. Consisting of local citizen volunteers, the Friends devote thousands of hours each year to habitat restoration, endangered species monitoring, environmental education programs, public outreach, and much more. Without assistance from the Friends, it would not be possible to implement the monthly public tours of the Refuge or conduct special tours and other public events that allow the public to enjoy the wildlife and habitats protected within the Refuge. This group of dedicated individuals has been involved in the stewardship of the Refuge for several decades. It is through their efforts that the Service is able to spread the word about the Seal Beach NWR.

As described, the Navy is also an important partner in the management of the Refuge, providing oversight of some issues, providing funding to assist in various aspects of wildlife and habitat management, and assisting in the Refuge's visitor program. Other partners include local universities, whose students conduct research on the Refuge; local agencies that assist in mosquito control and storm water management; and State and Federal agencies, such as the California Department of Fish and Game and NOAA National Marine Fisheries Service, that coordinate with the Refuge Manager on issues affecting coastal southern California resources.

**Mosquito Monitoring and Control**

The OCVCD is responsible for monitoring and controlling mosquitoes on the Refuge and adjacent Navy lands. On the Refuge, these activities are conducted in accordance with a SUP and approved PUPs, both of which are prepared on an annual basis. The SUP permits OCVCD to control populations of mosquitoes at selected locations on Refuge for the purpose of protecting human and wildlife health and safety. Locations currently approved for mosquito monitoring and control are indicated in Figure 2-3. The SUP states that mosquito control shall rely on the use of physical and biological control as much as practicable prior to using chemical larvicides. Larvicides approved for use on the Refuge include *Bacillus thuringienensis* var. *israelensis* (Bti), *Bacillus sphaericus* (Bs), and Altosid®. Bti and Bs, both naturally occurring soil bacteria, are used to control mosquitoes in wetlands prior to their emergence as adults.

Altosid® is a trade name for methoprene, an insect development regulator used in the control of mosquitoes. Methoprene is considered a biochemical pesticide because rather than controlling target pests through direct toxicity, it interferes with an insect's life cycle by mimicking a growth hormone found in mosquitoes that prevents the mosquito from reaching maturity or reproducing (USEPA 2001).

The special conditions of the SUP include: coordinate all activities with the Refuge Manager at least two business days prior to entry onto the Refuge or provide the Refuge Manager with a schedule of seasonal activities prior to the beginning of the mosquito season; limit activities to approved locations on the Refuge; enter approved locations by foot only; report any pesticide application within one week of application; and adhere to U.S. Environmental Protection Agency (USEPA or EPA) application regulations.

#### 2.4.3.2 Alternative B - Maximize Salt Marsh Restoration, Continue Current Public Uses

Under Alternative B (Figure 2-4), the wildlife and habitat management activities described in Alternative A would be expanded to include new activities intended to: protect and aid in the recovery of the light-footed clapper rail and California least tern; increase our understanding of the array of species present within the Refuge and their relationship with other species and existing habitats; broaden our understanding of how the Refuge's trust resources are being affected by climate change and sea level rise; and restore the remaining disturbed habitat areas on the Refuge to functional salt marsh and wetland/upland transition habitat. No changes to the public use program described in Alternative A are proposed.

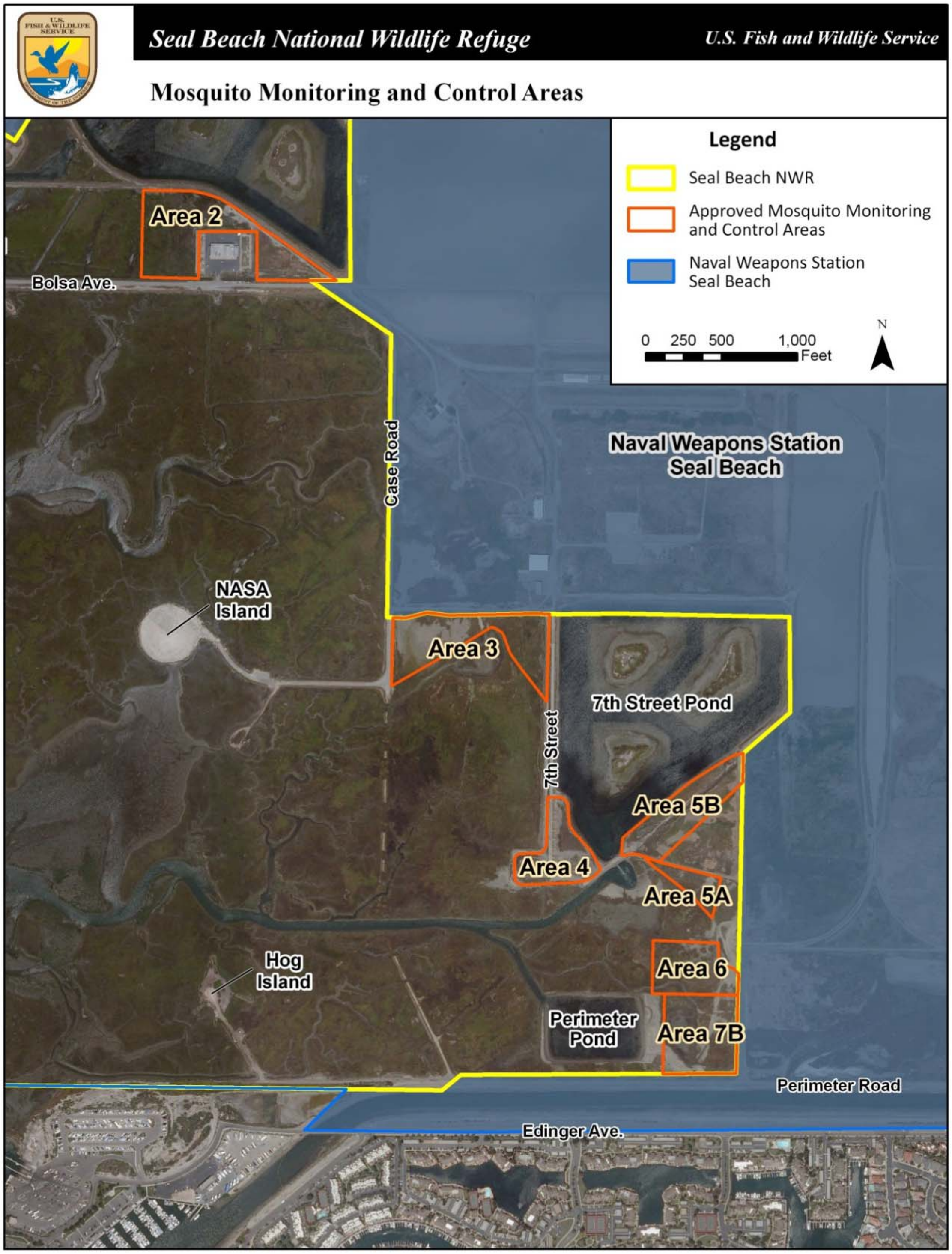


**Figure 2-3. Approved Mosquito Monitoring and Control Areas - Seal Beach NWR**

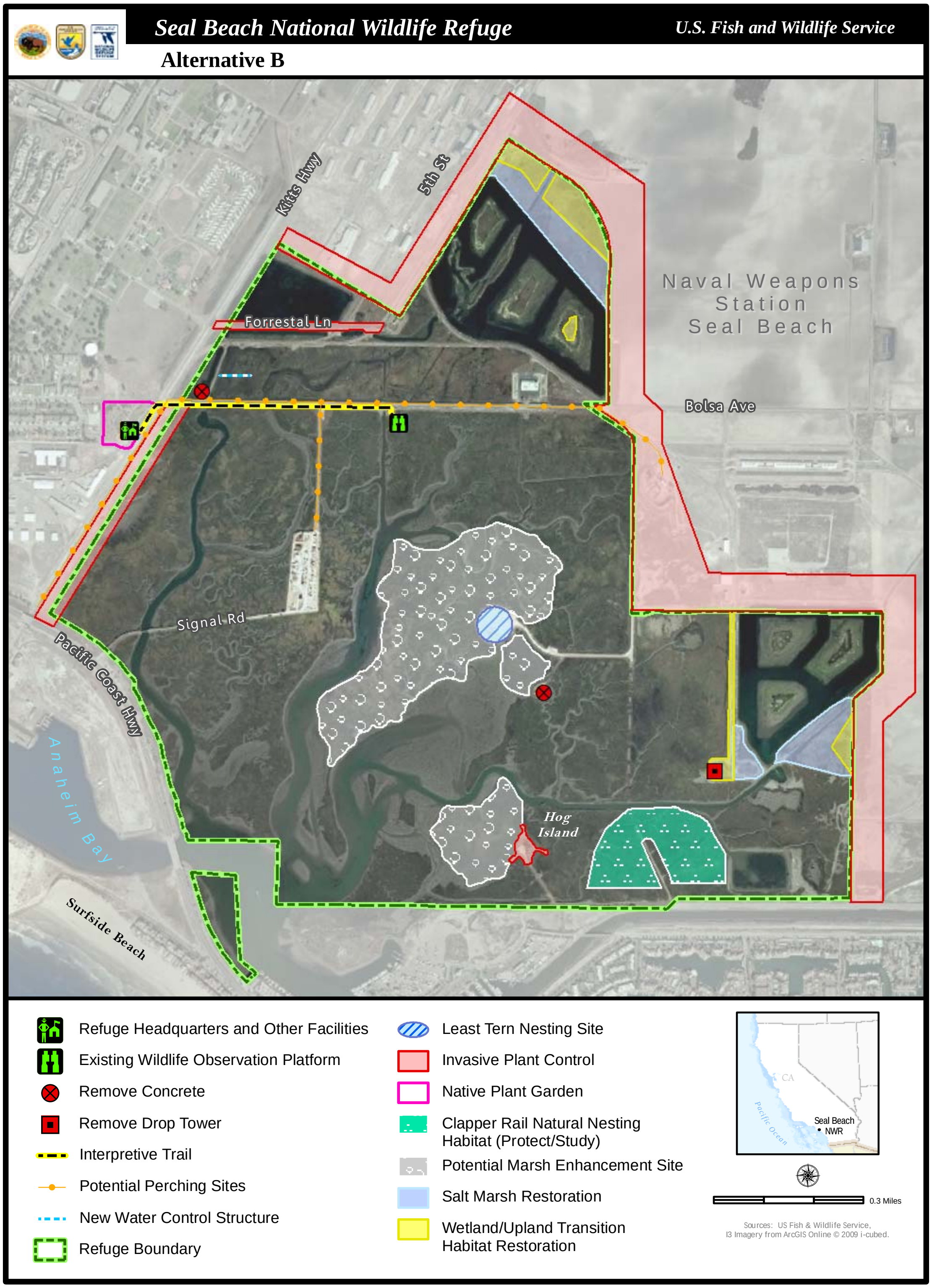


**Figure 2-4. Alternative B – Maximize Salt Marsh Restoration, Continue Current Public Uses**

**Wildlife and Habitat Management**

In addition to the wildlife and habitat management activities described under Alternative A, including predator management, various new or expanded actions would also be implemented under this alternative as described here.

Endangered Species Management. Management of the light-footed clapper rail under this alternative would be expanded to include developing a greater understanding of the habitat qualities and species dynamics present in the natural rail nesting areas located between Hog Island and Perimeter Pond. Efforts would be made to encourage research projects that: 1) identify the factors that appear to favor natural nesting in this area; 2) compare the fledgling success rates in these natural areas to fledgling success on nesting platforms; and 3) explore various options for improving habitat quality in other parts of the marsh in part to increase opportunities for natural nest sites on the Refuge.

In an effort to reduce avian predation of rails and least terns, the Refuge Manager would work with the Naval Weapons Station Seal Beach to reduce perching opportunities around the marsh. Potential actions could range from installing anti-perching materials on existing power poles and rooftops to relocating the existing poles well away from the marsh.

Integrated Pest Management. Under Alternative B, an Integrated Pest Management (IPM) Plan would be implemented for the Refuge. In accordance with 517 DM 1 and 569 FW 1, an IPM approach would be utilized, where practicable, to eradicate, control, or contain pest and invasive species (herein collectively referred to as pests) on the Refuge. Implementing the IPM Plan would involve using methods based upon effectiveness, cost, and minimal ecological disruption, which considers minimum potential effects to non-target species and the refuge environment.

Under the IPM Plan, 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 pesticide is necessary for use on the Refuge, the most specific (selective) chemical available for the target 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 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. The types of pesticides that can be used on the Seal Beach NWR are also limited to those products available for sale in the State of California. Before a pesticide product can be sold or offered for sale in California, is must be approved and registered by the State's Department of Pesticide Regulation.

Environmental harm by pest species would refer 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; out-competing them for food, nutrients, light, 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 involve detrimental changes in ecological processes. For example, invasive non-native plant species can out-compete 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. For example, invasions by fire-promoting non-native grasses that alter native plant communities can also increase the frequency and intensity of wild fires, which in turn increases fire-fighting costs and threats to adjacent developments.

Along with a more detailed discussion of IPM techniques, the IPM Plan describes the selective use of pesticides for pest management on the Refuge, where necessary. Throughout the life of the CCP, with the exception of mosquito-related pesticides, all 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. Chemical profiles that have already been prepared for pesticides currently in use on the Refuge are provided in Attachment B of the IPM Plan. 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 may be achieved through the implementation of additional BMPs that further define how, when, where, and to what extent a specific pesticide may be applied.

Pesticide use on the Refuge also conforms to the Integrated Pest Management Program for Naval Weapons Station Seal Beach, which requires that all pesticides used on the Refuge be approved by the Navy prior to initial use and that the details of pesticide application on the Refuge be documented on the Navy Online Pesticide Reporting System.

Mosquito Management. Mosquito management would be addressed through a SUP as described under Alternative A. Under the SUP, which is issued annually, mosquito monitoring would be implemented throughout the breeding season, actions to reduce potential mosquito breeding habitat on the Refuge would be conducted per available funding, and the Refuge Manager may allow compatible mosquito larvae control when the numbers of immature mosquitoes present in an area exceed OCVCD's mosquito larvae threshold treatment levels, as presented in Table 2-2. Although Table 2-2 addresses various mosquito species, only the species *Aedes taeniorhynchus* and *A. sqaminger* are currently known to breed on the Refuge.

Under Alternative B, the Refuge Manager may allow compatible mosquito pupae control such as monomolecular biodegradable film (e.g., Agnique MMF) when the numbers of later instar stages and/or pupae on the Refuge have exceeded established mosquito threshold treatment levels. In addition, mosquito monitoring would be expanded to include an evaluation of the effectiveness of the various mosquito control measures being implemented on the Refuge.

| Table 2-2<br>OCVCD Criteria for Considering Pesticide Application to Control Immature Mosquito Populations | |
|---|---|
| **Mosquito Species** | **Criteria for Considering Treatment** |
| *Culex* spp. | ≥ 2 immatures/20 dips |
| *Aedes* spp.[1] | ≥ 2 immatures/10 dips |
| *Culiseta* spp. | ≥ 2 immatures/10 dips |

Source: (Orange County Vector Control District 2010)

[1] *Aedes* is currently the only genus of mosquito known to breed on the Refuge.

In the event of a public health emergency, it may become necessary to control adult mosquitoes on the Refuge. The use of adulticides on the Refuge would require revisions to the current SUP and the existing Compatibility Determination for mosquito management, as well as additional NEPA and Endangered Species Act compliance, approval from the Service's Integrated Pest Management Coordinator through the PUPs review process; and coordination with the Navy Environmental Office staff on how, when, and where an adulticide could be applied on the Refuge.

Under Alternative B, the following mosquito control products would be considered for use on the Refuge: the larvicides *Bacillus thuringiensis* var. *israelensis* (Bti), *Bacillus sphaericus* (Bs), Altosid, and Natular™; and the pupacide monomolecular biodegradable film (e.g., Agnique MMF).

Other Management Activities. Other management actions proposed under this alternative to benefit listed species, as well as the other trust species supported by the Refuge include:

1. Replacement of the Western Culverts in the Bolsa Cell
   Two 30-inch culverts were installed within the western levee of the Bolsa Cell as part of the Port of Long Beach restoration project. These culverts, which facilitate the flow of bay water into the western end of the cell, have over the years been plugged to reduce the volume of water entering the cell and then subsequently reopened in an attempt to better regulate water levels, all with limited degrees of success. The existing culverts are in poor condition, with significant signs of deterioration. Tidal flow through the culverts has been severely compromised by mussel fouling, while pipe erosion is allowing water to flow around the culvert, threatening the stability of the levee. Under this alternative, the culverts would be removed, the levee repaired, and a new water control structure installed near the center of the levee.

   The preliminary design for the water control structure indicates that the structure would likely consist of pre-cast concrete headwalls and tail walls, a stainless steel slide/screw gate, and two 30-inch diameter, 40-foot-long High Density Polyethylene (HDPE) pipe, which is highly resistant to biological buildup (e.g., mussel fouling) and is not susceptible to corrosion. The incorporation of a slide/screw gate into the design would allow for the precise management of tidal flows into and out of the Bolsa Cell. Although the specific design of the structure could change during final design, the general way in which the structure would be operated would remain the same.

   Installation of the new structure would require the use of coffer dams, or the implementation of other appropriate actions, during construction to prevent tidal exchange through the construction site. The tide gate structure would be placed on base rock and then back filled with appropriate clean material. Once the areas around the concrete headwalls and tailwalls are back filled and properly compacted, rip-rap would be placed around the structure to prevent any erosion of the back fill material.

Following installation and testing of the new water control structure, the old culverts would be removed and this portion of the levee would be filled and stabilized with the rip-rap. Installation of the new structure, culvert removal, and levee stabilization would be implemented using a conventional land excavator. Debris and any excess fill from the project would be trucked away for disposal at an appropriate off-site location. All work would be conducted between September 15 and February 1 to avoid impacts to nesting birds, and best management practices would be implemented to protect water quality and native habitat.

Once all construction and site clean-up has been accomplished, the top of the levee would be planted with appropriate native wetland/upland transitional and upland vegetation. In addition to NEPA, which is addressed through this document, this project will also be required to comply with the requirements of the Clean Water Act, the Endangered Species Act, Section 106 of the Historic Preservation Act, and the Coastal Management Act.

2. <u>Removal of Concrete and Debris from the Marsh</u>
   Old concrete and other miscellaneous debris can be found in various locations throughout the marsh complex. Under this alternative, this debris would be removed and the area restored to native vegetation. Removal would likely require the use of an excavator, although some debris may be removed with a crane. To the extent feasible, heavy equipment used to remove the debris would remain on adjacent roads to reduce the potential for impacts to sensitive habitat. Where appropriate, such as in higher marsh areas or areas expected to support wetland/upland transitional habitat, locally native plants would be installed to ensure appropriate native plant species diversity. This alternative also proposes to work with Naval Weapons Station Seal Beach to remove the abandoned structure located on Hog Island. Activities associated with the removal of this structure would occur on existing roads and/or in disturbed upland areas. Activities would be restricted the non-breeding season.

3. <u>Invasive Plant Control Beyond the Refuge Boundary</u>
   To reduce the spread of non-native weeds on Refuge lands, this alternative includes a proposal to seek Service and/or grant funding that would enable Naval Weapons Station Seal Beach to implement an invasive plant control project for the upland areas located outside the Refuge along the perimeter of the Refuge boundary. The Refuge would also assist the Naval Weapons Station Seal Beach in identifying potential funding sources to support regular monitoring in the harbor and marsh for the invasive marine algae, *Caulerpa taxifoli*. If this species is located during monitoring, immediate actions would be taken to contain and eradicate it before it becomes established.

4. <u>Document the Health of the Refuge's Cordgrass Habitat</u>
   High quality cordgrass habitat is important to the light-footed clapper rail population on the Refuge. For reasons that have not yet been analyzed, the quality of the cordgrass habitat on the Refuge is not optimal. Therefore, under this alternative, funding and partnerships would be sought to develop and implement a study to describe the current health of the cordgrass stands within the Refuge; identify those

factors that could be inhibiting optimum plant health, density, and height; and develop strategies for improving the overall health of the cordgrass habitat, if necessary.

5. Implement Directed Surveys for Tiger Beetles
   Several tiger beetle species have been identified on the Refuge, particularly in salt pan areas; however, a directed survey to provide baseline data for tiger beetle diversity and abundance on the Refuge has never been conducted. Under this alternative, funding and partnerships would be sought to implement a directed search for tiger beetles. Special emphasis would be placed on identifying any habitat areas that support tiger beetle species such as Gabb's tiger beetle (*Cicindela gabbii*) and Frost's tiger beetle (*Cicindela senilis frosti*), which have been identified by the State as highly imperiled, (Comrack et al. 2008).

6. Increase Efforts to Inventory Refuge Species
   Baseline data for avian species diversity and abundance are well established for the Seal Beach NWR, and baseline data is also available for fish species presence in Anaheim Bay. Significantly less information is currently available for native plant species, other vertebrate, and invertebrate species that occur on the Refuge. To expand the information available for the array of species present within the Refuge and their relationship to other species and existing habitats, this alternative proposes to expand and/or update the existing biological baseline information for the Refuge by locating and compiling historic monitoring and/or survey data and seeking funding and/or developing partnerships to implement periodic (every three to five years) surveys for the array of organisms supported on the Refuge.

7. Implement a Five-Year Water Quality Monitoring Program
   Funding and/or partnerships would be sought to implement a five-year water quality monitoring program on the Refuge to regularly collect data on the basic physical parameters of the waters within the Refuge, including water temperature, dissolved oxygen, water salinity, pH, light attenuation, turbidity, and levels of inorganic nitrogen and phosphorus. This program would also include first flush monitoring of runoff entering the Refuge from adjacent drainage channels, as well as regular quarterly monitoring at pre-designated tide cycles and sample locations throughout the Refuge.

8. Monitor Tidal Channel Bathymetry and Channel Bank Stability
   The slopes along major tidal channels and around the perimeter of the restoration ponds would be photographed to establish a baseline from which the effects of ongoing erosion in these areas can be assessed. These areas would then be photographed and evaluated annually at similar tide cycles to determine if remediation is necessary to protect natural marsh edges for shorebird foraging and as refugia for migratory birds during high tides. An initial bathymetric survey of the main tidal channels in the marsh would also be conducted to establish baseline channel depths. This survey would be repeated every three to five years to determine what, if any, changes in channel bathymetry are occurring.

9. Expand Opportunities for Research on the Refuge
   During the scoping process, the need for research and associated studies of the species and biological processes occurring on the Refuge was identified. To address this need, the Refuge would reach out to various graduate programs to seek researchers interested in addressing research questions that benefit Refuge resources and improve management effectiveness.

10. Monitor Changes Related to Climate Change and Sea Level Rise
    To better understand how the Refuge's trust resources are being affected by climate change and sea level rise, funding and/or partnerships would be sought to facilitate routine monitoring and recording of tidal elevations within the marsh and changes in habitat quality and type over time. Changes in avian species composition would be determined by comparing monthly high and low tide counts with data provided from previous years. Additionally, periodic (every 5-10 years) fish surveys would be conducted to compare current conditions to those documented in comprehensive surveys conducted in past years. Data from endangered species monitoring would also be analyzed to identify any potential change in site use, species population sizes, productivity, and other relevant factors that might be associated with climate change and/or sea level rise. Understanding how conditions are changing as a result of climate change and sea level rise would assist the Refuge Manager in making necessary changes in ongoing management strategies to ensure that Refuge goals and purposes can continue to be achieved.

11. Improve the Quality of Runoff Entering the Marsh
    Refuge staff would coordinate with other Federal, State, and local agencies to identify actions and policies that when implemented would lead to improvements in the quality of the water entering the marsh from upstream sources. Through a multi-agency partnership, funding would be sought to design and implement specific projects on or off the Refuge to reduce the level of pollutants at the source and throughout the flood control system, including within the Bolsa Chica and East Garden Grove-Wintersburg flood control channels, both of which empty into Anaheim Bay.

**Habitat Restoration**

There are several opportunities for habitat restoration within the Refuge. Approximately 37 acres of disturbed upland have been identified as future restoration sites, including: 22 acres located to the north of Case Road Pond; approximately one acre on the easternmost island in the Case Road Pond; nine acres to the southeast of 7th Street Pond; and five acres located along the western edge of 7th Street Pond and around the existing drop tower at the southern end of 7th Street. These areas and the habitat types proposed for each site are presented in Figure 2-4. Table 2-3 provides a breakdown of proposed habitat acreages per location.

These restoration proposals could be implemented under one project proposal, or the restoration could be phased over a number of years. The extent and timing of when various restoration proposals are implemented would be dependent upon the level of funding that is secured to implement restoration. The overall cost of implementing the restoration proposals would be lower if all of the sites could be restored as part of single project, but this option may not be feasible based on the limited availability of funding sources for restoration. It is the intent of this document to fulfill the NEPA requirements for future implementation of these restoration proposals. Once the final restoration plans are completed, the project(s) will be reviewed for consistency with the analysis provided in this document. If consistent, no further actions related to NEPA will be necessary. Future restoration projects will however be required to comply with the requirements of the Clean Water Act, the Endangered Species Act, Section 106 of the Historic Preservation Act, and the Coastal Management Act.

| Table 2-3<br>Habitat Restoration Proposals for Alternative B | | |
|---|---|---|
| **Area** | **Area (acres)** | **Habitat to be Restored** |
| Northern portion of Case Road Pond site | 9 | Wetland/upland transition |
| Southern portion of Case Road Pond site | 12 | Intertidal salt marsh and mudflat |
| Easternmost island in the Case Road Pond | 1 | Wetland/upland transition |
| Triangle-shaped area to southeast of 7th Street Pond | 2 | Wetland/upland transition |
| Boomerang-shaped area to southeast of 7th Street Pond | 8 | Intertidal salt marsh and mudflat |
| Area at southwestern tip of 7th Street Pond and east of the drop tower | 2 | Intertidal salt marsh and mudflat |
| Strip of land to the west of 7th Street Pond and square area in vicinity of drop tower | 3 | Wetland/upland transition |

The upland areas to the north of Case Road Pond and to the southeast of 7th Street Pond were created in the 1920s when four to five feet of fill material was deposited into the historic marsh to create farmland. At present, these areas, as well as the upland area to the east of 7th Street Pond, are dominated by non-native, invasive upland plants. Restoration of these areas would involve the removal of fill material to achieve elevations supportive of type of habitat proposed for each site. The Case Road site, the area to the southeast of 7th Street Pond, and the area to the east of the drop tower would under this alternative be restored to a range of subtidal, intertidal mudflat, salt marsh, and wetland/upland transitional habitat, while the berm to the west of 7th Street and west of the drop tower would be restored to wetland/upland transitional habitat (refer to Figure 2-4). Conventional land excavators, motor graders, and dump trucks would be used to achieve the desired elevations, and excess material would be removed to an appropriate location either on or off the Refuge.

The salt marsh restoration sites near Case Road and 7th Street would be designed and constructed to include meandering subtidal channels that would extend from the existing edge of the subtidal habitat through the range of salt marsh zones (i.e., low, middle, high) that would be created. The channels would be constructed to include broad side slopes to support increased habitat diversity. Once the desired elevations have been achieved within the restoration sites, native plants appropriate to the range of elevations present at each site would be installed to supplement natural species recruitment. Areas proposed for wetland/upland transitional habitat would require the greatest density of installed plant material. To the extent practicable, cuttings and other vegetative matter, as well as plants sprouted from seeds collected within the Refuge's existing wetland habitats, would be used to vegetate the salt marsh and transition habitat areas.

Before salt marsh restoration could occur on the 7th Street sites, four inactive water monitoring wells would have to be removed from the area to the southeast of the pond, and the Navy would have to agree to have the small bunkers removed from the area located to the west of the pond. Elimination of the wells would involve removing the well casing to below the elevations of the future restoration project and then either filling the remaining well with sand and installing a concrete cap or filling the well entirely with concrete. Removal of the wells would require compliance with applicable County of Orange regulations. Removal of the bunkers would generate additional material for offsite disposal.

Restoration of the easternmost island in the Case Road Pond would involve the removal of the invasive weeds from the tops of the four highest mounds on the island and the installation of appropriate native wetland/upland transition species.

The installation of wetland/upland vegetation would begin in the fall when temperatures are cooler and the likelihood for precipitation is higher. The plant species to be installed would include alkali heath (*Frankenia grandifolia*), estuary seablite (*Suaeda esteroa*), alkali weed (*Cressa truxillensis*), salt grass (*Distichlis spicata*), sea lavender (*Limonium californicum*), and shore grass (*Monanthochloe littoralis*). Soil amendments and moisture gel packs would be provided when the plants are installed. If sufficient natural rainfall does not occur during the first three months after planting, additional moisture gel packs would be provided to ensure successful plant establishment.

In addition to the restoration sites described, other areas of upland on the Refuge, including areas located adjacent to pathways, along the edges of existing wetland areas, and beyond the shoulder of existing roadways would be planted with native upland species following invasive plant removal. This would reduce the potential for reinvasion of the area by non-native plants, expand habitat for native wildlife, and minimize the potential for erosion. A typical species list for such plantings would include: flat-top or California buckwheat (*Eriogonum fasciculatum*), California sagebrush (*Artemisia californica*), lemonade berry (*Rhus integrifolia*), broom baccharis (*Baccharis sarothroides*), coyote brush (*Baccharis pilularis*), California encelia (*Encelia californica*), white sage (*Salvia apiana*), and coastal goldenbush (*Isocoma menziesii*).

**Public Use Program**

No changes to the current public use program, as described under Alternative A, are proposed.

**Refuge Operations**

Under Alternative B, Refuge operations would include the construction of a maintenance storage building and new public restroom. These facilities would be constructed once funding is identified and the projects have been reviewed and approved by Naval Weapons Station Seal Beach. Both facilities would be constructed outside of the Refuge boundary adjacent to the existing Refuge Headquarters, located near the southwest corner of Kitts Highway and Bolsa Avenue (refer to Figure 2-3). This proposal does not require an expansion of the Refuge boundary. With Navy approval, these facilities can be constructed on Navy land and would be used to serve management and public use activities occurring on the adjacent Refuge. Additional details regarding these two facilities are provided here.

Maintenance Storage Building. Currently, most of the Refuge tools and equipment are stored is three small sheds located adjacent to the existing Refuge Headquarters. Due to the lack of adequate storage space, some tools and equipment are also being stored in outdoor areas located adjacent to the sheds. Refuge vehicles must be stored outdoors, where they are subject to wire damage from rodents and rabbits. Maintenance work must also be conducted outdoors. To address these storage and maintenance problems, this alternative proposes the construction of a maintenance storage building on disturbed land to the south of the Refuge Headquarters. The approximately 3,000-square-foot building would include three vehicle bays to house a gator, small riding mower, and two passenger vehicles. The building would also provide storage space for tools and equipment, a work area and small office for a maintenance worker, and a restroom facility with a shower.

Public Restroom Facility. The existing restroom facility in the Refuge Headquarters only has the capacity to accommodate one person at a time. This facility is woefully inadequate for meeting the needs of the public during monthly and special guided tours of the Refuge. To improve the visitor experience on the Refuge, this alternative includes a proposal to construction additional permanent male and female restrooms to accommodate the current need. This restroom facility, which would be constructed using green technologies to reduce water use and energy, would most likely be provided in a detached building placed on the north side of the Refuge Headquarters.

**Environmental Contaminants Coordination**

Environmental contaminants coordination would continue as described in Alternative A.

**Cultural Resource Management**

Although cultural resource management would continue to be implemented as described in Alternative A, this alternative also proposes to provide opportunities for archaeological and historical research on the Refuge. Potential research topics might include: the effects of changes in the paleoenvironment on prehistoric people in the area of the Refuge; the prehistoric occupation patterns on the Refuge's historic upland areas; the identification of Native American subsistence and settlement patterns in and around the Refuge; and coastal and inland trading patterns.

**Volunteers and Partners**

Support for the Friends of Seal Beach NWR and coordination with the Refuge's other partners, including Naval Weapons Station Seal Beach, would continue as described in Alternative A.

#### 2.4.3.3 Alternative C (Proposed Action) - Optimize Upland/Wetland Restoration, Improve Opportunities for Wildlife Observation

All of the management activities described in Alternative A, as well as the additional habitat and wildlife management actions described in Alternative B, with the exception of Alternative B's habitat restoration proposals, would also be implemented under Alternative C (Figure 2-5). The primary differences between Alternative B and Alternative C involve a few additional wildlife and habitat management actions; enhancement of light-footed clapper rail habitat; a greater focus on the restoration of upland and wetland/upland transition habitat; and the expansion of existing opportunities for wildlife observation.

**Wildlife and Habitat Management**

In addition to the actions described under Alternative B, the following additional actions would be implemented under Alternative C:

1. Management of Habitat to Support Tiger Beetles
   In addition to conducting directed surveys for tiger beetles, as proposed under Alternative B, Alternative C proposes to seek funding and/or partnerships that would facilitate the preparation and implementation of a tiger beetle management plan. This management plan would identify measures for protecting, maintaining, and if necessary, enhancing habitat to protect current tiger beetle abundance and diversity on the Refuge.

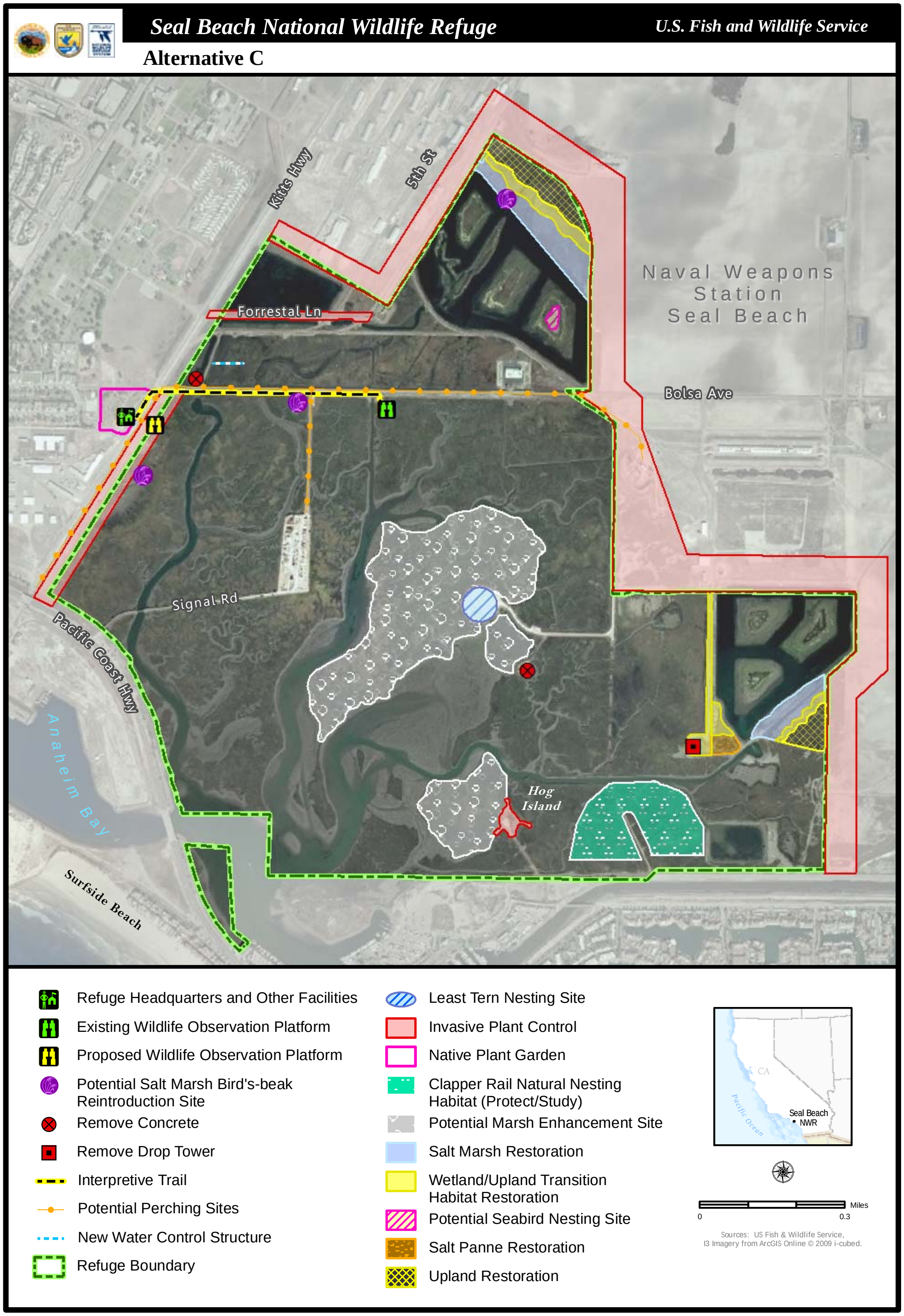


**Figure 2-5. Alternative C (Proposed Action) - Optimize Upland/Wetland Restoration, Improve Opportunities for Wildlife Observation**

2. <u>Establish Salt Marsh Bird's-Beak on the Refuge</u>
   As part of restoration planning for the Case Road Pond restoration site, potential sites for the establishment of one or more populations of the federally listed endangered plant, salt marsh bird's-beak, would be evaluated. <u>Following coordination with Naval Weapons Station Seal Beach's Environmental Programs and Services Office, i</u>f appropriate locations are identified within the restoration area, salt marsh bird's-beak seeds would be planted as part of the restoration project. Once the seeds are sown, the introduction sites would be monitored to document germination success and plant development. If seeding is successful and plants produce flowers and set seeds, the site would be monitored annually to record the size and quality of the population at each site. Other potential establishment sites, such as along the marsh to the east of Kitts Highway and the south of Bolsa Avenue and along the marsh edge on the south side of Bolsa Avenue in the vicinity of the interpretive trail, <u>would also be evaluated in coordination with the Navy, and if these sites are deemed appropriate for establishing this species, the same planting and monitoring process would be followed at these sites.</u>

3. <u>Enhancement of Light-footed Clapper Rail Habitat</u>
   Management of the light-footed clapper rail would be expanded to include an analysis of the extent to which the existing habitat quality within the salt marsh complex supports natural clapper rail nesting activities. Based on this analysis, strategies for improving habitat quality for nesting rails through the marsh complex would be developed, and as specific strategies are implemented, monitoring would be conducted to determine their effectiveness in supporting rail nesting and improving rail productivity. This proposal for enhancing light-footed clapper rail habitat would be further developed as part of a step-down habitat management plan for the Refuge.

   One proposal that would likely be evaluated as part of this step-down planning process is the pumping of sediment of appropriate grain size and nutrient content over a portion of the marsh (refer to Figure 2-4) to raise the elevation of the marsh plain in response to subsidence and sea level rise. Enough sediment would be distributed over the existing vegetation to provide for a slight increase in the elevation of the marsh plain, while still enabling the vegetation to grow up through the added sediment. Pre- and post-project monitoring would be conducted to identify any changes in cordgrass height and vitality, clapper rail use of the area for foraging, and clapper rail use of the area for nesting, as well as other factors.

4. <u>Removal of the Drop Tower</u>
   Under this alternative, the drop tower located at the end of 7th Street would be removed, and the area currently occupied by the tower would be restored to wetland/upland transition and native upland habitats, as described in subsequent text. Removal of the tower would eliminate a significant perching site for raptors and great blue herons, which have been documented preying on light-footed clapper rail and/or California least tern adults, chicks, and/or eggs.

5. <u>Habitat Restoration</u>
   As described under Alternative B, there are several opportunities for habitat restoration on the approximately 37 acres of disturbed upland habitat located within the Refuge boundary. These same areas would be restored under Alternative C, as illustrated in Figure 2-5, but the habitat proposals for these areas would provide a greater mix of upland and wetland/upland transition habitat than is proposed in Alternative B. The rational for emphasizing these higher elevation habitats in this

alternative is to address issues related to sea level rise. Much of the Refuge already supports low elevation salt marsh habitat, with relatively few areas available on the Refuge as high tide refugia for clapper rails and other marsh-dependent avian species. To ensure some areas of upland and upland/wetland transition at the edges of the marsh in the future, not all of the area available for wetland restoration would be used for that purpose under this alternative. The acres of each proposed habitat type per restoration site are provided in Table 2-4.

**Table 2-4**
**Habitat Restoration Proposals for Alternative C**

| Area | Area (acres) | Habitat to be Restored |
|---|---|---|
| Northern portion of Case Road Pond site | 8 | Upland (coastal sage scrub) |
| Middle portion of Case Road Pond site | 4 | Wetland/upland transition |
| Southern portion of Case Road Pond site | 10 | Intertidal salt marsh and mudflat |
| Easternmost island in the Case Road Pond | 1 | Seabird nesting site |
| Northern portion of area to southeast of 7th Street Pond | 5 | Intertidal salt marsh and mudflat |
| Middle portion of area to southeast of 7th Street Pond | 1 | Wetland/upland transition |
| Southern portion of area to southeast of 7th Street Pond, and square area where the drop tower is currently located | 3 | Upland (coastal sage scrub) |
| Northern portion of area at southwestern tip of 7th Street Pond | 1 | Wetland/upland transition |
| Southern portion of area at southwestern tip of 7th Street Pond | 1 | Salt pan habitat |
| Strip of land to the west of 7th Street Pond | 3 | Combination of wetland/upland transition and upland (coastal sage scrub) |

The Case Road Pond site and the area to the southeast of 7th Street Pond would be restored to a range of habitats, including intertidal mudflat, salt marsh, wetland/upland transitional, and coastal sage scrub. The intertidal habitats (i.e., mudflat, salt marsh) would include meandering shallow subtidal channels with gentle side slopes to provide a diversity of microhabitats. A disturbed strip of land to the west of 7th Street, an area at the southwestern end of the 7th Street Pond, and a portion of the area around the existing drop tower would be restored to wetland/upland transitional habitat. The area located to the east of the drop tower would be restored to salt pan habitat, and as discussed in Alternative B, the inactive monitoring wells in the vicinity of 7th Street and the bunkers to the west of 7th Street Pond would be removed prior to restoration.

These restoration proposals could be implemented under one project proposal, or the restoration could be phased over a number of years. The extent and timing of when various restoration proposals are implemented would be dependent upon the level of funding that is secured to implement restoration. The overall cost of implementing the restoration proposals would be lower if all of the sites could be restored as part of single project, but this option may not be feasible based on the limited availability of funding sources for restoration.

Conventional land excavators, motor graders, and dump trucks would be used to achieve the desired elevations and excess material would be removed to an appropriate offsite location. The restoration proposals in Alternative C include 11 acres of restored coastal sage scrub. Little, if any, earthwork would be required to prepare these areas for restoration. All of the restoration proposals in Alternative B would require some level of earthwork, with the greatest volume of cut occurring in areas proposed for intertidal salt marsh and mudflat habitat. As a result, the amount of grading necessary to implement Alternative C would be considerably less that that required for Alternative B. The specific details regarding volumes of cut and fill and overall site design and grading would be provided during the preparation of preliminary and final restoration plans and construction specifications.

Once grading has been completed and the desired elevations have been achieved, native plants appropriate to the range of elevations present at each site would be installed to supplement natural species recruitment. Areas proposed for wetland/upland transitional and coastal sage scrub would require the greatest density of installed plant material. Wetland/upland transitional habitat and coastal sage scrub habitat would be planted in the fall when temperatures are cooler and the likelihood for precipitation is higher. The native wetland/upland transitional vegetation would consist of species such as alkali heath, estuary seablite, alkali weed, salt grass, sea lavender, and shore grass. The primary components of the coastal sage scrub habitat would include flat-top or California buckwheat, California sagebrush, lemonade berry, coyote brush, coast sunflower, white sage, and coastal goldenbush. Soil amendments and a moisture gel packs would be used as described under Alternative B.

Under this alternative, the non-native vegetation on the four highest mounds of the easternmost island in Case Road Pond would be removed and the sites topped with clean sand suitable for nesting by ground nesting seabirds such as Forster's terns (*Sterna forsteri*) and black skimmers (*Rhynchops niger*).

Also, as described under Alternative B, other areas of upland adjacent to pathways, along the edges of existing wetland areas, and beyond the shoulder of existing roadways would be planted with native upland species following invasive plant removal.

6. <u>Integrated Pest Management</u>
   The IPM Plan proposed under Alternative B would also be implemented under Alternative C.

7. <u>Mosquito Management</u>
   <u>Mosquito management under Alternative C would be conducted just as described in Alternative B, except that under Alternative C, the use of the larvicide Natular would not be permitted for use on the Refuge.</u>

**<u>Public Use Program</u>**

Alternative C proposes to expand the existing visitor services opportunities on the Refuge. The current monthly tours and special tours would continue to be provided in coordination with Naval Weapons Station Seal Beach, as would on- and off-Refuge environmental education activities. This alternative also proposes to work with Naval Weapons Station Seal Beach to increase public access onto the Refuge for wildlife observation and environmental education purposes. In addition, in partnership with the Naval Weapons Station Seal Beach, funding would be sought to design and construct a two-level, 20-foot-high observation tower along the east side of Kitts Highway across from the Refuge Headquarters.

Under this alternative, the Refuge, together with Naval Weapons Station Seal Beach, would also increase the promotion of opportunities for environmental education and connecting people with nature on the Refuge by supporting requests for visits to the Refuge by educational institutions, non-governmental organizations, and archaeological/historical societies.

**Refuge Operations**

In addition to the actions addressed under Alternative B, this alternative proposes to expand on-site Refuge staff, which currently consists of a full-time Refuge Manager and a part-time maintenance worker, to also include a full-time Wildlife Biologist.

**Coordination with Naval Weapons Station Seal Beach**

Coordination with Naval Weapons Station Seal Beach would continue as described in Alternative A.

**Environmental Contaminants Coordination**

Environmental contaminants coordination would continue to be implemented as described in Alternative A.

**Cultural Resource Management**

Cultural resource management would be implemented as described in Alternative B.

**Volunteers and Partners**

Support for the Friends of Seal Beach NWR would continue as described in Alternative A, and coordination with the Refuge's other partners, including Naval Weapons Station Seal Beach, would continue to be an important Refuge strategy.

### 2.4.4 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 Refuge goals were considered but not selected for detailed study. Those alternatives that were eliminated from detailed study are as follows:

**Expand the Number of California Least Tern Nesting Sites within the Refuge**

The potential for providing additional locations on the Refuge to support nesting least terns was given considerable thought by the planning team and was discussed with other interested parties during our Habitat and Wildlife Management Review. The general consensus was that the existing least tern site on the Refuge has adequate capacity to support additional pairs of terns, and there is currently no need for an additional site on the Refuge. Adding another site would require splitting time spent by predator management and monitoring personnel between the existing site and the new site, which could result in reduced protection for nesting birds at both locations. Based on these factors, identifying additional least tern nesting sites on the Refuge was eliminated from detailed study.

**Expand the Refuge Boundary to Include the Los Cerritos Wetlands**

During the public comment period, the suggestion was made that the Los Cerritos Wetlands, located approximately one mile to the northwest of the Refuge, be incorporated into the boundaries of the Seal Beach NWR. These wetlands are currently overseen by the Los Cerritos Wetlands Authority, a joint powers authority of the City of Long Beach, City of Seal Beach, State Coastal Conservancy, and the Rivers and Mountains Conservancy. The purpose of the Authority is to provide for a comprehensive program of acquisition, protection, conservation, restoration, maintenance and operation and environmental enhancement of the Los Cerritos Wetlands area consistent with the goals of flood protection, habitat protection and restoration, and improved water supply, water quality, groundwater recharge and water conservation. The Authority has the ability to acquire and own real property and to conduct and implement restoration planning.

Including the Los Cerritos Wetlands within the management responsibilities of the Seal Beach NWR was determined to be outside the scope of the purposes for which the Seal Beach NWR was established. Additionally, these wetlands, which are not contiguous with Anaheim Bay, are currently being managed by a Joint Powers Authority (JPA), consisting of local, State, and a non-governmental agency. This JPA has been established for the specific purpose of overseeing the comprehensive conservation of these wetlands.

**Include Oil Island into the Refuge Following Termination of Oil Production Activities**

Several proposals were initially considered for the reuse of Oil Island once oil production ceases at this site. However, after further review, the reuse of Oil Island is not currently a viable option based on the operator's current agreement with the Navy. This agreement requires that Oil Island be removed and salt marsh habitat to be restored when oil production ceases at this location. Any proposal to do something other than restore salt marsh habitat at this site would require a full evaluation of alternatives, appropriate NEPA documentation, and potential permits from various State and/or Federal agencies.

**Improve Public Access onto the Refuge**

A number of comments were received during the scoping process related to improving the public's ability to gain access onto the Refuge. Some proposals sought to reduce the restrictions for access onto the Refuge through Naval Weapons Station Seal Beach, while others suggested creating a new access point that would allow direct access onto the Refuge from adjacent properties to the southeast. These proposals were considered but eliminated from further analysis because these access proposals would have conflicted with the mission of Naval Weapons Station Seal Beach.

### 2.4.5 Comparison of Alternatives by Issue

Table 2-5 presents an issue-by-issue comparison of the three management alternatives described in this chapter for the Seal Beach NWR.

| Table 2-5<br>Comparison of Alternatives for the Seal Beach NWR CCP | | | |
|---|---|---|---|
| **Issue Raised During Scoping** | **Alternative A (No Action)** | **Alternative B (Maximize Salt Marsh Restoration, Continue Current Public Uses)** | **Alternative C – Preferred Alternative (Optimize Upland/Wetland Restoration, Improve Opportunities for Wildlife Observation)** |
| ***Wildlife and Habitat Management*** | | | |
| **Expand nesting habitat for the California least tern on the Refuge** | Expansion of least tern nesting habitat is not proposed. Instead, continue to support and maintain the current least tern nesting site on NASA Island | Same as Alternative A | Same as Alternative A |
| **Increase the overall population of light-footed clapper rails on the Refuge** | Continue to implement predator management; conduct monitoring; maintain nesting platforms; and occasionally release captive-bred rails into the marsh | Same as Alternative A, as well as protect and study the Refuge's natural rail nesting areas to better understand the conditions and then manage for these conditions elsewhere on the Refuge; work with partners to improve the design of clapper rail nesting platforms, all in an effort to increase fledgling success | Same as Alternative B, as well as study the potential for improving the habitat quality of the Refuge's cordgrass habitat for nesting rails |
| **Reduce the potential for avian predation of least terns and light-footed clapper rails** | Continue to implement the predator management actions included in the approved Endangered Species Management and Protection Plan (USFWS and Navy 1991) | Same as Alternative A, as well as coordinate with Naval Weapons Station Seal Beach (NWSSB) to eliminate potential perching sites on power poles and other structures on and around the Refuge | Same as Alternative B, as well as remove the drop tower near the 7th Street Pond that provides perching for raptors and great blue herons |

| Table 2-5<br>Comparison of Alternatives for the Seal Beach NWR CCP | | | |
|---|---|---|---|
| **Issue Raised During Scoping** | **Alternative A<br>(No Action)** | **Alternative B<br>(Maximize Salt Marsh Restoration, Continue Current Public Uses)** | **Alternative C – Preferred Alternative<br>(Optimize Upland/Wetland Restoration, Improve Opportunities for Wildlife Observation)** |
| **Establish salt marsh bird's-beak on the Refuge** | No plans to establish salt marsh bird's-beak on the Refuge | No plans to establish salt marsh bird's-beak on the Refuge | Identify appropriate locations on the Refuge for establishing salt marsh bird's-beak, sow seeds, and monitor plant establishment |
| **Expand the acreage available for seabird nesting on the Refuge** | Continue to maintain NASA Island as a California least tern nesting site | Same as Alternative A | Provide 0.6 acre of seabird nesting habitat on the easternmost island in Case Road Pond |
| **Manage appropriate habitats on the Refuge to support tiger beetles** | No active management for tiger beetles on the Refuge | Establish baseline data for tiger beetle diversity and abundance on the Refuge | Same as Alternative B, as well as implement, as appropriate, tiger beetle habitat management |
| **Address the effects of climate change and sea level rise on habitat quality** | No actions are currently being implemented to address climate change or sea level rise | Monitor sea level rise, changes in habitat quality and species composition over time; and evaluate potential actions to address these changes | Same as Alternative B |
| **Address issues related to wind/water erosion in restored wetland areas** | Continue to maintain existing culverts and areas with existing slope protection | Same as Alternative A, as well as monitor, record, and photo-document ongoing changes and develop methods for reducing erosion as appropriate | Same as Alternative B |
| **Expand Refuge boundary to include Los Cerritos Wetlands** | Current refuge management does not include the Los Cerritos Wetlands | Expansion of refuge management to include the Los Cerritos Wetlands is not proposed | Same as Alternative B |

| Table 2-5<br>Comparison of Alternatives for the Seal Beach NWR CCP | | | |
|---|---|---|---|
| **Issue Raised During Scoping** | **Alternative A (No Action)** | **Alternative B (Maximize Salt Marsh Restoration, Continue Current Public Uses)** | **Alternative C – Preferred Alternative (Optimize Upland/Wetland Restoration, Improve Opportunities for Wildlife Observation)** |
| ***Habitat Restoration*** | | | |
| **Restore upland habitat to expand the Refuge's native habitat diversity** | Continue to control invasive plant species on the upland areas within the Refuge, as well as install native plants following invasive plant control to prevent reinvasion of nonnative species | Same as Alternative A, as well as work with the Navy to expand invasive plant control to include NWSSB lands adjacent to the Refuge; expand invasive species control on the Refuge and plant appropriate upland species to prevent reinvasion of nonnative plants | Same as Alternative B, as well as restore 11 acres of coastal sage scrub habitat on the Refuge, including 8 acres north of Case Road Pond and 3 acres southeast of the 7th Street Pond |
| **Expand wetland habitat on the Refuge** | Continue to manage the ±950 acres of coastal wetlands within the Refuge boundary to support fish, birds, and other marine organisms | Restore 22 acres of intertidal habitat (i.e., 12 acres to the north of Case Road Pond, 8 acres to the southeast of 7th Street Pond, 2.4 acres to the southwest of 7th Street Pond) and an additional 15 acres of wetland/upland transition habitat throughout the restoration areas to support coastal-dependent species | Restore 14 acres of intertidal habitat (i.e., 10 acres north of Case Road Pond, 5 acres to the southeast of 7th Street Pond) and 10 acres of wetland/upland transition habitat throughout the restoration areas to support coastal dependent species |
| ***Public Use*** | | | |
| **Provide the public with opportunities to enjoy the resources preserved on the Refuge** | Continue to provide monthly public tours of the Refuge, as well as special tours and other special events | Same as Alternative A | Same as Alternative A, as well as work with NWSSB to increase the number of opportunities available annually for wildlife observation and environmental education purposes |

| Table 2-5<br>Comparison of Alternatives for the Seal Beach NWR CCP | | | |
|---|---|---|---|
| **Issue Raised During Scoping** | **Alternative A (No Action)** | **Alternative B (Maximize Salt Marsh Restoration, Continue Current Public Uses)** | **Alternative C – Preferred Alternative (Optimize Upland/Wetland Restoration, Improve Opportunities for Wildlife Observation)** |
| **Construct new facilities to improve opportunities for wildlife observation** | Current opportunities for wildlife observation are provided along the interpretive trail that extends from the Refuge office/visitor contact station to the observation deck on Bolsa Avenue | Same as Alternative A | Same as Alternative A, as well as partner with the NWSSB to construct an elevated observation deck along the east side of Kitts Highway across from the Refuge office/visitor contact station |
| **Support environmental education** | Continue to support the Friends in their efforts to implement on- and off-refuge environmental education programs | Same as Alternative A | Same as Alternative A |
| **Improve the public's ability to access the Refuge** | Continue to work with the NWSSB to accommodate opportunities for the public to access the Refuge when accompanied by Refuge or NWSSB personnel | Same as Alternative A | Same as Alternative A |
| ***Refuge Operations*** | | | |
| **Provide adequate funding/staffing to achieve Refuge goals** | Continue current staff levels and provide support and encouragement for the Friends of Seal Beach NWR | Same as Alternative A | Expand on-site Refuge staff by adding a full time Wildlife Biologist |

| Table 2-5<br>Comparison of Alternatives for the Seal Beach NWR CCP | | | |
|---|---|---|---|
| **Issue Raised During Scoping** | **Alternative A (No Action)** | **Alternative B (Maximize Salt Marsh Restoration, Continue Current Public Uses)** | **Alternative C – Preferred Alternative (Optimize Upland/Wetland Restoration, Improve Opportunities for Wildlife Observation)** |
| ***Research*** | | | |
| **Encourage research that will benefit Refuge resources and future Refuge management** | Continue to support research on the Refuge that benefits Refuge management while taking into consideration potential endangered species impacts and Navy access restrictions | Identify needed areas for research and possible associated studies that benefit Refuge management and resources and are consistent with Refuge purposes and the mission of the NWRS | Same as Alternative B |

# 3 Affected Environment

Relevant information regarding the affected environment in and around the Seal Beach National Wildlife Refuge is provided in Chapter 4 of the Final CCP.

# 4 Environmental Consequences

## 4.1 Introduction

This chapter provides an analysis and evaluation of the environmental consequences of implementing the alternatives described in Chapter 2 of this EA. Impact evaluation has been conducted for each aspect of the environments described in Chapter 4 of the Final CCP (the Refuge's physical, biological, cultural, and socioeconomic setting). The adverse and beneficial effects of each alternative are generally described under two main action categories: Wildlife and Habitat Management (including habitat enhancement and restoration) and Public Use. Cumulative effects on the environment of implementing the three alternatives are presented in Section 4.9.

## 4.2 Effects to the Physical Environment

Topics addressed under the physical environment section of this document include direct and indirect effects to topography, visual quality, geology and soils, mineral resources, agricultural resources, hydrology and water quality, climate change and sea level rise, air quality, and greenhouse gas emissions.

The criteria used in this document to determine if a particular impact represents a significant adverse effect are presented 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 such as the Pacific Ocean or Anaheim Bay.

- <u>Geology/Soils</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>Mineral Resources</u> – Impacts to mineral resources would be considered significant if a proposed action could result in the loss of availability of a known mineral resource that would be of value to the region.

- <u>Agricultural Resources</u> – A significant adverse effect on agricultural resources would occur if a proposed Refuge action would impact adjacent Prime Farmland or cause the conversion of Prime Farmland to non-agricultural uses.

- Hydrology – An adverse hydrologic effect is considered significant if an action would result in increased storm and/or tidal flooding on- or off-site, a net deficit in the aquifer volume, a drop in the local groundwater table, or changes in tidal circulation that would trigger or accelerate slope/bank instability or erosion affecting facilities located both on and off the Refuge.

- Water Quality – 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 adjacent tidal waters, introduce contaminants (nonpoint source pollution) into the watershed, or otherwise substantially degrade water quality.

- Climate Change/Sea Level Rise – Although the proposals described in this document would have no influence over climate change or sea level rise, changing conditions associated with climate change and sea level rise could adversely affect Refuge resources or influence future Refuge management. The predicted effects of climate change and/or sea level rise could be significant if these effects would substantially alter or degrade sensitive habitats that support listed species, migratory birds, or other species of concern. In addition, effects of climate change and/or sea level rise would be considered significant if Refuge property, such as structures, trails, roads, signage, and other facilities, could be damaged or destroyed as a result of changing site conditions, including increasingly severe weather conditions.

- Air Quality – 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 National Ambient Air Quality Standards (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. Significant cumulative effects would occur if the "de minimis" (minimum) thresholds developed by the EPA for proposed Federal actions in a non-attainment area are exceeded.

- Greenhouse Gas Emissions – The Service has not developed a quantitative threshold for determining whether a project's greenhouse gas (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 a quantitative evaluation of the effects of the action's GHG emissions on the environment, including an estimate of the expected GHG emissions, and the extent to which efforts are made to reduce expected emissions.

- Contaminants – Adverse effects related to contaminants are considered significant when constituents of concern are present in the soil, groundwater, or surface water at levels that exceed standard screening levels for assessing ecological risk.

## 4.2.1 Alternative A – No Action

### 4.2.1.1 Effects to Topography/Visual Quality

**Wildlife and Habitat Management**

Conducting the wildlife and habitat management activities currently occurring on the Refuge, including monitoring of listed endangered and threatened avian species; management of NASA Island to support least tern nesting; trash and debris removal, culvert management, scientific research, and predator management would not result in adverse effects to topography.

Annual pre-nesting site preparation for the California least tern involves removing weedy vegetation from the NASA Island nesting site and improving substrate quality when necessary by spreading additional clean, light sand and shell fragments over some or all of the site; and addressing any erosion problems around the outer edges of the nesting site. The continuation of these types of actions would result in negligible changes to the topography within the nesting site; therefore, no adverse effects related to topography would occur.

Current Refuge wildlife and habitat management activities that could affect visual quality include the removal of weeds, repair to subsurface culverts, removal of trash and debris, installation of clapper rail nesting platforms, and yearly maintenance at the NASA Island California least tern nesting site. While some of these activities, including vegetation removal associated with culvert maintenance and control of invasive species, 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 construction, affected areas are replaced with appropriate native vegetation and areas where invasive species are controlled are replanted with native upland species. These actions serve to mitigate temporary changes in the visual character of the site. Therefore, continuation of these management activities would not result in significant adverse effects to visual quality. Some minor beneficial effects would be expected as a result of trash and debris removal and the replacement of weedy species with native plants.

**Public Use**

No changes to the existing topography within the Refuge occur as a result of conducting the existing limited public use program on the Refuge; therefore, no impacts to topography related to public use would occur under this alternative.

The facilities provided on the Refuge to accommodate public use include a pedestrian pathway along the south side of Bolsa Avenue east of Kitts Highway, an observation deck at the end of the pathway, low interpretive signage along the pathway and at the deck, and a kiosk to the north of the Refuge office/visitor contact station. None of these facilities block views of the Refuge, nor do they create any significant adverse effect to the visual quality of the Refuge.

### 4.2.1.2 Effects to Geology/Soils

**Wildlife and Habitat Management**

None of the wildlife and habitat management activities currently occurring on the Refuge 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. Therefore, no adverse effects related to geology or soils are anticipated under this alternative.

**Public Use**

Existing soil and geological conditions on the site do not pose a hazard, nor do these conditions adversely affect the function of the pathway that provides access for the public from the Refuge office/visitor contact station to the observation deck or the observation deck itself. Therefore, the facilities used in association with the existing public use program would not be impacted as a result of the geological or soil conditions on the Refuge.

#### 4.2.1.3 Effects on Mineral Resources

Continuing current management practices and public use programs on the Refuge would have no effect on the ongoing oil extraction operation at Oil Island.

#### 4.2.1.4 Effects to Agricultural Resources

**Wildlife and Habitat Management**

Lands identified as Prime Farmland occur immediately adjacent to the Refuge, and these lands are currently being farmed under the authority of the U.S. Navy. The continuation of wildlife and habitat management activities and public use programs currently occurring on the Refuge would have no effect on these ongoing farming operations. No effects to adjacent agricultural resources are therefore anticipated under Alternative A.

#### 4.2.1.5 Effects to Hydrology

**Wildlife and Habitat Management**

The primary management activities occurring on the Refuge that could have an effect on the hydrology in and around the Refuge involves the repair and replacement of existing culverts that facilitate tidal flows in and out of the restored wetland areas on the Refuge. These repairs are intended to maintain, and in some cases restore, tidal circulation between the main marsh complex and the restored subtidal areas of Forrestal, Case Road, 7th Street, and Perimeter Ponds, as well as improve tidal circulation within the marsh to levels that existed prior to culvert deterioration. The activities would not result in any significant adverse changes to the hydrological conditions within the Refuge. As described in Chapter 4 of the Final CCP, erosion resulting from tidal action and wind waves, along with other factors, is occurring along the banks of Forrestal Pond, Case Road Pond, and the mitigation channel to the west of the Bolsa Cell. No actions are proposed under Alternative A to address this issue; therefore, erosion of the banks would be expected to continue under this alternative.

**Public Use**

The existing public use program does not involve any activities that would impact hydrology within or outside of the Refuge; therefore, there would be no effect to hydrology from the continuation of the existing public use program on the Refuge.

#### 4.2.1.6 Effects to Water Quality

**Wildlife and Habitat Management**

Best Management Practices (BMPs) are currently implemented by Refuge staff as necessary during culvert maintenance activities to minimize erosion and sedimentation into adjacent wetlands. These BMPs (e.g., fiber rolls, silt fencing, cofferdams) are implemented during repairs to culverts, as well as other maintenance activities occurring in areas upstream or adjacent to the marsh. The continued implementation of these types of measures would minimize or avoid water quality impacts to the coastal wetlands on the Refuge, as well as the adjacent Anaheim Bay. Monitoring and clean-up of environmental contaminants on the Refuge would continue to be directed by Naval Weapons Station Seal Beach and 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.

**Pest Management**

The control of invasive plant species on the Refuge involves mechanical removal and the periodic application of herbicides, particularly in the disturbed upland areas that border the marsh. 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 focus 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.

Section 569 FW1 of the Service Manual requires that before any insecticide, herbicide, fungicide, or other pesticide can be used on a Refuge, a pesticide use proposal (PUP) must be prepared and approved for use. The Service uses this formal pesticide use review process 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. All PUPs, which are stored in the Pesticide Use Proposal System (PUPS), identify specific pesticides, such as herbicides and mosquito control products, proposed for use on a Refuge, as well as details on target pests, products applied, application dates, rates, methods, number of applications, site description, sensitive habitats, and best management practices 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 currently approved for use on the Seal Beach NWR are described in Chapter 3 of the Final CCP.

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 are considered minimal due to the types, limited quantities, and use restrictions that have been established for each herbicide used on the Refuge. In all cases, the application of a pesticide product must be conducted in accordance with the specifications on the product label. Further, through the PUPs review process, as described in Appendix G of the Final CCP, each product to be used on the Refuge, as well as the proposed application quantities and proposed number of applications per season is reviewed to ensure that no adverse effects to Refuge resources, including water resources, will occur as a result of the application of a particular product. When necessary to ensure adequate protection for sensitive resources, application amounts or the number of applications per season are reduced and/or buffer areas are established to adequately separate sensitive habitat areas from treated areas.

Aquamaster and Glyphosate Pro 4, both with the active ingredient glyphosate, are used on the Refuge to control post-emergent invasive plants. Aquamaster is permitted for use adjacent to wetlands, while Glyphosate Pro 4 is permitted for use in upland areas. Although glyphosate is highly soluble in water, it is also strongly adsorbed to suspended organic and mineral matter, which greatly reduces the potential for groundwater contamination. There is, however, some risk of surface water contamination from aquatic use of this product, as well as the risk of short-term impacts to water quality should soil from treated areas erode into adjacent wetlands. To minimize the potential for impacts to water quality as a result of applying glyphosate on the Refuge, Glyphosate Pro 4 is only used in terrestrial environments and is not applied if rain is predicted within 24 hours of proposed application. In addition, a buffer area between all treated areas and sensitive habitats, particularly wetlands, is maintained during the application of Aquamaster.

Surflan AS, with the active ingredient oryzalin, is soluble in water and does not have a strong tendency to adsorb to soil particles. It leaches downward to a limited extent with rainfall and has a moderate potential to contaminate groundwater. To minimize the potential for impacts to water quality, Surflan AS is only used in upland areas. The implementation of the following BMPs when using this product would further reduce the potential for water quality impacts: reduce the number of applications to one per year at an application rate of 1.5 pound of active ingredient per acre per year; maintain a minimum 25-foot buffer between all upland treatment site(s) and the high water mark of the nearest wetland area; and avoid the application of oryzalin to sites that are upslope of any surface water resources when the slope gradient is greater than 17 percent.

Sunlight breaks down imazapyr, the active ingredient in Habitat, very quickly in water. This product is considered a reduced risk herbicide that is permitted for use in uplands, riparian and aquatic habitats. It is used on the Refuge primarily for control of invasive, terrestrial plants and no impacts to water quality from the use of this product are anticipated.

Under Alternative A, mosquito monitoring and control would continue to be conducted by Orange County Vector Control District (OCVCD). Monitoring and surveillance activities would not affect water quality because this work is conducted by driving on existing roads and walking where no roads are present. As a result, there is limited potential for ground disturbance that could result in siltation or erosion of soils into adjacent wetland areas. In addition, no contaminants would be introduced into the Refuge's wetlands as a result of this activity.

The application of pesticides on the Refuge to control mosquitoes could affect water resources, because pesticide application to control mosquitoes occurs in an aquatic environment, specifically coastal salt marsh habitat. The products currently being used on the Refuge include Altosid Briquets and Altosid Pellets WSP, with the active ingredient methoprene; VectoBac 12AS and VectoBac G, both with the active ingredient *Bacillus thuringiensis israelensis;* and VectoLex WDG, with the active ingredient *Bacillus sphaericus*.

According to the Ninth Circuit Court (Headwaters, Inc. v. Talent Irrigation District (9th Cir. 2001) 243 F.3d 526), aquatic pesticides that are applied to waters of the United States in accordance with Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) label requirements are not considered pollutants; however, pesticides or by-products that persist in or leave the area of treatment after a specified treatment period are considered pollutants and require coverage under a National Pollutant Discharge Elimination System (NPDES) Permit. Currently, aquatic pesticides applied to surface waters of the United States for vector control are covered in California under NPDES General Permit No. CAG990004. Each discharger seeking coverage under this General Permit is required to submit a Monitoring Plan for approval by the appropriate Regional Water Quality Control Board (RWQCB) and must implement the monitoring plan as approved. The OCVCD has coverage under this General Permit.

The U.S. Environmental Protection Agency (USEPA) and California Department of Pesticide Regulation require that aquatic pesticides undergo toxicity testing and meet specific toxicity requirements before registering the pesticide for application to surface waters. USEPA has found that the application of properly registered aquatic pesticides pose a minimum threat to people and the environment. Additionally, the effects of these pesticides on water quality will be mitigated through compliance with FIFRA label requirements, and monitoring.

To mitigate potential effects to water quality resulting from pesticide applications, the NPDES General Permit requires that dischargers implement BMPs when conducting aquatic vector control programs. Dischargers are required to consider feasible alternatives to applying selected aquatic pesticides if the alternatives would reduce potential water quality impacts. If alternatives are identified that could reduce potential water quality impacts and they are also feasible, practicable, and cost-effective, the discharger is required to implement the identified alternative measures. One effective BMP identified in the General Permit is the use of non-toxic and less toxic controls. These include larvicides with very low toxicity that pose very little or no threat to the environment. USEPA has concluded that microbial larvicides (e.g., Bacillus thuringiensis israelensis, Bacillus sphaericus) do not pose risks to the environment; and methoprene, as used in vector control programs, does not pose unreasonable risks to the environment (California State Water Resources Board 2004). Therefore, the current vector control practices being conducted on the Refuge are not expected to result in any adverse effects to water quality.

**Public Use**

The pathway that provides access for the public from the Refuge office/visitor contact station to the observation deck consists of decomposed granite installed along a relatively flat surface. No signs of erosion along the pathway are evident and the pathway continues to provide a firm and stable surface, therefore, the continuation of the public use program currently conducted on the Refuge would have little, if any, effect to water quality in the adjacent wetlands.

#### 4.2.1.7 Effects from Climate Change/Sea Level Rise

**Overview**

Climate change, especially sea level rise, will significantly alter the existing conditions on the coast, making coastal intertidal habitats, including the salt marsh habitat protected within the Seal Beach NWR, some of the most at risk habitats in the world. As sea level rises, intertidal mudflats and salt marsh habitat will be converted to subtidal habitat. In addition, decreases in precipitation could adversely affect the health of the remaining cordgrass and other salt marsh vegetation that depends on some seasonal freshwater input to promote plant vigor.

Although global sea level rise is well documented, as described in Chapter 4 of the Final CCP, there are currently no clear answers regarding how fast and to what extent sea level rise will impact these existing habitats. This makes it difficult to establish specific long-term management strategies for protecting this important habitat. We must instead rely on adaptive management to help us identify measures to insure that coastal intertidal habitat and the wildlife it supports can persist at some level as conditions change.

In an effort to better understand the potential effects of sea level rise on the habitat at the Seal Beach NWR, the Service contracted the application of the Sea Level Affecting Marshes Model (SLAMM) for the Refuge. SLAMM 5.0.1, which accounts for the dominant processes involved in wetland conversion and shoreline modifications during long-term sea level rise, predicts the changes in tidal marsh area and habitat type due to sea level rise (Park et al. 1989, www.warrenpinnacle.com/prof/SLAMM).

The primary set of global sea level rise scenarios used within SLAMM was derived from the work of the IPCC (IPCC 2001) and was run using the IPCC and fixed-rate scenarios presented in Table 4-1. These scenarios, which include new information related to assumptions of one meter and 1.5 meters of global sea level rise by the year 2100 (Chen et al. 2006, Monaghan et al. 2006), indicate that global sea level may be rising progressing more rapidly than was previously assumed. The A1B maximum (A1B Max) scenario incorporates the suggestion by Rahmstorf (2007) that a feasible range by 2100 might be 50 centimeters (cm) (19.7 inches) to 140 cm (55.1 inches).

The SLAMM analysis for the Seal Beach NWR also incorporated a number of other factors, including: digital elevation mapping derived from LIDAR and ifSAR data from 2003 and 1998, respectively; 2005 wetland boundary data from the National Wetlands Inventory; historic trends in sea level rise in the general vicinity of the Refuge; the approximate tidal range at the site; salt marsh accretion rates; and the assumption that all of the Refuge's tidally influenced habitats have unrestricted tidal flow (Clough and Larson 2008). The historic trend for sea level rise in the general vicinity of the Refuge was estimated at 1.5 mm/year (0.059 inches/year) using the average of the three closest stations (9410660, Los Angeles, California; 9410580, Newport Beach, California; 9410840, Santa Monica, California). There are no long-term sea level trend data available for the gage at Long Beach, California. The measured rate at this location is roughly equal to the global average for the last 100 years.

**Table 4-1**
**Scenarios Used to Run SLAMM 5**

| Scenario | Global SLR[1] by 2025 (cm) | Global SLR[1] by 2050 (cm) | Global SLR[1] by 2075 (cm) | Global SLR[1] by 2100 (cm) |
|---|---|---|---|---|
| A1B Mean | 8 | 17 | 28 | 39 |
| A1B Max | 14 | 30 | 49 | 69 |
| 1 meter | 13 | 28 | 48 | 100 |
| 1.5 meter | 18 | 41 | 70 | 150 |

[1] Sea Level Rise
Source: (Clough and Larson 2008)

The tide range at the Refuge was estimated at 1.67 meters using the average of the four closest National Oceanic and Atmospheric Administration (NOAA) oceanic gages (9410660, Los Angeles, California; 9410580, Newport Beach, California; 9410680, Long Beach, Terminal Island, California; 9410650, Cabrillo Beach, California). The United States Geological Survey (USGS) topographical map for this region suggests an approximate tidal range of four feet (1.22 meters) (Clough and Larson 2008).

The salt marsh accretion rate used in the model for this site was 2 millimeters (mm) per year (0.079 inches per year), which represents the low end of measured accretion rates for salt marsh. This rate was deemed appropriate because freshwater input into the marsh is extremely limited and subsidence has occurred in the area in the past. The rate of 2 mm per year does account for biogenic production and the possibility that increased sea level rise will deliver additional sediment to the Refuge (Clough and Larson 2008).

Although the results of the SLAMM for the Seal Beach NWR indicate that the Refuge would have differing degrees of vulnerability to sea level rise depending on the scenario of sea level rise analyzed, the results confirm that the Refuge will be adversely affected by sea level rise in all scenarios. Under the most conservative sea level rise scenario (A1B Mean), 0.39 meter (1.28 feet) by 2100, roughly one-quarter of the Refuge's salt marsh habitat would be converted to subtidal habitat. The amount of salt marsh acres lost to habitat conversion increases to two thirds under scenario A1B Max, a 0.69 meter (2.26 feet) rise by 2100, and nearly one hundred percent of the salt marsh habitat would be lost under scenarios that assume a rise of greater than one meter (3.28 feet). The small quantity of undeveloped dry land on the Refuge is predicted to be vulnerable under all scenarios run, while the developed dry land was assumed to be maintained and protected in this analysis (Clough and Larson 2008).

A review of results presented in Table 4-1 indicates that under the sea level rise scenario adopted by the California Coastal Conservancy Board (40 cm [16 inches] by 2050 and 140 cm [55 inches] by 2100), roughly one-quarter of the salt marsh habitat on the Refuge would be converted to subtidal habitat by 2050 and all of the salt marsh habitat and undeveloped upland areas would be converted to subtidal habitat by 2100.

**Wildlife and Habitat Management**

Under Alternative A, the Refuge would continue to be managed as it is today, with no specific actions being taken to address sea level rise. However, management actions such as the monitoring of the Refuge's light-footed clapper rail population and conducting monthly avian surveys could provide some insight into how sea level rise may be affecting wildlife resources on the Refuge.

Over the next 15 years, it is likely that the effects of sea level rise (e.g., higher high tide elevations, increases in the frequency of surface flooding due to higher high tides that occur during storm events) will become more evident. However, the effects of sea level rise over the next 15 years are not anticipated to adversely affect Refuge resources.

As time goes on, these effects are expected to become progressively more profound. Based on the results of the SLAMM, sea level rise over the next 25 to 100 years could inundate the cordgrass habitat on the Refuge, adversely impacting the light-footed clapper rail and the habitat that supports this species. In addition, the condition of existing culverts serving the restoration areas of the Refuge could be degraded as a result of increased tidal elevations. Wind and wave erosion would also be expected to increase along the slopes located adjacent to the restored area at the north end of the Refuge, as well as around the perimeter of NASA Island. Actions to address these impacts will be required at some point in the future, possibly requiring major revisions to the Refuge goals and objectives to address the changes associated with sea level rise.

**Public Use**

The SLAMM assumes that the developed dry land within the Refuge (e.g., areas supporting streets, buildings, and other facilities) would be maintained and protected; however, there are no assurances that this will in fact be the case. Bolsa Avenue, which includes a public use trail along its western edge, is already subject to tidal flooding during extreme high tides. The cost of protecting this road from more frequent inundation may be excessive and would likely be the responsibility of the Navy. Therefore, the trail, an existing observation deck, and interpretive signs that have been installed along the length of the trail would be subject to damage as a result of sea level rise. These effects are not anticipated to occur over the next 15 years, but are anticipated to occur at some point in the future. At such time as inundation becomes too frequent, these facilities would have to be abandoned or relocated. Monitoring of tidal elevations over time will provide insight into when plans should be initiated to address the removal and/or relocation of these existing facilities. Opportunities for wildlife observation, interpretation, and environmental education would continue to be available despite the effects of sea level rise. No new facilities are proposed under Alternative A; therefore, the anticipated impacts to the Refuge's public use facilities would be limited to those facilities that are already present on the Refuge.

#### 4.2.1.8 Effects to Air Quality

**Wildlife and Habitat Management**

Current wildlife and habitat management activities on the Refuge require the use of motorized vehicles for access to various project sites; to accommodate habitat and species monitoring; to deliver tools, supplies, and other equipment to habitat management sites; and for removing trash and debris from the marsh. The staff on the Refuge consists of one full-time Refuge Manager and a part-time maintenance worker, generating approximately 32 vehicle trips to and from the Refuge per week. Refuge volunteers who assist at the Refuge generate an estimated 20 additional trips per week. The sum of these activities contributes extremely low levels of air quality emissions and the pollutions generated as a result of these activities are considered negligible in the context of the larger air basin regulated by the South Coast Air Quality Management District.

**Pest Management**

Several pesticides are used on the Refuge, including herbicides to control invasive plants and insecticides, applied by OCVCD, to control mosquitoes. 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. Surflan AS, VectoBac 12AS, VectoBac G, and VectoLex WDG are considered non-volatile, while Altosid, Aquamaster, Glyphosate Pro 4, and Habitat are volatile. Because all of these products are used at such low volumes on the Refuge, even the volatile products quickly become diluted in the atmosphere, minimizing the effect on local air quality. The potential for adverse air quality impacts as a result of pesticide use is also lessen through compliance with all Federal, State, and local pesticide use laws and regulations, as well as Departmental, Service, and National Wildlife Refuge System (NWRS or Refuge System) pesticide-related policies. This includes compliance with the Federal Insecticide, Fungicide and Rodenticide Act of 1996 (FIFRA), which requires all pesticides to be applied at the rates and with the application equipment specified on the pesticide label. The use of herbicides on the Refuge also requires the implementation of BMPs developed as part of the PUP review process. These include restricting herbicide application to periods when wind speeds are less than 10 miles per hour and no inversion conditions exist.

Based on the analysis provided previously and the actions taken to minimize potential effects, the implementation of the habitat and pest management proposals included under Alternative A will not adversely affect air quality.

**Public Use**

The public use program currently conducted on the Refuge generates vehicular emissions as a result of visitors traveling to and from the Refuge for monthly tours and other special events. In addition, Service vans are used to transport visitors onto the Refuge from outlying parking areas. The total number of trips, if calculated on a per week basis, would total approximately 45 trips per week. In the context of the emissions generated throughout the air basin, these emissions are negligible. Therefore, continuation of the current public use program would not adversely affect air quality.

#### 4.2.1.9 Effects Related to Greenhouse Gas Emissions

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 23, 2010, the Council on Environmental Quality (CEQ) issued draft guidance on when and how Federal agencies should analyze the environmental effects of GHG emissions and climate change when they describe the environmental impacts of a proposed action under NEPA. As part of this draft guidance, CEQ proposes to advise Federal agencies to consider whether analysis of direct and indirect GHG emissions from a proposed action may provide meaningful information to decision makers and the public. CEQ is suggesting 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 annual volume 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.

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.

Activities that would occur on the Refuge under Alternative A that would emit GHGs include the use of vehicles by staff and volunteers to get to and from the Refuge, the use of vehicles by visitors to the Refuge, the use of motorized equipment to implement management actions, the occasional use of trucks to provide supplies to the Refuge, and the use of electricity for power and heat within the Refuge office. Quantifying the amount of GHG emissions generated from these types of uses is difficult; however, through the use of the USEPA's Greenhouse Gas Equivalencies Calculator (USEPA 2009), it is possible to get a general idea of the magnitude of the emission associated with such uses. To obtain an estimate the number of metric tons of $CO_2$ emissions that could be generated annually as a result of implementing Alternative A, we estimated the number of miles traveled by Refuge staff, visitors, and volunteers to get to and from the Refuge on an annual basis and then translated in gallons of gasoline consumed per year as a result of this travel. Based on data provided by the USEPA Calculator, approximately 42 metric tons of $CO_2$ emissions would be generated annually as a result of these trips. The operation of the Refuge office/visitor contact station requires approximately 14 kilowatt hours per month (168 kilowatt hours per year), which represents about 0.12 metric tons of $CO_2$ emissions per year (USEPA 2009). Based on these calculations, Alternative A would be expected to generate annual GHG emissions generally equivalent to the annual GHG emissions generated by eight passenger vehicles.

Another aspect of Alternative A is the proposal to protect and manage native habitats on the Refuge. The majority of the Refuge supports salt marsh habitat, which is considered very effective in removing carbon from the atmosphere and storing it in marsh soils (Chmura et al. 2003). Further, unlike freshwater marshes, tidal salt marshes release only negligible amounts of methane, a powerful greenhouse gas, so the overall benefits of carbon sequestration provided by salt marsh are great (Brevik and Homburg 2004).

In the absence of more specific guidance on how to determine a level of significance, we have compared the level of GHG emissions from this proposal to other types of GHG emission generators, as well as considered the carbon sequestration benefits of the salt marsh habitat present on the Refuge. Based on these factors, we have concluded that given the very low levels of GHG emissions that would result from the implementation of Alternative A, the GHG emissions from this project do not represent a significant direct or indirect impact on the environment.

#### 4.2.1.10 Effects Related to Contaminants

**Wildlife and Habitat Management**

Under Alternative A, the primary ground-disturbing activity that would continue to occur on the Refuge is the planting of native vegetation following invasive plant species control. This activity generally occurs in upland areas around the eastern perimeter of 7th Street Pond, on the outer edges of Hog Island, and other disturbed upland areas on the perimeter of the Refuge. Areas identified by the Navy through their Installation Restoration Program/Munitions Response Program that could contain contaminants related to past military activities are avoided to ensure no adverse effects related to contaminants.

Prior studies conducted on the Refuge by the Navy as part of their Installation Restoration program identified total petroleum hydrocarbon and chromium levels that exceeded State Water Resources Control Board designated levels to protect marine waters. Additionally, in 1995 a study was completed to assess the effects of operations at Naval Weapons Station Seal Beach on the biota of the Refuge's salt marsh habitat. This study focused on the potential bioaccumulation of chemicals in species that are primary food items of the California least tern and light-footed clapper rail. Although observed contaminant levels in primary food items did not warrant a concern for immediate remediation, levels were sufficient to potentially produce sublethal effects in the least tern and clapper rail. Because a major pathway for contaminants of concern, including cadmium, chromium, copper, lead, nickel, zinc, DDE, and polychlorinated biphenyl (PCB), are erosion and runoff from surrounding upland areas, the draft INRPM for Naval Weapons Station Seal Beach (U.S. Navy 2011) recommends further monitoring to assess bioaccumulation of chemicals in these species particularly in the northwest and southeast areas of the Refuge.

**Public Use**

No contaminants are known or expected to be present in areas used by the public as part of the public use programs currently conducted on the Refuge.

### 4.2.2 Alternative B – Maximize Salt Marsh Restoration, Continue Current Public Uses

Under Alternative B, the wildlife and habitat management activities described in Alternative A would be expanded to include additional activities intended to protect and aid in the recovery of the light-footed clapper rail and California least tern; to increase our understanding of the array of species present within the Refuge and their relationship with other species and existing habitats; to broaden our understanding of how the Refuge's trust resources are being affected by climate change and sea level rise; and to restore the remaining disturbed habitat areas on the Refuge to functional salt marsh and wetland/upland transition habitat. This alternative also includes the implementation of an Integrated Pest Management (IPM) Plan. No changes to the public use program described in Alternative A would occur under this alternative.

#### 4.2.2.1 Effects to Topography/Visual Quality

**Wildlife and Habitat Management**

Each of the management activities conducted under Alternative A would also occur under Alternative B. None of these would result in adverse effects to topography. In addition, Alternative B calls for restoration of salt marsh and wetland/upland transitional habitats in several locations around the Refuge. The proposed restoration sites include: approximately 20 acres of land located to the north of Case Road Pond; one acre on the eastern-most island in the Case Road Pond; 10 acres to the southeast of 7th Street Pond; and five to six acres located along the western edge of 7th Street Pond and around the existing drop tower at the southern end of 7th Street.

Restoration of the areas to the north of Case Road Pond and southeast of 7th Street Pond would involve the removal of fill material to achieve elevations supportive of the type of habitat proposed for each site. The Case Road site, the area to the southeast of 7th Street Pond, and the area to the east of the drop tower would be restored to a range of sub-tidal, intertidal mudflat, salt marsh, and wetland/upland transitional habitat, while the area to the west of 7th Street Pond and west of the drop tower would be restored to wetland/upland transitional habitat. Conventional land excavators, motor graders, and dump trucks would be used to achieve the desired elevations and excess material would be removed to an appropriate offsite location.

The salt marsh restoration sites near Case Road and 7th Street would be designed and constructed to include meandering subtidal swales that would extend from the existing edge of the subtidal habitat through the range of salt marsh zones (i.e., low, middle, and high) that would be created. The swales would be constructed to include broad side slopes to support increased habitat diversity.

The sum total of these proposed restoration efforts would be to change the topography and elevations on approximately 36 acres of the Refuge. These changes would not, however, be adverse, as they would not negatively modify a highly scenic area nor would they affect a locally or regionally important topographic landmark. Neither would the proposed grading substantially alter the existing landform by creating manufactured slopes higher than 10 feet or steeper than 2:1 (50 percent).

Alternative B calls for restoration of salt marsh and wetland/upland transitional habitats at several sites around the Refuge, the replacement of existing culverts in the Bolsa Cell with a new water control structure, and the removal of concrete and other debris from the marsh. At present, the restoration sites, as well as the upland area to the east of 7th Street Pond, are dominated by non-native, invasive upland plants. Conventional land excavators, motor graders, and dump trucks would be used to achieve the desired elevations in the restored areas. Excess material from the restoration site, as well as concrete and other debris removed from the marsh, would be removed to an appropriate offsite location using dump trucks. While grading activities in the restoration areas are underway, there would be temporary, minor adverse effects to visual quality. However, once grading has concluded and the sites have had the chance to be restored to native salt marsh and transitional habitats, visual quality would be improved over the present condition.

No substantive change in the appearance of the levee in the Bolsa Cell would result from the replacement of the existing culverts with a new water control structure, and removal of the 1,400 to 1,600 metric tons of concrete debris from the marsh would have a beneficial effect.

Overall, Alternative B would have a long-term, beneficial impact on visual resources at the Refuge.

**Public Use**

No changes to the current public use program are proposed under Alternative B; therefore, as described under Alternative A, no impacts to topography or visual quality would result from the continuation of the limited public use program that is currently conducted on the Refuge.

#### 4.2.2.2 Effects to Geology/Soils

**Wildlife and Habitat Management**

As noted in the previous sections, each of the management activities conducted under Alternative A would also occur under Alternative B. None of these activities would trigger or accelerate substantial slope instability, subsidence, ground failure, or erosion, thus affecting onsite facilities or adjacent facilities, such as roadway embankments and bridge abutments and pilings. Alternative B proposes to expand existing management activities to include habitat restoration in several locations within the Refuge. Restoration of salt marsh and wetland/upland transitional habitats could temporarily expose soil to wind and water erosion if Best Management Practices (BMPs) are not implemented during construction. To avoid such impacts, all restoration construction specifications would include the requirement to implement appropriate BMPs for erosion and sediment control during construction to minimize the potential for water and wind erosion at the project site. In addition, all slopes associated with future restoration would have a slope gradient of 4:1 or flatter to avoid the potential for erosion in the future. The restoration of portions of the Refuge's upland areas would have no effect on the site's current susceptibility to geological hazards, such as liquefaction, settlement, ground rupture, or lateral spreading.

To avoid erosion and soil loss during the installation of a new water control structure in the levee to the west of the Bolsa channel, BMPs such as the use of silt fencing, cofferdams, straw wattles, and filter fabric to protect exposed soil would be implemented during project construction. The slopes adjacent to the structure would be protected from erosion with riprap or the installation of native vegetation, as deemed appropriate during final design.

The implementation of appropriate BMPs during habitat restoration would reduce the potential for impacts to soil erosion to below a level of significance. Additionally, the restoration proposals included in Alternative B would not trigger or accelerate substantial slope instability, subsidence, ground failure, or erosion that could adversely affect onsite facilities or adjacent facilities, such as roadway embankments and bridge abutments and pilings.

**Public Use**

The continuation of the limited public use program as currently conducted at Seal Beach NWR would not adversely affect geology or soils for the same reasons described under Alternative A.

#### 4.2.2.3 Effects to Mineral Resources

The wildlife and habitat management proposals included under Alternative B include working with the Navy and others to reduce the number of avian predator perching sites on and adjacent to the Refuge. At present, above-ground power poles extend along the northern access road to Oil Island. To implement the proposal to reduce perching sites would require coordination with the operator of the Oil Island site. Adding anti-perching features to the tops of the existing poles is not expected to result in any adverse effects to the ongoing oil extraction operations at Oil Island.

Alternative B does not include any new public use proposals; therefore, as described in Alternative A, no adverse effects to the operations at Oil Island would occur as a result of continuing the current public use programs on the Refuge.

#### 4.2.2.4 Effects to Agricultural Resources

**Wildlife and Habitat Management**

Under Alternative B, there is a proposal to work with the Navy to create a buffer around the outer boundary of the Refuge where invasive plant species would be controlled in an effort to reduce the potential for reinvasion of restored upland areas on the Refuge by non-native weedy plants. Although this effort could extend a few feet into existing agricultural areas, the potential effects to existing agricultural operations would be minimal.

**Public Use**

The continuation of the limited public use program currently conducted on the Refuge would not result in any significant adverse effects to nearby farming activities on the Naval Weapons Station Seal Beach.

#### 4.2.2.5 Effects to Hydrology

**Wildlife and Habitat Management**

Implementation of the proposal to expand salt marsh and wetland/upland transition habitat on much of the remaining upland areas within the Refuge would result in the restoration of tidal influence to areas that were historically subject to tidal action. The proposed restoration would have no effect on the limited freshwater drainages that enter the Bay from the north and would result in only minor changes to the hydrology in Anaheim Bay. These proposals could, however, result in localized changes to the existing hydrology within the Refuge warranting additional study prior to restoration. Specifically, the proposal to restore approximately 20 acres just to the northeast of Case Road Pond would result in a minor expansion of the tidal prism in the area north of Bolsa Avenue. This could in turn increase the volume of water flowing through the existing culverts that connect Case Road Pond to the unrestricted portion of Anaheim Bay, located to the south of Bolsa Avenue.

To ensure that the rate of flow through these culverts during incoming and receding tides would not create the potential for erosion around the existing culverts, modeling would be conducted in conjunction with restoration engineering to determine the anticipated flow rates at the culverts. This modeling effort would also evaluate the adequacy of the other culverts in the area to handle the anticipated flows. Should the results of this modeling indicate the potential for erosion, appropriate measures, such as altering the restoration design to reduce tidal velocities and/or armoring the areas around the affected culverts to minimize the potential for erosion, would be incorporated into the final restoration design.

As described in Chapter 4 of the Final CCP, the culverts that convey tidal flows into the western portion of the Bolsa Cell from the mitigation channel are in very poor condition, showing significant signs of deterioration. To correct this problem and address past concerns related to how much tidal flow should be permitted within the Bolsa Cell, Alternative B proposes to remove the deteriorated culverts, repair the levee, and rather than replace the existing culverts, install a new water control structure near the center of the levee.

The replacement of the existing culverts with a new water control structure would eliminate unregulated fluctuations in tidal flow, as experienced in the Bolsa Cell since 1990. This will enable Refuge staff to protect habitat for the Belding's savannah sparrow, while also improving habitat in the cell for the light-footed clapper rail. It will also allow regulation of water levels during periods of heavy rainfall and higher high tides to protect existing structures to the east of the Bolsa Cell from flooding. Prior to the completion of final design for the water control structure, a numerical model of the tidal hydraulics in the Bolsa Cell under existing conditions and in the future assuming the construction of a new water control structure will be conducted to establish how best to design the structure to meet the habitat and flood protection needs of the Refuge. Modeling would also provide the data necessary to determine if the installation of this structure could affect flows in the existing culvert that connects the mitigation channel to Anaheim Bay, as well as to assist in the final design of the water control structure, including the appropriate size and invert elevation of the inlet.

Installation of the new water control structure would require the use of cofferdams, or the implementation of other appropriate actions, to prevent tidal exchange through the construction site while the structure is being installed. The existing culverts would remain in place during this phase of the project to ensure continued tidal exchange within the Bolsa Cell. Once installed, tidal flows through the water control structure could be adjusted to maintain tidal elevations in the Bolsa Cell that would optimize habitat quality for light-footed clapper rails and Belding's savannah sparrows, while remaining low enough to ensure that adjacent structures would not be subject to inundation. This structure would also enable the Refuge Manager to regulate elevations in the Bolsa Cell in the future as needed to respond to the effects of sea level rise.

The proposal to conduct further analysis, including modeling of proposed actions, prior to implementing any projects that could affect the hydrology within the Refuge's coastal wetlands would ensure that no significant adverse impacts related to hydrology and flooding would result from the implementation of Alternative B.

**Public Use**

The continuation of the limited public use program proposed under Alternative B would not result in any significant adverse effects to local hydrology on the Refuge or beyond the Refuge boundary in Anaheim Bay.

#### 4.2.2.6 Effects to Water Quality

**Wildlife and Habitat Management**

Habitat restoration and enhancement proposals included under Alternative B that could have an effect on water quality include the grading activity associated with the restoration of tidal influence to approximately 36 acres within the Refuge, as well as activities associated with replacing existing culverts, including the culverts in the Bolsa Levee. These actions have the potential to increase erosion and sedimentation into adjacent wetland areas, particularly during storm events. Excess sediment in runoff from a construction site both during and after construction can cause increased turbidity in natural water systems, reducing the amount of sunlight reaching aquatic plants, such as eelgrass, clogging fish gills, and blanketing aquatic habitat and potential spawning areas with silt. Sediment introduced into adjacent waterway can also transport other pollutants such as nutrients, metals, and oils and greases into adjacent wetlands. These effects can be avoided through appropriate construction design and construction activity.

To avoid such water quality impacts, the construction specifications for each individual restoration project would include the requirement to implement appropriate BMPs. These BMPs could include the use of silt fencing, straw wattles, and filter fabric to prevent the introduction of exposed soils into adjacent wetland areas, the installation of cofferdams during construction, 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, no adverse effects to water quality within the Refuge or Anaheim Bay would occur as a result of any ground-disturbing activities proposed under Alternative B.

The potential for impacts to water quality would be further reduced by the implementation of a Storm Water Pollution Prevention Plan (SWPPP) during construction, as 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. Coverage under this General Permit, which involves electronically filing the Permit Registration Documents (i.e., Notice of Intent, SWPPP, and other compliance related documents required by this General Permit) with the State, would be obtained for all construction projects on the Refuge, including restoration projects, which disturb one or more acres of land surface.

Alternative B also proposes the implementation of a water quality monitoring program to regularly collect data on the basic physical parameters of the waters within the Refuge. Additionally, Refuge staff would participate in other Federal, State, and local agency activities related to the improvement of quality of water throughout the watersheds that ultimately empty into Anaheim Bay. Through such a multi-agency partnership, the Refuge would seek to implement measures that would reduce the level of pollutants in the Bolsa Chica and East Garden Grove-Wintersburg channels that could adversely affect habitat quality and trust resources on the Refuge. To the extent that its aims could be achieved, this proposal's effects on water quality would be beneficial.

**Pest Management**

The effects to water quality of continuing to use Aquamaster and Glyphosate Pro 4 (active ingredient glyphosate), Surflan AS (active ingredient oryzalin), Habitat (active ingredient imazapyr), Altosid Briquets and Altosid Pellets WSP (active ingredient methoprene), VectoBac 12AS and VectoBac G (active ingredient *Bacillus thuringiensis israelensis*), and VectoLex WDG (active ingredient *Bacillus sphaericus*) would be similar to those described under Alternative A. The difference between Alternatives A and B is that under Alternative B, <u>the use of those pesticides not associated with mosquito management</u> would be implemented in accordance with the IPM Plan. The IPM Plan includes a number of BMPs that would be implemented to minimize any adverse effects of pesticide application to water quality. <u>For potential water quality impacts related to the use of pesticides related to mosquito management, the annual Special Use Permit issued to the OCVCD would conditions to ensure that potential water quality impacts are avoided or minimized.</u>

As described in the IPM Plan, along with the selective use of pesticides, IPM involves the implementation of a number of other strategies for eradicating, controlling, and containing pest species. These strategies include prevention, mechanical and physical methods, cultural methods, biological control methods, 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 use of biological controls to eliminate tamarisk, restoration of native species in disturbed areas) to address pest species on the Refuge would be similar to those effects described elsewhere within this chapter, where they are discussed specifically as habitat management techniques to achieve resource management objectives.

All pesticides considered for use on the Refuge, including any new pesticides that may be applied following the approval of this CCP, are evaluated through the PUP review process using scientific information and analyses that is documented in "Chemical Profiles" of the IPM (Attachment B of the IPM Plan). These profiles, which are described in detail in Section 7 of the IPM Plan, provide quantitative assessment/screening tools and threshold values to evaluate potential effects to water, soil, and air. The use of specific pesticides on the Refuge is approved when the Chemical Profiles prepared for each active ingredient indicate sufficient scientific evidence that potential impacts to the Refuge's physical environment are likely to be only minor, temporary, or localized in nature. This analysis, which is conducted by the Regional IPM Coordinator, may indicate the need to adjust application timing and/or quantities and/or the need for specific BMPs to protect water quality.

A number of BMPs intended to protect water quality are included in the IPM Plan that would be implemented on the Refuge whenever pesticide application occurs. Some of these BMPs include:

- As a precaution against spilling, spray tanks will not be left unattended during filling.
- Refuge staff will consider the water quality parameters (e.g., pH, hardness) that are important to ensure the greatest efficacy, when specified on the pesticide label.
- All pesticide spills will be addressed immediately using procedures identified in the Refuge's spill respond plan.
- A one-foot no-spray buffer from the water's edge will be used, where applicable, and when it does not detrimentally influence effective control of pest species.
- 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, other larger tank wand applications), where 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 >30% 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 on the Refuge is provided in Section 5 of the IPM Plan (Appendix G of the Final CCP).

In some cases (as described in the Environmental Fate discussion found in Section 7.6 of the IPM Plan), 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 as a result of 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 ($DT_{50}$) (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 PUP approval process. This potential is determined using the Groundwater Ubiquity Score (GUS) (refer Section 7.6 of the IPM Plan 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 for soil half-life and $DT_{50}$.

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 as a result of low toxicity or short persistence in the environment, and/or the implementation of general and pesticide specific BMPs. The risks to water quality of particular pesticides presented in Table 4-2 is derived from pesticide product labels and the Pesticide Properties Database (PPDB 2009) developed by the Agriculture & Environment Research Unit of the University of Hertfordshire http://sitem.herts.ac.uk/aeru/footprint/en/index.htm.

As described previously, additional BMPs may be required for certain products proposed for use on the Refuge. The following specific BMPs are identified in the Chemical Profiles for the use of glyphosate and oryzalin:

Glyphosate: Apply aquatic labeled or surfactant free glyphosate formulations to aquatic habitats and riparian habitats within 25 feet of surface water resources.

Oryzalin: Allow one application at 1.5 pounds of active ingredient per acre per year; maintain a minimum 25-foot buffer zone between all upland treatment site(s) and the high water mark of the nearest surface water resource(s); and avoid the application of oryzalin to sites that are upslope of any surface water resources when the slope gradient is greater than 17 percent.

No specific BMPs are required for the use of products containing the active ingredient imazapyr.

**Table 4-2**
**Environmental Fate of Herbicides Used on the Refuge**
**(Factors Specific to Water Quality)**

| Active Ingredient | Product Name(s) | Formulation and application details | Solubility in Water at 20°C | Soil Degradation | Aquatic Degradation | GUS Leaching Potential |
|---|---|---|---|---|---|---|
| Glyphosate | Glyphosate Pro 4 (includes a surfactant) | Mix with water and spray or apply with a wiper or sponge bar | High (emulsifies) | Non-persistent | <100 days | Low leachability |
| Glyphosate | Aquamaster | Mix with water and a nonionic surfactant, and spray or apply with a wiper or sponge bar | High (completely miscible) | Non-persistent | <100 days | Low leachability |
| Imazapyr | Habitat | Mix with water and a surfactant, and spray | High (miscible) | Non-persistent | <100 days | Moderate leachability (GUS < 2) |
| Oryzalin | Surflan AS | Usually mix with water and spray | Low (miscible) | Moderately persistent | <100 days | Low leachability |

Mosquito management under this alternative would be similar to Alternative A in that the mosquito control products currently used on the Refuge, as presented in the discussion for Alternative A, would also be used under Alternative B. Therefore, the potential effects to water quality described under Alternative A would also apply to Alternative B.

Also addressed under Alternative B is the OCVCD's request to consider the use of several new products on the Refuge for the control of mosquitoes, in addition to those described under Alternative A. These include: Natular™, a larvicide with the active ingredient spinosad, and Agnique®, a larvicide and pupacide made from renewable plant oils. Before these or any new pesticides proposed for mosquito control can be used on the Refuge, they must first be approved through the PUP review process and specifically permitted for use in the Refuge Special Use Permit.

With respect to water quality, Natular and Agnique are generally non-persistent in soil or water and are not expected to leach into groundwater. No water quality standards or criteria have been established for spinosad, the active ingredient in Natular, but it is classified as a "Minimum Risk Pesticide" by the USEPA. Agnique is considered "practically nontoxic" by the USEPA. Under Alternative B, Agnique or other nonmolecular biodegradable film products would be considered for use on the Refuge only if the numbers of mosquito pupae present on the Refuge exceed established thresholds developed by OCVCD (2010), as described in Chapter 2.

To minimize adverse effects to water quality related to mosquito control, the following BMPs <u>should be included in future Special Use Permits</u>:

- Where mosquito control is necessary, use the most effective means that pose the lowest risk to abiotic and biotic resources;
- Apply pesticides only in specific, discrete areas where monitoring data justify its use.
- Use of drift retardants (thickeners designed to minimize the formation of droplets smaller than 150 microns), which have also been evaluated through the PUP review process, to reduce aerial drift of pesticides;
- Employ wind speed restrictions on spraying;

**<u>Public Use</u>**

The potential effects to water quality from implementing the current public use program, as proposed under Alternative B, would be same as those discussed under Alternative A.

#### 4.2.2.7 Effects from Climate Change/Sea Level Rise

**<u>Wildlife and Habitat Management</u>**

The effects of climate change and sea level rise on Refuge resources and facilities would be the same for Alternative B as those described under Alternative A. However, unlike Alternative A, Alternative B includes strategies intended to assist Refuge staff in identifying and addressing changes related to sea level rise. These strategies include the development and implementation of a plan to annually track changes in tidal elevations within various areas of the Refuge and establish benchmarks based on the duration of inundation, high tide levels, and other appropriate factors, for implementing actions to address these changes.

Additionally, by 2015 a study will be completed that will analyze various measures that could be implemented on the Refuge to reduce the effect of sea level rise on sensitive coastal habitats. Such measures could include retrofitting existing water control structures to manipulate tidal flows entering the previously restored portions of the Refuge, including Forrester Pond, Case Road Pond, and 7th Street Pond; installing new water control structures elsewhere on the Refuge for the same purpose; and raising the elevations of the existing marsh plain by spraying or otherwise applying appropriate sediment over the existing marsh vegetation. The implementation of these types of measures is expected to adequately address the effects of sea level rise over the 15-year life of this CCP. However, despite these actions, the SLAMM results indicate that sea level rise over the next 25 to 100 years are likely to have a profound impact on the trust resources protected within the Seal Beach NWR. Therefore, reevaluation of the goals, objectives, and strategies addressed in this the CCP may be necessary in the future to determine if and how additional strategies for addressing the effects of sea level rise on these coastal resources should be implemented.

**Public Use**

Alternative B does not propose any changes to the existing public use program implemented on the Refuge; therefore, the effects of sea level rise on public uses would be the same for Alternative B as were described for Alternative A.

#### 4.2.2.8 Effects to Air Quality

**Wildlife and Habitat Management**

Each of the management activities conducted under Alternative A would also occur under Alternative B. As described in Section 4.2.1.8, none of these activities would result in adverse effects to air quality. The additional management activities included within Alternative B that relate to habitat restoration, culvert replacement, and concrete debris removal would result in temporary, localized adverse impacts to air quality related to fugitive dust and tailpipe emissions generated by construction equipment (e.g., land excavators, motor graders, dump trucks, excavator with a hydraulic hammer). The various activities would take place over a period of one to two months and are not expected to generate emissions in excess of current air quality standards. To ensure that all emissions are minimized to the maximum extent practicable, the following measures would be included in the construction specifications for all proposed restoration and enhancement projects implemented on the Refuge:

- Measures shall be implemented to prevent visible dust emissions from leaving the project site boundary, 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; covering excavated materials to prevent erosion; and stopping work during high wind conditions.
- The load of all haul vehicles shall be covered to reduce fugitive dust generated during the transport of materials, and any stock piled material shall be covered to reduce the production of dust.
- Construction equipment and vehicles shall not track dirt and dust onto public roads, and all equipment and tires shall be washed and/or swept prior to leaving the project site.
- All equipment used on the site shall meet South Coast Air Quality Management District (SCAQMD) standards.

The additional activities proposed under Alternative B would not generate any additional vehicle trips following project completion, therefore, these proposal would not generate any long-term air emissions beyond those already described for Alternative A. Through the implementation of the measures described previously, short-term emissions generated as a result of the proposed restoration would not contribute significantly to a cumulative increase in short-term emissions.

Compliance with SCAQMD rules and regulations, as well as the implementation of the air quality measures described, would ensure that air emission from the implementation of this alternative would not contribute significantly to a cumulative increase in emissions. Finally, the proposals in this alternative are not expected to exceed SCAQMD thresholds and Federal "de minimis" levels; however, general conformity analysis may be implemented in the future when more detailed information about the restoration proposal is available.

**Pest Management**

Several pesticides are used on the Refuge, including herbicides to control invasive plants and insecticides, applied by OCVCD, to control mosquitoes. 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. Surflan AS is considered non-volatile, while Aquamaster, Glyphosate Pro 4, and Habitat are volatile. Because all of these products are used at such low volumes on the Refuge, even the volatile products quickly become diluted in the atmosphere, minimizing the effect on local air quality. The potential for adverse air quality impacts as a result of pesticide use is further reduced through compliance with all Federal, State, and local pesticide use laws and regulations, as well as Departmental, Service, and NWRS pesticide-related policies. This includes compliance with the Federal Insecticide, Fungicide and Rodenticide Act of 1996 (FIFRA), which requires all pesticides to be applied at the rates and with the application equipment specified on the pesticide label. The IPM Plan 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. Some of these BMPs include:

- 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, other larger tank wand applications), where practical;
- Refuge staff will use low volume rather than high volume foliar applications when the low impact methods described are not feasible or practical, to maximize herbicide effectiveness and ensure correct and 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 the largest droplet size that results in uniform coverage;
- Applicators will use drift reduction technologies such as low-drift nozzles, where possible;
- Where possible, spraying will occur during low (average<7mph and preferably 3 to 5 mph) and consistent direction wind conditions with moderate temperatures (typically <85 °F);
- Where possible, 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;
- Spray applications will be made at the lowest height for uniform coverage of target pests to minimize or eliminate potential drift; and
- If windy conditions frequently occur during afternoons, spraying (especially boom treatments) will typically be conducted during early morning hours.

A complete list of the BMPs to be implemented on the Refuge is provided in Section 5 of the Final IPM Plan.

In some cases (as described in the Environmental Fate discussion found in Section 7.6 of the IPM Plan), product specific BMPs would be implemented to ensure that impacts to air quality are not significant. For example, pesticides with a high potential to volatilize (evaporate) from soil and plant surfaces and move off-target into the atmosphere would only be approved for use on the Refuge if additional BMPs are implemented specifically to minimize drift and protect air quality. The BMPs required under these circumstances include:

- Do not treat when wind velocities are less than two or greater than 10 miles per hour with existing or potential inversion conditions;
- Apply the largest-diameter droplets possible for spray treatments;
- Avoid spraying when air temperatures exceed 85°F;
- Use the lowest spray height possible above target canopy; and
- Where identified on the pesticide label, incorporate the pesticide into the soil as soon as possible during or after application.

The implementation of the various BMPs described in the preceding paragraphs would reduce the potential for localized and any potential regional air quality impacts related to herbicide use to below a level of significance.

Mosquito management would result in little, if any, change in the number of vehicle miles traveled by OCVCD to implement mosquito monitoring and control on the Refuge. With respect to <u>mosquito-related pesticide use, BMPs that, when implemented, would reduce localized impacts to air quality from volatile pesticides such as Altosid should be included as conditions in annual Special Use Permits.</u> These BMPs include:

- Where possible, 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;
- When spraying large areas, use drift retardants to reduce aerial drift of pesticides;
- Spray applications will be made at the lowest height for uniform coverage of target pests to minimize or eliminate potential drift; and
- If windy conditions frequently occur during afternoons, spraying (especially boom treatments) will typically be conducted during early morning hours.

**<u>Public Use</u>**

The continuation of the limited public use program as currently conducted on the Refuge would not result in any significant adverse effects to air quality. Vehicular emissions from the travel of visitors to the Refuge for monthly tours are negligible in the context of the wider airshed of the SCAQMD.

### 4.2.2.9 Effects Related to Greenhouse Gas Emissions

**Wildlife and Habitat Management**

In addition to the management activities described for Alternative A, Alternative B also proposes the restoration and enhancement of approximately 36 acres of tidally influenced habitat, replace the culverts in the Bolsa Cell, and remove concrete debris from the marsh. These additional activities will result in a temporary increase in GHG emissions over those anticipated under Alternative A, however, the proposed construction activities will occur over relatively short period of time. The overall GHG emissions generated by two or three construction vehicles operating over a one- to two-month period would be relatively low compared to the other activities occurring within the SCAQMD. Therefore, the GHG emissions anticipated to result from the implementation of this alternative are not expected to represent a significant direct or indirect impact on the environment.

To further reduce the total GHG emissions generated from the operation and maintenance of the Refuge, as vehicles are replaced, new vehicles will be selected that have better fuel economy. In addition, whereever 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. The 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.

**Public Use**

The effects of the Refuge's existing public use program on GHG emissions would be the same under Alternative B as were described in Section 4.2.1.9 for Alternative A.

### 4.2.2.10 Effects Related to Contaminants

**Wildlife and Habitat Management**

Under Alternative B, several areas on the Refuge are proposed as sites for future restoration. Of these restoration sites, the area southeast of the 7th Street Pond was formerly used by the Navy as an explosives burning ground (Installation Restoration Site 6). Groundwater sampling at this site in 2003 and 2004 indicated that no contaminants concerns were present at the site and the site was considered closed. Nevertheless, coordination with the Navy during the development of specific restoration plans for this site would be conducted to ensure that no constituents of concern to Refuge trust resources or water quality are present at the site. In addition, the monitoring wells that were installed at this site to facilitate monitoring of contaminants levels would have to be removed prior to restoration.

<u>There are also two Munitions Response Program sites that could affect restoration efforts in and around the 7th Street Pond and the drop tower. Constituents of concern, as described in Chapter 4 of the Final CCP, have been detected at levels that exceed human health and/or ecological and background screening criteria. The area around the drop tower is likely to contain buried munitions debris, as well as various constituents of concern. As a result, coordination with the Navy and the Service's Environmental Contaminants Program would be necessary prior to preparing and implementing restoration plans for areas immediately adjacent to these sites. The area east of Case Road and northeast of NASA Island also represents a potential hazard to Refuge resources do to the presence of lead in the marsh soils. The Service will continue to work with the Navy to resolve the contaminant issues at this site.</u>

**Public Use**

No contaminants are known or expected to be present in areas used by the public as part of the public use programs currently conducted on the Refuge.

### 4.2.3 Alternative C (Proposed Action) – Optimize Upland/Wetland Restoration, Improve Opportunities for Wildlife Observation

All of the management activities described in Alternative A would also be implemented under Alternative C. In addition, this alternative includes restoration and enhancement proposals for the same areas proposed under Alternative B; however, under Alternative C these areas would be restored to a combination of tidally influenced wetlands and native upland areas. Other activities proposed under Alternative C include developing a management plan for tiger beetles, establishing salt marsh bird's-beak on the Refuge, removing the existing drop tower near the 7th Street Pond, and implementing actions in a portion of the marsh to improve conditions to support cordgrass-dominated salt marsh habitat. Finally, this alternative proposes to expand the opportunities available on the Refuge for wildlife observation.

#### 4.2.3.1 Effects to Topography/Visual Quality

**Wildlife and Habitat Management**

The same areas proposed for habitat restoration in Alternative B (approximately 36 acres) would be restored under Alternative C, but the habitat proposals for these areas would provide a greater mix of upland and wetland/upland transitional habitat than is proposed in Alternative B. Areas proposed for upland habitat would experience little or no changes in elevation, while tidal restoration sites would be excavated to achieve elevations that would support the desired tidal wetland habitat (i.e., low marsh, mid marsh, high marsh, upland/wetland transition). The overall extent of change to the existing landform would be less under Alternative C than that required under Alternative B, although the effects to the existing topographic character of the Refuge would be minimal under either alternative.

Under Alternative C, spraying of clean sediment of appropriate grain size and nutrient content onto a portion of the marsh to improve the quality of the cordgrass would be evaluated and potentially implemented. Under this proposal, enough sediment would be distributed over the existing vegetation to provide for a slight increase in the elevation of the marsh plain, while still enabling the vegetation to grow up through the added sediment. The increased elevation of the marsh plain would not, however, be discernible to the casual observer; therefore, no adverse effects related to topography would occur.

The proposal to replace existing culverts and remove the drop tower would not result in any adverse effects related to topography.

As in Alternative B, under Alternative C, while grading activities are underway during the restoration of habitats, there would be temporary, minor adverse effects to visual quality. However, once grading has concluded and the sites have had the chance to be restored to native salt marsh and transitional habitats, visual quality would be improved over the present condition. Thus, Alternative C would also have a long-term, beneficial impact on visual resources at the Refuge. Removal of concrete and debris from existing marsh areas and removal of the drop tower would augment these beneficial visual impacts.

**Public Use**

Alternative C would expand opportunities for environmental education, interpretation, wildlife observation, and wildlife photography by increasing the number of guided tours and constructing an elevated wildlife observation deck. These proposals would have no effect on the topographic character of the Refuge. Because the elevated observation deck proposed for construction under this alternative would be constructed in the general vicinity of other existing structures, including the Refuge headquarters and various Navy buildings, it would not fundamentally alter the current visual character of the area. Therefore, the public use proposals included under this alternative would not adversely affect the character or visual quality of the area.

#### 4.2.3.2 Effects to Geology/Soils

**Wildlife and Habitat Management**

Each of the management activities conducted under Alternative A would also occur under Alternative C. None of these activities would trigger or accelerate substantial slope instability, subsidence, ground failure, or erosion, thus affecting onsite facilities or adjacent facilities, such as roadway embankments and bridge abutments and pilings. Alternative C proposes to expand existing management activities to include habitat restoration, culvert replacement, concrete debris removal, improvements to cordgrass habitat, and removal of the drop tower. Restoration activities could temporarily expose soil to wind and water erosion if BMPs are not implemented during construction. To avoid such impacts, all restoration construction specifications would include the requirement to implement appropriate BMPs for erosion and sediment control during construction to minimize the potential for water and wind erosion at the project site. In addition, all slopes associated with future restoration would have a slope gradient of 4:1 or flatter to avoid the potential for erosion in the future. The restoration of portions of the Refuge's upland areas would have no effect on the site's current susceptibility to geological hazards, such as liquefaction, settlement, ground rupture, or lateral spreading.

To avoid erosion and soil loss during the installation of a new water control structure in the levee to the west of the Bolsa channel, BMPs such as the use of silt fencing, cofferdams, straw wattles, and filter fabric to protect exposed soil would be implemented during project construction. The slopes adjacent to the structure would be protected from erosion through the use of rip rap or native vegetation as deemed appropriate during final design.

The implementation of appropriate BMPs during habitat restoration would reduce the potential for impacts to soil erosion to below a level of significance. Additionally, the restoration proposals included in Alternative C would not trigger or accelerate substantial slope instability, subsidence, ground failure, or erosion that could adversely affect onsite facilities or adjacent facilities, such as roadway embankments and bridge abutments and pilings.

**Public Use**

Alternative C would expand opportunities for environmental education, interpretation and wildlife observation and wildlife photography by increasing the number of guided tours and constructing an elevated wildlife observation deck. These proposals would have no effects on the Refuge's geology or soils and the proposed observation deck would not be susceptible to geological hazards, such as liquefaction, settlement, ground rupture, or lateral spreading.

#### 4.2.3.3 Effects to Mineral Resources

As described under Alternative B, adding anti-perching features to the tops of the existing power poles used by the ongoing oil extraction operations at Oil Island would not adversely affect the ability of the operator to continue extract oil from beneath the site. Additionally, none of the expanded public use proposals included under Alternative C would affect current oil extraction operations. Therefore, no adverse effects relate to mineral resources are anticipated under this Alternative.

#### 4.2.3.4 Effects to Agricultural Resources

**Wildlife and Habitat Management**

The effects to adjacent agricultural resources of implementing the wildlife and habitat management actions proposed under Alternative C would be the same as those described under Alternative B.

**Public Use**

Expanding public use opportunities on the Refuge, as proposed under this alternative, would have no effects on the adjacent farming activities on Naval Weapons Station Seal Beach.

#### 4.2.3.5 Effects to Hydrology

**Wildlife and Habitat Management**

The effects to hydrology under Alternative C would be essentially the same as those described for Alternative B. Therefore, no adverse effects related to hydrology are expected from any of the wildlife and habitat management activities proposed under Alternative C. For additional details, refer to Section 4.2.2.5.

**Public Use**

Expanding public use opportunities on the Refuge, as proposed under Alternative C, would not result in adverse effects to hydrology on the Refuge or in Anaheim Bay.

#### 4.2.3.6 Effects to Water Quality

**Wildlife and Habitat Management**

Proposals under Alternative C that could have an effect on water quality within Anaheim Bay include grading activity associated with the restoration of approximately 36 acres within the Refuge, as well as activities associated with replacing existing culverts. As described under Alternative B (Section 4.2.2.6), to avoid water quality impacts as a result of construction and restoration projects, the construction specifications for each individual project would include the requirement to implement appropriate BMPs to prevent the introduction of exposed soils into adjacent wetland areas. In addition, these projects would be required to implement the actions included in the Storm Water Pollution Prevention Plan prepared for the project prior to construction. With the implementation of these measures, no adverse effects to water quality within the Refuge or Anaheim Bay would be anticipated from the implementation of the wildlife and habitat management actions associated with Alternative C. The implementation of a water quality monitoring program, as described for Alternative B, would also be implemented under Alternative C.

**Pest Management**

The analysis of potential effects to water quality from the implementation of the IPM Plan and mosquito management practices directed under an annual Special Use Permit would be generally the same as those described under Alternative B. The effects, if any, to water quality as a result of the use of Natular on the Refuge would be avoided because the use of these products is not proposed under Alternative C.

**Public Use**

Expanding the public use program at Seal Beach NWR would not result in any significant adverse effects to water quality on the Refuge or in Anaheim Bay.

#### 4.2.3.7 Effects from Climate Change/Sea Level Rise

**Wildlife and Habitat Management**

The effects of climate change and sea level rise on Refuge resources and facilities would be the same for Alternative C as those described under Alternative A. However, Alternative C also includes the strategies intended to assist Refuge staff in identifying and addressing changes related to sea level rise, as described in Alternative B, as well as an additional strategy for attempting to replace intertidal habitats anticipated to be converted to subtidal habitat as a result of sea level rise. The implementation of these types of measures is expected to adequately address the effects of sea level rise over the 15-year life of this CCP. However, despite these actions, the SLAMM results indicate that sea level rise over the next 25 to 100 years are likely to have a profound impact on the trust resources protected within the Seal Beach NWR. Therefore, reevaluation of the goals, objectives, and strategies addressed in this the CCP may be necessary in the future to determine if and how additional strategies for addressing the effects of sea level rise on these coastal resources should be implemented.

**Public Use**

Of the proposals included in Alternative C to expand opportunities for public use, the proposal to construct an elevated observation deck could be subject to impacts related to sea level rise at some point in the future. In order to avoid impacts related to sea level rise, the SLAMM results will be taken into consideration in selecting the site for the proposed elevated observation deck.

#### 4.2.3.8 Effects to Air Quality

**Wildlife and Habitat Management**

Each of the management activities conducted under Alternative A would also occur under Alternative C. As described in Section 4.2.1.8, none of these activities would result in adverse effects to air quality. The additional management activities included within Alternative C that relate to habitat restoration, culvert replacement, concrete debris removal, removal of the drop tower, and improvements to support cordgrass habitat in the marsh would result in temporary, localized adverse impacts to air quality related to fugitive dust and tailpipe emissions generated by construction equipment (e.g., land excavators, motor graders, dump trucks, excavator with a hydraulic hammer, generators). The various activities would take place over a period of two to three months and are not expected to generate emissions in excess of current air quality standards. To ensure that all emissions are minimized to the maximum extent practicable, the following measures would be included in the construction specifications for all construction related projects implemented on the Refuge:

- Measures shall be implemented to prevent visible dust emissions from leaving the project site boundary, 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; covering excavated materials to prevent erosion; and stopping work during high wind conditions.

- The load of all haul vehicles shall be covered to reduce fugitive dust generated during the transport of materials, and any stock piled material shall be covered to reduce the production of dust.
- Construction equipment and vehicles shall not track dirt and dust onto public roads, and all equipment and tires shall be washed/swept prior to leaving the project site.
- All equipment used on the site shall meet SCAQMD standards.

The construction activities proposed under Alternative C would not generate any long-term vehicle trips; therefore, no long-term impacts to air quality are anticipated. Through the implementation of the measures described, short-term emissions generated as a result of the proposed management activities would not contribute significantly to direct or cumulative increases in short-term emissions.

Compliance with SCAQMD rules and regulations, as well as the implementation of the air quality measures described, would ensure that air emission from the implementation of this alternative would not result in the further degradation of air quality within the SCAQMD. Finally, the proposals in this alternative are not expected to exceed SCAQMD thresholds and Federal de minimis levels; however, general conformity analysis may be implemented in the future when more detailed information about the restoration proposal is available.

**Pest Management**

The analysis of potential effects to air quality from the implementation of the IPM Plan and mosquito management would be the same under this alternative as described previously for Alternative B.

**Public Use**

Expanding the public use program on the Refuge would result in minor increases in annual visitation to the Refuge, representing an increase in vehicle trips generated. This increase is not, however, expected to be significant as access to the Refuge is limited by the security needs of the Navy. Vehicular emissions from the travel of visitors to the Refuge under this alternative would be negligible in the context of the wider airshed of the SCAQMD.

#### 4.2.3.9 Effects Related to Greenhouse Gas Emissions

**Wildlife and Habitat Management**

The GHG emissions generated as a result of implementing the management activities included under Alternative C would be slightly higher than those anticipated under Alternative B. The increase would be attributed to the temporary use of generators to facilitate hydraulic spraying of marsh mud onto existing cordgrass habitat. Some of these emissions would be offset by a slight reduction in construction emission, as upland restoration would require less grading activity than would the extent of salt marsh restoration proposed under Alternative B.

Although this alternative would result in a slight increase in the generation of temporary GHG emissions, the emissions would occur over relatively short period of time. Therefore, the GHG emissions anticipated to result from the implementation of this alternative are not expected to represent a significant direct or indirect impact on the environment.

The measures described for reducing GHG emissions associated with Refuge management, as described under Alternative B, would also be implemented under this alternative.

**Public Use**

Although the public use program would be expanded under this alternative, the increase in visitation that would result would not of a sufficient magnitude to generate significant volumes of GHG emissions. Therefore, this alternative would not represent a significant contribution, either directly or cumulatively, to the GHG emissions generated in the SCAQMD air basin.

#### 4.2.3.10 Effects Related to Contaminants

**Wildlife and Habitat Management**

The areas proposed for restoration under Alternative C are the same areas proposed for restoration under Alternative B—only the habitat types would differ; therefore, the potential for impacts related to contaminants would be the same as those described under Alternative B.

**Public Use**

No contaminants are known or expected to be present in areas where expanded public use programs as proposed under Alternative C would be conducted.

## 4.3 Effects to Habitat and Vegetation Resources

The effects to the habitats and vegetation supported on the Seal Beach NWR as a result of implementing the three alternatives are described in this section. Potential impacts to these resources are characterized by evaluating direct, indirect, and cumulative effects. Direct impacts would involve the removal of vegetation as a result of ground-disturbing actions, while indirect impacts would involve changes to habitat or vegetation that are incidental to the implementation of an action. Cumulative impacts to habitat and vegetation resources, described in Section 4.9.2, would result when the incremental impact of an action is added to other, closely related past, present, or reasonably foreseeable future actions.

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.
- 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.

A significant cumulative effect would occur if the loss or modification of native habitat or a sensitive or narrow endemic plant species as a result of the proposed action is minor but when considered in light of other similar losses or gains within the region, would be considerable.

The potential effects to habitats, including subtidal, coastal salt marsh, transitional and upland habitats, and to native vegetation are described in the following text for each of the three alternatives.

### 4.3.1 Alternative A – No Action

**Wildlife and Habitat Management**

The area of each major habitat type on the Refuge would remain generally unchanged under Alternative A, as would the relative quality of each habitat type. That is, unrestored upland areas dominated by ruderal or invasive plants would continue in this sub-optimal condition. The muted tidal regimes of the Refuge's four tidal basins would continue to support large areas of continually submerged, shallow subtidal habitat. Tidal waters from Anaheim Bay would continue to enter and exit the restored ponds via constructed channels and culverts that pass under the surrounding roadways. Eelgrass beds would likely continue to be found in various locations throughout the Refuge's subtidal habitat, including some of the subtidal channels and all of the mitigation ponds.

Coastal salt marsh, covering approximately 565 acres within the Refuge, would continue to be the dominant habitat type on the Refuge and intertidal channels and tidal mudflats would not be altered. No actions would be implemented to address the effects of limited sources of freshwater input and higher tidal elevations and/or subsidence on the overall quality of the cordgrass-dominated habitat on the Refuge.

The Refuge's upland habitat, most of which was historically wetland habitat that was filled during the last century to accommodate development, would be retained under Alternative A. Hog Island, which is the only area within the Refuge that historically supported native upland vegetation, would also remain unchanged under Alternative A.

Management activities proposed under Alternative A that could have an effect on the existing habitat and vegetation on the Refuge include:

- Light-footed clapper rail monitoring to record nesting activity and estimate overall population size;
- Conducting monthly bird surveys;
- Inspecting, maintaining, replacing, and/or installing clapper rail nesting platforms in salt marsh habitat;
- Conducting invasive plant control in upland and upland transition areas;
- Removing trash and debris from upland and upland transition areas, as well as along the edges of the marsh;
- Inspecting, cleaning, and/or replacing culverts on the Refuge that convey tidal waters into various portions of the Refuge; and
- Implementing predator management, including conducting periodic night surveys to identify potential predators.

Monitoring of light-footed clapper rails is generally conducted from the edges of the marsh and from non-motorized boats traveling through the marsh. Actions related to the nesting platforms are also conducted using boats. Monitoring teams and volunteers are trained to understand the importance of protecting the sensitive marsh habitat and every effort is taken to avoid the trampling of vegetation during these activities. As a result, adverse effects to native habitat related to clapper rail management are minimal and do not represent a significant adverse impact on the environment.

The effects to habitat and vegetation as a result of conducting monthly bird surveys are similar to those described for clapper rail monitoring. Therefore, this activity would not result in any significant adverse impacts to the environment.

Removal of trash and other debris from the Refuge could result in temporary impacts related to trampling of vegetation; however, the majority of trash removal occurs in areas dominated by non-native vegetation or at the edges of the marsh. Any trampling of marsh vegetation that may occur would be minor and would be offset by the benefits of removing trash and debris from the marsh.

Monitoring, cleaning, and/or replacing of the various culverts on the Refuge could result in some temporary impacts to marsh habitat, but these effects would be minimal and the benefits of maintaining adequate tidal circulation within the various wetland areas on the Refuge would offset any temporary impacts to existing habitat. If permanent impacts to native habitat would occur as a result of the activities associated with culvert replacement, mitigation in the form of habitat restoration/creation using accepted replacement ratios for the affected native habitat would be provided.

Predator management is generally conducted from the edges of the marsh and in the vicinity of the least tern nesting area; therefore, the potential for trampling of sensitive habitat and vegetation is minimal.

Based on the information provided here, the wildlife and habitat management actions associated with Alternative A would not result in significant adverse impacts to Refuge habitats or sensitive vegetation. Rather, the effects to these habitats of implementing this alternative would tend to be neutral or in some cases beneficial.

**Pest Management**

Under Alternative A, invasive plant removal involves both mechanical and chemical control methods, with control focused on invasive, weedy plant species present in the Refuge's upland and upland transition areas. The primarily locations on the Refuge where this control occurs include: the upland area north of the Case Street Pond; the area southeast of the 7th Street Pond; NASA Island; and Hog Island. Other focus areas include the shoulders of Bolsa Avenue, Forrestal Lane, and the east side of Kitts Highway. The use of herbicides to control invasive, non-native plants, could adversely impact non-target plants due to pesticide drift, if appropriate application techniques are not employed. However, the potential for adverse effects is considered minimal because of the small quantities of herbicide used and the precautionary measures taken during application, including applying all herbicides in accordance with label requirements. Hand weeding, rather than spraying, would be conducted in sensitive habitat areas, such as areas dominated by native salt marsh habitat. If spraying is proposed in proximity to sensitive habitat areas, the area to be sprayed would first be surveyed for sensitive species and areas to be avoided during spraying would be flagged or otherwise delineated to ensure avoidance of these areas. Hand weeding and limited herbicide spraying would also provide minor benefits to habitat areas by providing opportunities for increased native plant cover.

Activities associated with mosquito management on the Refuge could result in impacts to vegetation related to trampling. This is of particular concern in areas that support salt marsh habitat. To minimize such impacts, access into the marsh by mechanized vehicles is prohibited and mosquito monitoring and control is limited to six specific areas on the Refuge. These areas are located around the perimeter of the salt marsh complex, and can only be accessed via foot traffic. If a significant mosquito problem is identified elsewhere on the Refuge, access into the affected area requires prior approval by the Refuge Manager and OCVCD staff must be accompanied into the area by authorized Service personnel.

The application of VectoBac 12AS, VectoBac G, VectoLex WDG, and Altosid to control mosquito production on the Refuge is not likely to adversely affect vegetation directly because these pesticides are not known to harm plants. Although reductions in certain invertebrate populations as a result of repeated pesticide applications may have the potential to impact specific invertebrate-plant interactions (e.g., pollination) on the Refuge, because only a limited portion of the Refuge is subject to mosquito control, the adverse effects to vegetation and habitat quality of such an impact would be minimal.

**Public Use**

Activities associated with the existing public use program on the Refuge are limited to existing roadways, trails, and unvegetated areas to avoid impacts to sensitive habitat and vegetation. Therefore, the continuation of these programs would not adversely affect any Refuge habitats.

Another use that occasionally occurs on the Refuge is scientific research. Scientific research activities are encouraged on the Refuge provided the activities are consistent with Refuge purposes and the mission of the NWRS. To ensure that activities related to scientific research do not result in adverse effects to Refuge resources, each researcher must obtain a Refuge Special Use Permit from the Refuge Manager. The Special Use Permit includes various conditions related to access, seasonally restrictions, and research methods that the researcher must agree to abide by in order to avoid impacts to sensitive resources.

### 4.3.2 Alternative B – Maximize Salt Marsh Restoration, Continue Current Public Uses

**Wildlife and Habitat Management**

The primary difference between Alternative A and Alternative B with regard to habitats is that Alternative B includes restoration and enhancement proposals that would replace upland areas supporting non-native vegetation with coastal salt marsh and wetland/upland transitional habitat.

Under Alternative B, the area of subtidal and intertidal habitats would remain unchanged, while much of the disturbed upland habitat would be restored to tidally influenced habitat or native wetland/upland transition habitat. The existing upland sites proposed for restoration are all areas that were originally wetlands or transitional habitat, but were filled prior to the establishment of the Refuge to support upland uses.

The proposed salt marsh and wetland/upland transition restoration sites include 21 acres of land located to the north of Case Road Pond, 0.6 acre on the eastern-most island in the Case Road Pond, 9.4 acres to the southeast of 7$^{th}$ Street Pond, and 5.5 acres located along the western edge of 7$^{th}$ Street Pond and around the existing drop tower at the southern end of 7$^{th}$ Street. The remaining areas of non-native upland habitat located along roadways, pathways, and upland edges of existing wetland areas would over time be planted with appropriate native upland species. Such plantings would generally occur following invasive plant removal to avoid reinvasion of the treated area by non-native plants and to minimize the potential for erosion of exposed soils into adjacent wetland areas. To ensure that no significant short- or long-term impacts to existing native habitat would occur as a result of the restoration and enhancement proposals included in Alternative B, native habitat in the immediate vicinity of a restoration or enhancement project would be protected with temporary fencing and appropriate BMPs would be implemented to minimize the potential for erosion and/or sedimentation within and adjacent to the project site. Overall, these restoration proposals would result in beneficial effects to the Refuge's native habitat areas.

All of the management activities proposed under Alternative A would also be implemented under Alternative B, and the following additional activities would be implemented under Alternative B:

- Replace the western culvert in the Bolsa Cell with a water control structure;
- Remove concrete and debris from the marsh;
- Expand management and study of light-footed clapper rail habitat;

- Implement surveys for tiger beetles, native plant species, fish, and other vertebrates and invertebrates;
- Implement an IPM program that includes coordinating with Naval Weapons Station Seal Beach to expand invasive plant control beyond the Refuge boundary;
- Implement a water quality monitoring program; and
- Monitor tidal channel bathymetry, channel bank stability, and changes related to sea level rise.

Replacement of the existing culvert in the Bolsa Cell with a new water control structure would require excavation within the existing levee and the edges of the adjacent wetland, resulting in temporary impacts to habitat and native vegetation. For the most part, the levee banks are covered with rip rap to reduce the potential for erosion and levee failure. However, some wetland and wetland/upland transition vegetation is present on the banks and along the top of the levee. This vegetation would be removed when the old culvert is removed and the new water structure is constructed. To compensate for the loss of native vegetation, the site of the old culvert and any exposed areas around the new water control structure would be revegetated with appropriate native habitat following construction. Impacts to adjacent subtidal habitat would be temporary and following project completion would be expected to quickly reestablish through natural plant recruitment. All mitigation for the permanent loss of native habitat would be mitigated using replacement ratios appropriate for the affected habitat. The implementation of site-appropriate BMPs to reduce erosion, as described in Section 4.2.2.2, would reduce the potential for indirect impacts to surrounding native habitat to below a level of significance.

An excavator with a hydraulic hammer would be used to break apart an estimated 1,400 to 1,600 metric tons of concrete and debris from the marsh. The majority of the construction activity could be implemented from existing roadways located near the site of the debris. Once the material is broken up, it would be loaded by excavator into trucks to be hauled away for appropriate disposal. In those places where the debris extends below the marsh surface, the concrete would be removed with an excavator, and the vacated area would be filled with appropriate material from on site to reestablish the appropriate marsh elevation. The proposed activity could result in temporary impacts to marsh habitat; however, following the removal of the debris from the site, appropriate marsh plants would be installed in disturbed areas to restore the native vegetation. Overall, the proposal would have a beneficial effect on the habitat quality of the marsh.

Proposals related to the expansion of monitoring, species surveys, and habitat studies would require access into sensitive habitat areas, however, with adherence to appropriate protocols for minimizing trampling of vegetation and using non-motorized boats to access remote areas of the marsh, impacts to these habitats would be minimal. To ensure that all efforts to minimize impacts to Refuge resources are implemented, the Refuge Manager would be responsible for developing protocols and sharing this information with all monitors, surveyors, and researchers prior to commencement of specific field activities.

The proposal to increase the opportunities for scientific research on the Refuge could result in minor trampling of vegetation. However, measures to avoid such impacts, involving the inclusion of conditions within individual Refuge Special Use Permits related to where and how sensitive resource areas can be accessed and general oversight of research activities by the Refuge Manager, would reduce the potential for adverse impacts to below a level of significance.

**Pest Management**
Potential effects to Refuge habitat associated with the implementation of the IPM Plan would be minor, temporary, or localized in nature. Along with the selective use of pesticides, the IPM program also describes other appropriate strategies (biological, physical, mechanical, and cultural methods) to eradicate, control, or contain pest species in order 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 species as a result of low toxicity, short persistence in the environment, and implementation of BMPs. The implementation of 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 Section 5 of the Final IPM Plan for a complete listing of BMPs) would ensure that adverse effects to non-target vegetation is minimized and/or avoided.

The proposal to expand control of invasive plant species to beyond the boundaries of the Refuge through a cooperative effort with the Navy would be implemented in accordance with the IPM program and would therefore also have minor, temporary, or localized impacts on native Refuge habitat.

Under this alternative, mosquito management would be implemented through Special Use Permits issued to the OCVCD. The OCVCD has requested that the Refuge consider the use of an additional product larvicide, Natular, on the Refuge. Therefore the use of the product is being evaluated as part of this alternative.

The effects of Agnique MMF on salt marsh vegetation are unknown, while spinosad, the active ingredient in Natular, is known to be partly taken up by leaf tissue. Spinosad has a low potential for acute toxicity to aquatic plants and a moderate potential for acute toxicity to algae. USEPA categorizes spinosad as highly toxic to bees. It can also impact species in the orders Lepidoptera and Coleoptera (Thompson et al. no date), including some pollinating insects. As a result, use of this product has the potential to adversely affect specific invertebrate-plant interactions (e.g., pollination) on the Refuge.

BMPs that address proper handling and application of pesticides to minimize impacts to non-target species, including plants, would be included in future Special Use Permits for mosquito control. These BMPs and the stipulations included in the Compatibility Determination for Mosquito Management (Appendix E-3 of the Final CCP) would be incorporated in the annual SUP issued to the OCVCD, therefore, ensuring that the potential for adverse effects to sensitive plant resources would be minimized.

**Public Use**
Alternative B would continue the limited public use program currently conducted on the Refuge, as well as expand opportunities for scientific research on the Refuge. As described for Alternative A, these uses would not result in significant adverse effects to subtidal, intertidal, coastal salt marsh, transitional, and upland habitats.

### 4.3.3 Alternative C (Proposed Action) – Optimize Upland/Wetland Restoration, Improve Opportunities for Wildlife Observation

**Wildlife and Habitat Management**
Under Alternative C, the areas of subtidal habitat would not change, but as in Alternative B, areas of non-native upland habitat would be restored to salt marsh, mudflats, and transitional habitats. Although the proposed restoration sites under Alternative C would be generally the

same as under Alternative B, under Alternative C, there would be a greater mix of upland and wetland/upland transitional habitat than is proposed in Alternative B.

A 21-acre area located to the north of Case Road Pond and a 9.4-acre area to the southeast of 7th Street Pond would be restored to a range of habitats, including intertidal mudflat, salt marsh, wetland/upland transition, and coastal sage scrub. The intertidal habitats (i.e., mudflat, salt marsh) would also include meandering shallow subtidal channels with gentle side slopes to provide a diversity of microhabitats. A strip of land to the west of 7th Street, an area at the southwestern end of the 7th Street Pond, and the area around the existing drop tower (refer to Figure 2-5) would be restored to wetland/upland transitional habitat and the area located to the east of the drop tower would be restored to salt pan habitat. All of the areas proposed for restoration are currently dominated by non-native upland vegetation; therefore, no direct impacts to sensitive native habitats would result from the proposed restoration. To avoid indirect impacts to sensitive native habitats during restoration, the implementation of the BMPs described in Section 4.2.2.2, would minimize the potential for erosion or sedimentation in existing native habitat areas. In addition, sensitive habitat located in proximity to a proposed restoration area would be fenced prior to any construction activity to ensure that inadvertent entry into sensitive habitat areas is avoided. Overall, the replacement of non-native vegetation with native coastal habitat would represent a benefit to the environment.

Other potential beneficial effects of Alternative C related to habitat include the establishment of one or more populations of the federally listed endangered salt marsh bird's-beak as part of marsh restoration efforts, improving the quality of the Refuge's cordgrass-dominated salt marsh habitat by pumping clean sediment of appropriate grain size and nutrient content onto a portion of the marsh, and restoration of wetland/upland habitat in the vicinity of the drop tower.

In addition to restoration, Alternative C includes a number of other management activities intended to support the trust resources on the Refuge. These management activities include those proposed under Alternatives A and B (the potential effects of which have been addressed previously), as well as the following additional activities that could have an effect on habitat or vegetation:

- Improve the habitat quality of the Refuge's cordgrass-dominated salt marsh habitat;
- Manage some areas of salt pan and upland habitat to support tiger beetles;
- Establish one or more populations of salt marsh bird's-beak on the Refuge, and;
- Remove the drop tower located near 7th Street Pond.

Under Alternative C, a management plan would be developed to determine how best to manage existing salt pan and wetland/upland transition areas to support the various species of tiger beetles present on the Refuge. Until the management plan is prepared, it is not possible to determine all of the actions that may be proposed for implementation; however, it is anticipated that these actions would result in improvements to existing and/or restored habitat and would not have any adverse effects of sensitive habitats or vegetation.

The removal of the drop tower located at the end of 7th Street would allow for full restoration of the area in and around the current site of the drop tower to native habitat; therefore, no impacts to sensitive habitat or vegetation would result from this proposal.

Also under this alternative, efforts to understand and improve the quality of the Refuge's cordgrass-dominated salt marsh habitat would be expanded beyond the study described in Alternative B to include consideration for examining the effectiveness of pumping clean sediment of appropriate grain size and nutrient content onto a specified portion of the marsh, as illustrated in Figure 2-5. Enough sediment would be distributed over the existing vegetation to provide for a slight increase in the elevation of the marsh plain, while still enabling the vegetation to grow up through the added sediment. This activity, which would be limited to a few locations within the marsh, is intended to improve the vigor and overall health of the cordgrass, therefore, the temporary impacts to these areas would be offset by improved habitat value following establishment of the affected cordgrass vegetation.

**Pest Management**

The analysis of potential effects to habitat quality from the implementation of the IPM Plan and proposed mosquito management would be generally the same under this alternative as described previously for Alternative B. Natular would not be permitted for use on the Refuge under this alternative.

**Public Use**

The visitor services opportunities described in Alternative A would continue to occur under Alternative C. As described for Alternative A, these uses would not result in significant adverse effects to sensitive habitats or vegetation. Alternative C also includes proposals that would expand to a limited extent the existing public uses already implemented on the Refuge. The expansion of these uses, which would include additional Refuge tours and/or bird watching events, would not result increase the potential for impacts to sensitive habitats. The site of the proposed two-level, 20-foot-high observation tower, which is located along the east side of Kitts Highway across from the Refuge headquarters, does not currently support native vegetation; therefore, no adverse effects to sensitive habitat or vegetation would result from this project.

## 4.4 Effects to Wildlife and Fisheries

The effects to wildlife and fisheries of implementing the various alternatives are described here. Once again, potential impacts to these resources are characterized by evaluating direct, indirect, and cumulative effects. Direct impacts involve the primary effect of implementing an action, such as the flushing of foraging shorebirds as a result 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 increasing the availability of fish in the vicinity of seabird nesting areas following levee breaching. Cumulative impacts would occur when the incremental direct or indirect impact of an action is added to other related actions that would affect the same species (or group of species), such as the effect of expanding nesting habitat for the light-footed clapper rail on the Refuge combined with similar habitat expansion elsewhere in the region. An effect to wildlife and fisheries would be considered significant if:

- An action would result in a substantial change in the amount or quality of available habitat of a wildlife species.
- An action would result in a substantial adverse effect, either directly or through habitat modifications, on any wildlife or fish species identified as a sensitive or special status species in local or regional plans, policies, or regulations or by California Department of Fish and Game (CDFG) or the Service, or any avian species identified as a Bird of Conservation Concern.

- There would be a permanent loss of occupied sensitive species habitat or the direct mortality of individuals of sensitive species as a result of a 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 would impede the use of native wildlife nursery sites for longer than two weeks.
- There would be a substantial reduction in the population abundance of fish species inhabiting Anaheim Bay as a result of a proposed action.
- An action would substantially change in the availability of habitat for fish.

A significant cumulative impact would result from habitat modifications affecting wildlife and/or fish that would be considered minor for the proposed action but when considered in light of other similar losses within the region would be considerable.

## 4.4.1 Alternative A – No Action

### 4.4.1.1 Effects to Waterfowl, Seabirds, Shorebirds, and Other Waterbirds

**Wildlife and Habitat Management**

Under Alternative A, current wildlife and habitat management activities on the Refuge, including invasive plant control, trash and debris removal, culvert maintenance and replacement, environmental contaminants coordination, native upland plant restoration, species surveys, and predator management, would continue. As described in the previous section, these activities would not result in significant adverse effects to sensitive habitats, including habitats that support foraging, resting, or breeding birds. However, these activities could result in the flushing of foraging or nesting birds. To minimize the effects of such disturbance, management activities with the potential to disturb nesting birds are generally limited to periods outside the breeding season, and where such activities must occur during the nesting season, they are not conducted in proximity to known or potential nesting areas. In addition, activities related to surveys, monitoring, and invasive plant species control are generally limited to one or two days a month and generally for periods not longer than two to four hours. The Refuge Manager also schedules these activities to avoid peak migration periods. Through the implementation of these considerations, the potential for significant adverse effects related to changes in the presence, populations, or distribution of waterbirds on the Refuge is less than significant. Further, the implementation of these activities is considered cumulatively beneficial.

The implementation of the Endangered Species Management and Protection Plan (USFWS and U.S. Navy, Naval Weapons Station Seal Beach 1991) has resulted in the loss of one great blue heron (*Ardea herodias*). In 2007, lethal removal of the great blue heron was required after the heron was observed eating least tern chicks. In total, four chicks were confirmed taken by this heron (Ross 2007). No predation by herons was observed in subsequent years; however, there is the potential that the lethal take of a heron could occur again in the future if an individual heron is thought to pose a risk to a listed species supported on the Refuge. Because the lethal take of a heron is a very rare event, the continued implementation of predator management on the Refuge would not represent a significant impact to the local heron population.

**Pest Management**

Mechanical and chemical control of invasive weedy plants is conducted on the Refuge primarily within the disturbed uplands that surround the salt marsh complex. Some invasive plant control also occurs on the least tern nesting site on NASA Island and on Hog Island, a natural upland area on the Refuge. This activity can result in disturbance to migratory birds; 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 invasive plant control is only implemented periodically throughout the year.

The primary herbicides used on the Refuge contain the active ingredient glyphosate. These herbicides, including Aquamaster and Glyphosate Pro 4, are post-emergent, systematic herbicides with no residual soil activity. These products are acceptable for use in wetland areas and wildlife management areas and if used in accordance with the product label, would not adversely affect waterbirds. Surflan AS, containing the active ingredient oryzalin, is used strictly in upland areas to control saltbush, Bermuda grass, mustard, salt cedar, and other invasive weeds. This product is a pre-emergent, surface-applied chemical that does not control emerged weeds. When used in accordance with label instructions, this product will not adversely affect waterbirds or other wildlife. Habitat, containing the active ingredient imazapyr, is used on the Refuge to control perennial pepperweed, myoporum, Brazilian pepper, and other invasive shrubs and trees. USEPA (2006a) has determined that this product poses no risks of concern to birds.

The pesticides currently used by the OCVCD to control mosquito populations on the Seal Beach NWR have been approved through the PUP review process. These pesticides include the larvicides *Bacillus thuringiensis israelensis* (Bti) and *Bacillus sphaericus* (Bs) and Altosid®, a biochemical pesticide with the active ingredient methoprene. Methoprene is to be used on the Refuge only as a second line of defense.

Testing indicates that when Bti and Bs are used according to label directions these microbial pesticides pose no significant direct effect to non-target species or the environment (USEPA 2007b). The products are not considered toxic to mammals, birds, fish, and most non-target invertebrates (insects and worms) (Davis and Peterson 2008); however, some research indicates that there may be indirect effects on the ecosystem as a result of multiple applications of these products. These effects relate to disruptions in the invertebrate food web that can affect non-target wetland fauna (Hershey et al. 1998, Poulin et al. 2010). According to USEPA evaluations of ecological effects on mallard ducks and bobwhite quail, methoprene is considered practically non-toxic to birds (USEPA 2001).

The Compatibility Determination for Mosquito Management (Appendix E-3 of the Final CCP) includes a list of stipulations that, when implemented, would ensure the compatibility of this use with the purposes of the Refuge and the mission of the Refuge System. These stipulations also serve as mitigation to ensure that no significant adverse effects to Refuge resources would result from the implementation of mosquito monitoring and control on the Refuge.

**Public Use**

Public tours of the Refuge are generally limited to the areas around the visitor contact station and the trail that extends along Bolsa Avenue from Kitts Highway to the existing observation deck. The potential for flushing waterbirds from these locations is relatively low because of the distances between the public use areas and high use waterbird habitat. Additionally, public tours are only conducted once a month, so the overall effect on wildlife from this activity is low. Special bird watching tours are also conducted on the Refuge, but most of the bird observation is conducted from existing roads or pathways. Although there is a greater potential for flushing foraging birds during these events than from general public tours, disturbance is still considered relatively low. Therefore, the continuation of the limited public use program as currently conducted on the Refuge is not expected to cause adverse effects to waterfowl, seabirds, shorebirds, and other waterbirds.

#### 4.4.1.2 Effects to Landbirds

**Wildlife and Habitat Management**

The effects to landbirds as a result of implementing the wildlife and habitat management activities proposed under Alternative A would be similar to those described for waterbirds. Specifically, actions related to invasive species control, surveys and monitoring, trash and debris removal, and culvert maintenance/replacement could result in some disturbance to landbirds, however, the extent and duration of disturbance would be limited and all activity in potential nesting areas would be avoided during the nesting season.

Predator management conducted on the Refuge in accordance with the Endangered Species Management and Protection Plan (USFWS and U.S. Navy, Naval Weapons Station Seal Beach 1991) would continue to result in the loss of some individual landbirds considered a threat to the endangered California least tern and light-footed clapper rail. The effects of predator management on landbirds was addressed in detail in the Endangered Species Management and Protection Plan Environmental Impact Statement (EIS) prepared by the Service and the Navy in 1990 and the Record of Decision, which was signed in 1991. Both documents are incorporated by reference into this environmental assessment (EA). The Endangered Species Management and Protection Plan EIS (USFWS and U.S. Navy, Naval Weapons Station Seal Beach 1991) concludes that the removal of a few problem raptors would not affect the overall population levels of any species of raptor supported on the Refuge or Naval Weapons Station Seal Beach. In addition, implementation of predator management would benefit ground-nesting birds, such as mourning doves and killdeer.

Between 2007 and 2009, the number of landbirds controlled to protect endangered species was very low. In 2007, three ravens were lethally removed from the site and a red-tailed hawk (*Buteo jamaicensis*) and a kestrel (*Falco sparverious*) were trapped and transported to a distant location for release (Ross 2007). In addition, non-lethal hazing of peregrine falcons (*Falco peregrinus*) was implemented after frequent intrusions into the least tern nesting site were observed. Although labor intensive, hazing proved to be very effective at discouraging falcons from entering the nesting colony. In 2008, two kestrels were trapped and transported to a distant location for release, and peregrine falcons and a female northern harrier (*Circus cyaneus*) were successfully hazed from the nesting colony (Ross 2008). American kestrels were once again observed hunting in the nesting colony in 2009. This resulted in two kestrels being live trapped and transported to an offsite location for release. An additional kestrel had to be lethally removed. Hazing was effective in discouraging a red-tailed hawk and a peregrine falcon from hunting in the site (Ross 2009).

Based on the small number of landbirds lost to predator control, the continuation of past predator management practices is not expected to result in any significant changes in the current population of landbirds on the Refuge or Naval Weapons Station Seal Beach.

**Pest Management**

As described, birds foraging and nesting on the Refuge are not considered at risk as a result of the use of the herbicides and mosquito control products currently being used on the Refuge. However, some research indicates that there may be indirect effects on the ecosystem as a result of multiple applications of mosquito control products. These effects relate to disruptions in the invertebrate food web that can affect non-target fauna (Hershey et al. 1998, Poulin et al.

2010). For instance, the availability of prey for birds such as swallows could be adversely affected over time. There is, however, limited research on this topic; therefore, the degree to which Refuge birds could be impacted is not known.

**Public Use**
The effects to landbirds from continuing the limited public use program currently conducted on the Refuge would be similar to those described for waterbirds. No significant adverse impacts to landbirds are therefore anticipated.

#### 4.4.1.3 Effects to Fish and other Marine Organisms

**Wildlife and Habitat Management**
Continuing to conduct wildlife and habitat activities related to trash and debris removal, invasive plant control, culvert maintenance and periodic replacement, environmental contaminants coordination, native upland plant restoration, species surveys, and predator management would have limited potential for impacts to fish and marine organisms. Of the management activities proposed under Alternative A, culvert maintenance/replacement and invasive plant control would have the potential for adverse impacts to fish and other marine organisms if BMPs are not implemented as part of these activities. To avoid any adverse effects to these species, activities related to the inspection, cleaning, and/or replacement of culverts would include the implementation of BMPs. Culverts are generally inspected on an annual basis and cleaned every 5-10 years, if needed. Replacement only occurs if there is significant evidence of corrosion. To reduce the potential for impacts to fish and other marine organisms from these activities, BMPs, as described in Section 5.2.1.6, would be implemented to minimize the introduction of sediment into the Refuge's wetland areas, reduce the potential for increased turbidity levels within the water column, prevent general degradation of water quality, reduce the potential loss of fish during construction, and avoid impacts to eelgrass habitat. Any impacts to eelgrass habitat would be mitigated in accordance with the requirements of the Southern California Eelgrass Mitigation Policy, adopted July 31, 1991.

**Pest Management**
As described in Section 4.4.1.1, invasive plant control on the Refuge currently involves mechanical removal, as well as the application of herbicides. Glyphosate-based herbicides are post-emergent, systematic herbicides acceptable for use in wetland areas. If used in accordance with the product label, these products pose no hazard to fish or other marine organisms. Specifically, terrestrial formulations of these herbicides are only used in upland areas and a minimum buffer of 50 feet is maintained between application areas and adjacent wetlands. Additionally, on this Refuge, aquatic formulations of glyphosate-based herbicides are only used along the margins of wetland areas and a minimum buffer of 25 feet is maintained between the application area and the adjacent wetland.

Surflan AS, which contains the active ingredient oryzalin, is toxic to fish and therefore is not permitted for use in wetland areas. When used in accordance with label instructions and in association with BMPs, this product is not expected to adversely affect fish or other marine organisms.

Further, microbial larvicides and methoprene are used on the Refuge by the OCVCD to control mosquitoes. When applied in accordance with label directions, microbial larvicides (Bti and Bs) are not expected to pose a risk to fish or other marine organisms.

Methoprene applied at levels recommended on the label are not likely to be toxic to non-target species. For example, methoprene was found to have an effect on copepods, crabs, and shrimp, although these effects were generally observed at concentrations higher than those of operational rates (Bircher and Ruber 1988, Marten et al. 1993, Hershey et al. 1998). According to the latest USEPA fact sheet for methoprene (USEPA 2001), data generated under laboratory and field conditions indicate that methoprene mosquito product formulations, including slow release briquette formulations, have a maximal rate of release of ≤ 4 parts per billion (ppb). The typical amount of methoprene necessary for mosquito control is < 1.0 ppb. The initial concentrations of methoprene when applied to aquatic habitats may reach 4 to 10 ppb, but residual concentrations are approximately 0.2 ppb (Ross et al. 1994). Most non-target organisms support margins of safety of >200 ppb, therefore, exposure to methoprene would not be expected to reach levels which are toxic to aquatic non-target species either after acute or chronic exposure. Once methoprene is released into the aquatic environment, it is non-persistent with a half-life of about 30-40 hours.

The conclusions of a few longer term studies of the effects of Bti and methoprene on the environment do, however, indicate that repeated use of these products may have indirect effects related to disruptions in the invertebrate food web that could affect non-target wetland fauna (Hershey et al. 1998, Poulin et al. 2010). The general conclusion of these studies is that an integrated approach to mosquito control is necessary to avoid long-term detrimental effects on the environment that appear to be occurring as a result of the continuous (year after year) application of these types of pesticides within a given area (Hershey et al. 1998, Walker et al. 2005, Tilquin et al. 2008, Poulin et al. 2010). To minimize the potential for impacts to fish and other marine organisms from mosquito control, the OCVCD's Special Use Permit limits the application of these products to areas around the perimeter of the salt marsh complex.

**Public Use**

The current public use program does not include any uses with the potential to impact fish or marine organisms. Research activities are directed by the Refuge Manager through Special Use Permits that include project specific conditions to avoid any adverse effects to Refuge resources. Therefore, no adverse effects to fish or marine organisms would result from the continuation of these programs.

#### 4.4.1.4 Effects to Terrestrial Invertebrates, Amphibians, and Reptiles

**Wildlife and Habitat Management**

The Refuge management activities that would continue under Alternative A would have limited potential for impacts to terrestrial invertebrates, amphibians, or reptiles in part because population numbers and appropriate habitat to support these organisms is relatively low on the Refuge. Mechanical removal of invasive vegetation could adversely affect some individuals, but such losses would be low and therefore not considered significant. In areas that have the potential to support tiger beetles, habitat disturbance associated with Refuge management is minimized to the maximum extent practicable. Generally, non-native plant control and culvert maintenance are not required in these areas. Other activities, such as trash removal, surveys/monitoring, and predator control when conducted in these areas, are limited to reduce the potential for direct and indirect impacts to these invertebrates.

**Pest Management**

Based on available literature, the USEPA has concluded that glyphosate is practically nontoxic to invertebrates, including honeybees (USEPA 1993). The use of products with the active ingredient oryzalin is not expected to impact terrestrial invertebrates, amphibians, or reptiles.

In addition, oryzalin is classified as practically nontoxic to honey bees (USEPA 1994). According to the USEPA ecotoxicity criteria, imazapyr is practically non-toxic to insects; however, little data is available regarding the toxicity effects of imazapyr to reptiles and amphibians. Adherence to the label requirements of these products and implementation of BMPs related to herbicide application will ensure that the use of these products on the Refuge will not adversely affect invertebrates or any reptiles and/or amphibians present on the Refuge.

Mosquito control involving the use of Bti and Bs are also not expected to significantly impact these organisms. The USEPA, after considering the available studies, has concluded that methoprene applied at levels recommended on the label is of low toxicity and poses very little hazard to non-target species (USEPA 2001). However, earlier studies of some species in the order Coleoptera did show some sensitivity to methoprene (Marten et al. 1993). This is of concern on the Refuge because at least two of the areas currently being treated for mosquitoes are believed to support one or more species of tiger beetles (in the order Coleoptera). A search of the existing literature did not find any studies that evaluated the effect of methoprene on tiger beetles; therefore, the risk of using this product in areas where these organisms occur is unknown. To avoid potential impacts to sensitive tiger beetle species, under this alternative, future SUPs for mosquito control will restrict the use of methoprene to those areas of the Refuge that are not known or expected to support high numbers of tiger beetles.

**Public Use**

Public use activities are primarily limited to existing roads and pathways; therefore, no adverse effects to terrestrial invertebrates, amphibians and reptiles would result from the continuation of the existing public use program on the Refuge.

#### 4.4.1.5 Effects to Mammals

**Wildlife and Habitat Management**

The management activities proposed under Alternative A would have minimal effect on the mammal populations that occur on the Refuge. The activity with the greatest potential for impact to mammals is predator management, which is implemented as part of the Endangered Species Management and Protection Plan (USFWS and U.S. Navy, Naval Weapons Station Seal Beach 1991).

Implementation of the predator management plan between 2007 and 2009 has only resulted in the lethal control of one mammal, a coyote (*Canis latrans*) in 2007. This individual was responsible for predating approximately 160 least tern nests before it was removed from the site (Ross 2007). In 2008, a small barrier fence was installed on each side of the site near the entrance to nesting area, to further discourage coyote activity in the vicinity of the nesting site. This management action proved effective. No evidence of coyote activity was observed near the site; therefore, no direct control of coyotes was required in 2008 or 2009. Based on past actions, continuing the existing predator management plan would not adversely affect the mammal populations on the Refuge.

**Pest Management**

The active ingredients glyphosate, oryzalin, and imazapyr are all considered to be practically nontoxic to mammals by the USEPA (USEPA 1993, USEPA 1994, USEPA 2006b); therefore, no adverse affects to mammal present on the Refuge are anticipated as a result of the continued use of these products in accordance with label requirements and the implementation of appropriate BMPs.

According to the USEPA, various tests conducted for Bti and Bs revealed no expected harm to non-target organisms, therefore, when applied in accordance with label directions, microbial larvicides (Bti and Bs) are not expected to pose a risk to mammals. Studies also demonstrate that in mammals, methoprene is rapidly and completely broken down and excreted, mostly in the urine and feces. It is considered non-persistent and non-toxic to mammals and presents no long-term hazard to mammals at recommended application rates (IPCS no date).

**Public Use**

None of the public use activities implemented on the Refuge would have the potential for adverse impacts to mammals, as all activities are limited to existing roads and pathways.

### 4.4.2 Alternative B – Maximize Salt Marsh Restoration, Continue Current Public Uses

#### 4.4.2.1 Effects to Waterfowl, Seabirds, Shorebirds, and Other Waterbirds

**Wildlife and Habitat Management**

Under this alternative, all of the actions described in Alternative A would also be implemented. Therefore, the effects on waterbirds of implementing these specific actions would be the same as those described for Alternative A.

In addition to the actions described in Alternative A, Alternative B would also involve the restoration of approximately 36 acres of disturbed upland to tidal wetland and wetland/upland transition habitat; the replacement of the existing culverts in the Bolsa Cell levee with a water control structure; the removal of concrete debris from the marsh; and the implementation of an IPM program for the Refuge. Restoration, installation of a water control structure, and removal of concrete debris would all result in temporary adverse impacts to waterbirds due to increased noise levels and overall disturbance from construction equipment. To avoid impacts to nesting birds, all construction activity would occur outside of the breeding season. The level of disturbance would also be minimized through appropriate siting of construction access routes. Access would be taken from areas furthest from existing wetlands. In addition, temporary fencing would be installed to delineate the construction site and keep construction equipment out of habitat areas. Although impacts related to disturbance would be adverse to foraging and resting waterbirds, these impacts would be short in duration and limited in area; therefore, the anticipated disturbance would be less than significant. Once completed, these actions would benefit waterbirds by improving habitat quality and/or providing additional areas for foraging and resting.

Installation of a water control structure within the Bolsa Cell levee would also provide enhanced management capabilities over the amount of tidal flow entering or exiting the Bolsa Cell. This would improve the function and habitat values of this area for waterbirds. Other additional actions associated with this alternative may also benefit waterbirds by improving the quality and quantity of habitat. For example, monitoring tidal channel bathymetry and channel bank stability, as proposed, could help protect natural marsh edges for shorebird foraging and as refugia for migratory bird during high tides.

**Pest Management**

Under Alternative B, the control of pests on the Refuge would be conducted using an integrated approach to pest management. The control of pests, other than mosquitoes, will be conducted in accordance with the IPM Plan prepared for the Seal Beach NWR (Appendix G), <u>while mosquito monitoring and control would occur in accordance the conditions included in</u>

annual Special Use Permits. Under this alternative, Natular, used to control mosquito larvae, would also be permitted for use on the Refuge.

Herbicide use currently being implemented on the Refuge, as described for Alternative A would also continue under this alternative. Additional products may also be approved for 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. These profiles provide quantitative assessment/screening tools and threshold values to evaluate potential effects to species groups (e.g., birds, mammals, and fish). A PUP (including appropriate BMPs) is approved where the Chemical Profiles provide 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 in order 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 as a result of low toxicity or short-term persistence in the environment. Therefore, waterbirds would not be substantially affected as a result of the use of these pesticides.

The proposal to expand control of invasive plant species to beyond the boundaries of the Refuge through a cooperative effort with the Navy would be implemented in accordance with the IPM Plan and would therefore also have the potential for only minor, temporary, or localized impacts to waterbirds.

Mosquito management proposed under this alternative would also be conducted through an integrated approach per the procedures implemented throughout the OCVCD. However, as described under Alternative A, most chemical control of mosquitoes can result in direct and indirect adverse effects to one or more non-target species. The altered ecological communities that may result from these control efforts can impact biological integrity and diversity through disruptions in food webs and other ecological functions. The effect to some waterbirds could be a temporary reduction in prey species at or near the control site. Some pesticides also have the potential to directly impact individual birds, as described in greater detail in subsequent text.

The OCVCD has requested consideration of two new products to control mosquitoes on the Refuge: Natular, a larvicide with the active ingredient spinosad, and Agnique®, a larvicide and pupacide made from renewable plant oils. The label for Natular identifies this product as toxic to aquatic organisms. In addition, non-target aquatic invertebrates may be killed in waters where this pesticide is applied. Agnique is potentially lethal to any aquatic insect that lives on the water surface or requires contact with the air-water interface. As a result, the use of either of these products on the Refuge could have indirect, albeit limited, effects on the food base of bird species that prey on aquatic insects.

In considering direct effects on birds, spinosad, the active ingredient in Natular, shows slight toxicity to birds, while Agnique, which is considered to be "practically nontoxic," is not known to cause direct chronic or acute toxicological effects to birds.

Based on studies of avian acute dietary toxicity and avian acute oral toxicity tests, USEPA (2008b) classifies phenothrin as practically non-toxic to avian species. Piperonyl butoxide, the other component of sumithrin, is also considered practically nontoxic to birds on an acute basis (USEPA 2006c).

Mosquito control could result in a temporary decrease in the availability of waterbird prey species in some portions of the Refuge should nontarget species be impacted by pesticide drift. The effects of pesticide drift and disturbance would be reduced through restrictions in the SUP on when and where pesticides can be applied on the Refuge and strict adherence to label requirements.

**Public Use**

As no new public use opportunities are proposed under Alternative B, the effects to waterbirds would be the same as those described for Alternative A.

#### 4.4.2.2 Effects to Landbirds

**Wildlife and Habitat Management**

All of the actions described in Alternative A (e.g., predator management, invasive plant control, culvert maintenance and/or replacement, monitoring) would also be implemented under Alternative B. Therefore, the effects of implementing these specific actions on landbirds would be the same as those described for Alternative A.

New actions proposed under Alternative B include the restoration of approximately 36 acres of disturbed upland to tidal wetland and wetland/upland transition habitat; the replacement of the existing culverts in the Bolsa Cell levee with a water control structure; the removal of concrete debris from the marsh; and the implementation of an IPM program for the Refuge. The restoration proposals included under Alternative B would eliminate some of the low-quality upland habitat present on the Refuge, replacing it with salt marsh and wetland/upland transition habitats. The proposal to convert disturbed upland habitat to native tidally influenced habitat would displace some resident or migratory landbirds, however, the numbers of landbirds affected would be low and no listed or special status landbird species would be affected. Therefore, the effect on landbirds of restoring habitat in accordance with Alternative B would be less than significant.
Changes to the water control structures in the Bolsa Cell and the removal of concrete from the marsh would have no effect on landbirds.

**Pest Management**

The potential for direct effects to landbirds from the implementation of the IPM Plan and mosquito management would be similar to those described in Section 4.4.2.1.

The expansion of mosquito control to include the use of a spinosad and monomolecular films could result in temporary and generally localized reductions in the availability of insect prey for upland birds due to the potential for these products to kill some non-target insect species (see Section 4.4.2.4 for additional details). This situation could adversely affect biological integrity and diversity on the Refuge through disruptions in food webs and other ecological functions. The implementation of the measures described in Section 4.4.2.1 would also minimize the effects of spray drift and disturbance on landbirds.

**Public Use**

As no new public use opportunities are proposed under Alternative B, the effects to landbirds would be the same as those described for Alternative A.

### 4.4.2.3 Effects to Fish and Other Marine Organisms

**Wildlife and Habitat Management**

Under this alternative, all of the actions described in Alternative A would also be implemented. Therefore, the effects to fish and other organisms of implementing these specific actions would be the same as those described for Alternative A.

In addition to the actions described in Alternative A, Alternative B would also involve the restoration of approximately 36 acres of disturbed upland to tidal wetland and wetland/upland transition habitat; the replacement of the existing culverts in the Bolsa Cell levee with a water control structure; the removal of concrete debris from the marsh; and the implementation of an IPM program for the Refuge. Restoration, installation of a water control structure, and removal of concrete debris would all have the potential for adverse impacts to fish and other marine organisms if BMPs are not implemented as part of project implementation. To avoid any short- or long-term adverse effects to these species, BMPs, as described in Section 4.2.1.6, would be implemented to minimize the introduction of sediment into the Refuge's wetland areas, reduce the potential for increased turbidity within the water column, prevent general degradation of water quality, reduce the potential loss of fish during construction, and avoid impacts to eelgrass habitat.

**Pest Management**

The pest management actions described under Alternative A would likely continue as part of the proposed IPM Plan to be implementation under Alternative B. Therefore, the potential effects of continuing to use the pesticides described under Alternative A would also occur under this alternative. In addition, under the IPM Plan, any new pesticide products proposed for use on the Refuge would be evaluated using scientific information and analyses documented in "Chemical Profiles." Following this procedure would ensure that potential impacts to biological resources, including fish and other marine organisms, would be minor, temporary, or localized in nature. Additionally, this evaluation would ensure that appropriate BMPs can be implemented to further control the potential effects of the proposed product. Thus, potential impacts to fish and other marine organisms from implementing the proposed IPM Plan would be less than significant.

The proposal to expand control of invasive plant species to beyond the boundaries of the Refuge through a cooperative effort with the Navy would be implemented in accordance with the IPM Plan and would therefore be unlikely to have any effect on fish or marine organisms.

<u>Implementation of mosquito management under this alternative could result in the use of additional pesticides on the Refuge. Expanding the types of mosquito control used on the Refuge (which would require approval through the PUP review process) would result in potential impacts to fish and marine organisms as described in subsequent text</u>.

<u>The mosquito larvicide Natular™ includes the active ingredient spinosad, a product of bacterial fermentation. Spinosad, classified as a "reduced-risk" compound by the EPA, triggers continuous involuntary nervous stimulus in mosquito larvae that leads to paralysis and death. It is a broad-spectrum pesticide, although it is only active if ingested or contacted while in liquid form. The label for Natular ™ states that this product is toxic to aquatic organisms and non-target aquatic invertebrates may be killed in waters where this pesticide is applied. Spinosad also shows moderate toxicity to fish. The liquid form of spinosad is highly toxic to marine mollusks on an acute basis (Material Safety Data Sheet May 2002). Spinosad is also identified as moderately toxic to fish. Intertidal habitat extends almost to the edges of the</u>

Refuge; therefore, the use of this product even in the areas currently designated for mosquito control could adversely affect the marine organisms present in these estuarine habitats.

Agnique is considered "practically nontoxic." Studies show no effects on the various life stages of long-nose killifish, fiddler crab, snail, or marine plants. This product is, however, potentially lethal to any aquatic insect that lives on the water surface or requires contact with the air-water interface. As a result, its use on the Refuge could have adverse indirect effects on the food base of fish species that prey on aquatic insects, but these effects are considered minimal.

Implementation of BMPs, the stipulations in the Compatibility Determination for Mosquito Management, and the conditions included in annual SUPs would ensure that impacts to fish and other marine organisms are minimized and temporary in nature.

**Public Use**

As no new public use opportunities are proposed under Alternative B, the effects to fish and other marine organisms would be the same as those described for Alternative A.

#### 4.4.2.4 Effects to Terrestrial Invertebrates, Amphibians, and Reptiles

**Wildlife and Habitat Management**

Reptiles and amphibians are generally not well represented within salt marshes and marine habitats, and the limited amount of upland area on the Refuge generally supports low quality non-native habitat. As a result, species diversity of these organisms on the Refuge is low. The Refuge management activities described in Alternative A would also be implemented in Alternative B, and as previously described, these activities would not result in any significant impacts to terrestrial invertebrates, amphibians, or reptiles.

The proposed restoration of the majority of the Refuge's remaining disturbed upland habitat to tidally influenced habitat could adversely affect some individuals of native terrestrial invertebrates and reptiles, but such losses would be low and therefore not considered significant. In areas around the 7th Street Pond, where tiger beetles may be present, a more detailed survey of potential tiger beetle habitat would be conducted prior to completing specific restoration plans for adjacent upland areas. If important tiger beetle habitat is identified, preservation of that habitat, as appropriate, would be incorporated into the future restoration design for that area.

**Pest Management**

Implementation of the IPM Plan for the Refuge, as described, would ensure that no adverse effects to the Refuge's terrestrial invertebrates, amphibians, or reptiles would occur as a result of the use of pesticides. Studies indicate sensitivity of some species in the order Coleoptera to methoprene (*Marten et al. 1993*). This is of concern on the Refuge because at least two of the areas currently being treated for mosquitoes are believed to support one or more species of tiger beetles (in the order Coleoptera). A search of the existing literature did not find any studies that evaluated the effect of methoprene on tiger beetles; therefore, the risk of using this product in areas where these organisms occur is unknown. To avoid any adverse effects to tiger beetles, the Compatibility Determination for Mosquito Management (Appendix E-3 of the Final CCP) includes the stipulation that Altosid can only be applied in locations approved by the Refuge Manager.

Of the mosquito control products proposed for use on the Refuge under this alternative, Natular has the potential to adversely affect terrestrial invertebrates. The USEPA categorizes spinosad as highly toxic to bees, with topical acute activity of less than 1 microgram per bee. It also impacts species in the orders Lepidoptera and Coleoptera (Thompson et al. no date). Some spinosad products are used to kill fire ants, a soil dwelling species. It is not known if these or other spinosad-based products could have adverse effects on native ants or other soil fauna. As a result, native pollinators and other non-target species could be at risk should this product be used on the Refuge.

**Public Use**

As no new public use opportunities are proposed under Alternative B, the effects to insects, reptiles, and amphibians would be the same as those described for Alternative A.

#### 4.4.2.5 Effects to Mammals

**Wildlife and Habitat Management**

Under Alternative B, all of the actions described in Alternative A would also be implemented. Therefore, the effects to mammal as a result of implementing these specific actions, including predator management, would be the same as those described for Alternative A.

Impacts to land mammals would be similar to those described for landbirds in that upland habitat would be converted to wetland and transitional habitat resulting in the loss of habitat to support upland oriented species. The mammalian species that occur on the Refuge also occur on the adjacent uplands of Naval Weapons Station Seal Beach, as well as along the edges of the marsh, therefore, some habitat to support these species will continue to be present on the Refuge. Because the population of mammals on the Refuge is small and no special status or sensitive species are supported exclusively on the Refuge, the loss of upland habitat would not represent a significant adverse impact to mammals.

Avoidance of significant adverse effects to seals and sea lions that occasionally enter the Refuge through the larger tidal channels that extend to Perimeter Pond and 7th Street Pond would occur through the implementation of measures similar to those described to protect sea turtles during construction and culvert replacement. These measures include conducting presence/absence surveys prior to construction, monitoring for these species during construction, and installing appropriate barriers, as appropriate, to keep these species out of the restoration areas during construction.

**Pest Management**

Implementation of the IPM Plan for the Refuge, as described, would ensure that no adverse effects to the Refuge's mammals would occur as a result of the use of pesticides.

The pesticides proposed for use under this alternative to control mosquitoes are not expected to adversely affect mammalian species supported on the Refuge. Spinosad is relatively low in toxicity to mammals (Thompson et al. no date), while no effects to mammals would be expected as a result of the use of Agnique MMF.

**Public Use**

As no new public use opportunities are proposed under Alternative B, the effects to mammals would be the same as those described for Alternative A.

### 4.4.3 Alternative C (Proposed Action) – Optimize Upland/Wetland Restoration, Improve Opportunities for Wildlife Observation

#### 4.4.3.1 Effects to Waterfowl, Seabirds, Shorebirds, and Other Waterbirds

**Wildlife and Habitat Management**

Management actions under Alternative C would be similar to those provided under Alternative B. The primary difference between the two alternatives involves the types of habitats that would be restored. Under Alternative C, there would be a greater mix of upland and wetland/upland transitional habitat restored than is proposed in Alternative B. Despite this difference, the effects to waterbirds of implementing the restoration proposals included under Alternative C would be generally the same as those described for Alternative B.

The proposal to improve the habitat quality within a portion of the Refuge's cordgrass-dominated salt marsh habitat would have a temporary adverse effect on waterbirds as a result of the disturbance and temporary loss of habitat from placing a thin layer of soil on top of the existing cordgrass vegetation. This activity would occur outside of the nesting season and outside of peak migration periods to minimize impacts to avian species present in the marsh. Only a small portion of the marsh would be impacted at any one time and cordgrass would be expected to grow up through the soil within several months, therefore, impacts would be short in duration and limited in area resulting in less than significant impacts to avian species. This activity is expected to improve habitat quality within cordgrass habitat resulting in benefits to a variety of marsh-dependent avian species.

The removal of the drop tower would eliminate a current great blue heron nesting site. In 2009, approximately three pair of herons nested on the drop tower and similar numbers of nesting pairs have used the tower over the last several years (pers. comm. John Fitch, April 7, 2010). Herons have also been observed nesting in the eucalyptus trees on Naval Weapons Station Seal Beach near the recreational vehicle park, located to the northwest of the Refuge, and on buoys in the outer portion of Anaheim Bay. The drop tower supports relatively few nesting herons compared to other known nesting sites in Orange County, including nesting sites at Anaheim Lake, where up to 50 nesting pairs have been observed and Irvine Lake where up to 40 nests have been observed (Hamilton and Willick 1996). Although the removal of the drop tower would displace nesting herons, the elimination of this nesting site would not represent a significant adverse impact to the regional population of nesting great blue herons. Other nesting opportunities are available in the area, including elsewhere on Naval Weapons Station Seal Beach, at Bolsa Chica, and in various locations in adjacent Huntington Beach and Long Beach.

**Pest Management**

The analysis of potential effects to waterfowl, seabirds, shorebirds, and other waterbirds from the implementation of the IPM Plan and mosquito management would be the same under this alternative as described previously for Alternative B; however, the use of Natular is not proposed under this alternative.

**Public Use**

The visitor services opportunities described in Alternative A would continue to occur under Alternative C and additional opportunities for public use would also be provided, including increasing the number of days available annually for Refuge tours and/or bird watching events and constructing a two-level, 20-foot-high observation tower along the east side of Kitts Highway across from the Refuge visitor contact station. Although the number of tours and bird watching events would increase, the areas used to accommodate these activities would remain the same. As result, the potential for flushing waterbirds would remain relatively low and the frequency of disturbance would still be limited to just a few times a month. Therefore, the public use program proposed under Alternative C would not be expected to result in any significant adverse effects to waterfowl, seabirds, shorebirds, and other waterbirds.

#### 4.4.3.2 Effects to Landbirds

**Wildlife and Habitat Management**

All of the actions described in Alternative A (e.g., predator management, invasive plant control, culvert maintenance and/or replacement, monitoring) and the majority of the actions described in Alternative B, with the exception of the specific restoration proposals, would also be implemented under Alternative C. Therefore, the effects of implementing these specific actions on landbirds would be similar to those described for Alternatives A and B.

The primary difference between Alternatives B and C with respect to landbirds is the proposal in Alternative C to restore native upland habitat near the northeast corner of the Case Road Pond and the southeast corner of the 7th Street Pond instead of wetland/upland transition habitat, as proposed under Alternative B. In total, approximately 36 acres of disturbed upland would be restored under Alternative C, with 11 acres to be restored to coastal sage scrub habitat (refer to Figure 2-5). The proposed restoration would eliminate much of the low-quality upland habitat present on the Refuge, which would displace landbirds during construction. This would represent a temporary adverse impact, but the impacts would not be considered significant because the numbers of landbirds affected would be low and no listed or special status species supported by upland habitat would be affected. The establishment of 11 acres of coastal sage scrub habitat on the Refuge would provide long-term benefits to landbirds, including raptors whose prey base would increase slightly as a result of the availability of new native upland habitat.

Although the removal of the drop tower near the 7th Street Pond would eliminate perching opportunities for raptors and other landbirds, this action would not represent a significant adverse effect to landbirds because there are numerous perching opportunities available for these birds just beyond the Refuge boundary. The actions associated with improving habitat quality within portions of the Refuge's cordgrass habitat would have no effect on landbirds.

**Pest Management**

The analysis of potential effects to landbirds from the implementation of the IPM Plan and mosquito management would be the same under this alternative as described previously for Alternative B; however, the use of Natular is not proposed under this alternative.

**Public Use**

Alternative C would expand available public use opportunities on the Refuge as described in Section 4.4.3.2; however, the level of disturbance to landbirds as a result of this limited increase in public use would be less than significant. The observation platform would be constructed on disturbed habitat that only supports limited numbers of landbirds; therefore, no impacts to and birds are anticipated as a result of this proposal.

### 4.4.3.3 Effects to Fish and Other Marine Organisms

**Wildlife and Habitat Management**

The impacts to fish and other marine organisms as a result of implementing Alternative C would be similar to those described under Alternative B. All of the measures discussed in Section 4.4.2.3 to avoid significant adverse impacts to fish and other marine organisms would also be implemented under Alternative C. Benefits to fish and other marine organisms would be slightly lower than those provided under Alternative B, as approximately 11 acres of the proposed restoration area would be restored to upland rather than tidally influenced habitat under Alternative C.

Removal of the drop tower would have no effect on fish or other marine organisms, while the proposal to improve habitat quality within portions of the Refuge's cordgrass habitat could adversely affect marine organisms. To minimize the potential for impacts to fish and other marine organisms as a result of depositing a layer of clean material over portions of the Refuge's cordgrass habitat, silt fencing or other techniques for controlling sediment movement outside of the proposed enhancement area would be installed to reduce the potential for increased turbidity throughout the marsh. In addition, treatment areas would be limited in size to further reduce the effects of this activity on overall water quality within the Refuge.

**Pest Management**

The analysis of potential effects to fish and other marine organisms from the implementation of the IPM Plan and mosquito management would be essentially the same under this alternative as described previously for Alternative B. The exception is that the use of Natular is not proposed under this alternative, therefore, potential adverse effects to marine and estuarine organisms related to use of Natular would not occur.

**Public Use**

Expansion of the public use program and construction of an observation tower would have no effect on fish or other marine organisms.

### 4.4.3.4 Effects to Terrestrial Invertebrates, Amphibians, and Reptiles

**Wildlife and Habitat Management**

The impacts to terrestrial invertebrates, amphibians, and reptiles, particularly sea turtles, as a result of implementing Alternative C would be similar to those described under Alternative B. All of the measures discussed in Section 4.4.2.4 to avoid significant adverse impacts to sea turtles would also be implemented under Alternative C. As noted earlier, amphibians and reptiles are generally not well represented on the Refuge, and impacts to these organisms as a result of restoration would be minimal. Restoring approximately 36 acres of low quality upland habitat would reduce the area available to support terrestrial invertebrates, amphibians, and reptiles; however, the proposal to restore approximately 11 acres of high quality coastal sage scrub habitat would actually improve overall conditions on the Refuge for these species.

Under Alternative C, in addition to conducting directed surveys for tiger beetles, if possible, a tiger beetle management plan would be implemented that identifies measures for protecting, maintaining, and where necessary, enhancing habitat to protect current tiger beetle species abundance and diversity on the Refuge. Thus, Alternative C would be the most beneficial of the three alternatives for tiger beetles.

The removal of the drop tower and the proposal to enhance habitat quality in portions of the Refuge's cordgrass-dominated salt marsh habitat would have no effect on terrestrial invertebrates, amphibians, or reptiles.

**Pest Management**

The analysis of potential effects to terrestrial invertebrates, amphibians, and reptiles from the implementation of the IPM Plan and mosquito management would be the same under this alternative as described previously for Alternative B; however, the use of Natular is not proposed under this alternative.

**Public Use**

Expansion of the public use program and construction of an observation tower would have no effect on terrestrial invertebrates, amphibians, or reptiles.

#### 4.4.3.5 Effects to Mammals

**Wildlife and Habitat Management**

Impacts to land mammals would be similar to those described for landbirds, in that disturbed upland habitat would be converted to wetland, transitional, and native upland habitat. This would result in the temporary loss of approximately 36 acres of upland habitat and the permanent loss of 26 acres of upland habitat. Because the population of mammals on the Refuge is small and no special status or sensitive species are supported exclusively on the Refuge, this loss of upland habitat would not represent a significant adverse impact to mammals.

Avoidance of significant adverse effects to seals and sea lions would occur through the implementation of measures similar to those described to protect sea turtles during construction and culvert replacement. These measures include conducting presence/absence surveys prior to construction, monitoring for these species during construction, and installing appropriate barriers, as appropriate, to keep these species out of the restoration areas during construction.

**Pest Management**

The analysis of potential effects to mammals from the implementation of the IPM Plan and mosquito management would be the same under this alternative as described previously for Alternative B; however, the use of Natular is not proposed under this alternative.

**Public Use**

Expansion of the public use program and construction of an observation tower would have no effect on the limited number of mammals present within the Refuge.

## 4.5 Effects to Endangered and Threatened Species and Other Species of Concern

The direct, indirect, and cumulative 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. A significant cumulative impact would result from habitat modifications affecting listed or special status species that would be considered minor for the proposed action but would be significant when considered in light of other similar losses within the region.

## 4.5.1 Alternative A – No Action

### 4.5.1.1 Effects to California Least Tern

**Wildlife and Habitat Management**

Management activities currently being implemented on the Refuge would continue under Alternative A. Those existing activities that could have a direct effect on the California least tern include annual maintenance of the least tern nesting site at NASA Island, including site preparation, invasive weed control, and fence repair; implementation of predator management; conducting the Eyes on the Colony volunteer program; monitoring of the least tern nesting colony throughout the nesting season; monthly bird surveys, and periodic night surveys. The majority of these activities are implemented to benefit the least tern nesting colony. Other activities associated with Refuge management such as trash and debris removal are scheduled to avoid sensitive locations during the nesting season, while major projects such as culvert maintenance or replacement would occur outside of the nesting seasons. These measures would avoid any potential impacts to nesting terns.

Temporary disturbance of nesting terns can occur when site monitors enter or get close to the nesting area. This disturbance can cause adult terns to momentarily leave the nest, putting chicks or eggs at risk of predation. To reduce the potential for disturbance, monitoring protocols, such as limiting the number and duration of visits to the nesting site, are implemented throughout the nesting season. Past experience has 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.

On-site monitoring also facilitates timely adaptive management. If, during monitoring, it is determined that disturbance impacts are becoming a threat to the nesting terns, the existing protocols can be reevaluated and additional measures (e.g., greater use of blinds, further limiting the time spent in the colony, scheduling monitoring activities to avoid periods of increased disturbance from other sources, such as adverse weather conditions or the presence of potential predators) can be implemented. Another benefit of monitoring is the ability to quickly respond to any signs of potential predation, thus avoiding any loss of adult terns, chicks, or eggs.

Depredation of California least terns by mammalian and avian predators was the primary limiting factor to the reproductive success of this species throughout its range in 2000, however, in 2008, overall least tern mortality due to non-predation factors was greater than mortality due to predation (Marschalek 2009). At Seal Beach NWR in 2008, an estimated 206 nests were established on NASA Island, but only 44 fledglings were produced. It is believed that great blue heron predation was responsible for the high levels of mortality at this site. The implementation of predator management on the Refuge is intended to benefit the least tern by reducing mortality in the tern nesting colony through the control of potential predators before they enter the site. Unfortunately, this is not always possible, and predators do find access into the site. For mammalian predators, this often occurs at night, while avian predation can occur at any time. The predator management program as currently implemented does not result in any adverse impacts to the nesting terns, but does provide important benefits. The overall effectiveness of the program could be improved by enhancing visual access into the nesting area for the Eyes on the Colony volunteers.

An issue that may arise in the near future is the predation of young least tern chicks by gull-billed terns, a Bird of Conservation Concern. Predation of least tern chicks by gull-billed terns has been repeatedly documented in San Diego County, and at least one account of predation by a gull-billed tern was recorded in Orange County during the 2009 nesting season. A pair of gull-billed terns was observed picking up two least tern chicks on NASA Island in June 2009, but for unknown reasons, the chicks were dropped and the gull-billed terns ultimately left the site. The current predator management plan for the Refuge does not address specific measures for controlling gull-billed terns either directly or indirectly; therefore, adverse effects to least terns as a result of gull-billed tern predation could occur in the future. The Service is currently meeting to develop management solutions for the benefit both species. Depending upon the types of solutions approved to address this issue, amendments to the existing predator management plan for Seal Beach NWR could be proposed at some time in the future. Substantive changes or additions to the way in which predator management is implemented on the Refuge would require additional NEPA compliance prior to the approval of the revised plan.

**Pest Management**

Herbicides are used on NASA Island to control invasive, weedy species. Applications within the nesting site are conducted outside of the nesting season when the terns are not present on the Refuge. Products that have been used in this area include Surflan AS, Glyphosate Pro 4, and Aquamaster. Surflan AS is an effective pre-emergent that has reduced the need for extensive annual control of weedy species. Glyphosate Pro 4 and Aquamaster are currently used for spot treatment of weedy plants on the nesting site. USEPA has determined that oryzalin, the active ingredient in Surflan, may be characterized as "slightly toxic" to birds in acute studies and "practically non-toxic" in dietary studies (USEPA 1994). Glyphosate is described by the USEPA as “no more than slightly toxic to birds” (USEPA 1993).

No mosquito monitoring or control is implemented on NASA Island or in the primary foraging areas around the nesting island, therefore, no adverse effects to terns as a result of mosquito control would be anticipated.

**Public Use**

No public use activities are permitted in the immediately vicinity of NASA Island during the nesting season, therefore, no impacts to nesting terns are anticipated as a result of continuing the current public use program on the Refuge. Volunteer activities, including clean-up and weed pulling on NASA Island occurs annually just prior to the commencement of nesting season. This public use activity represents a benefit to the nesting terns.

### 4.5.1.2 Effects to Light-footed Clapper Rail

**Wildlife and Habitat Management**

Current management activities conducted on the Refuge to protect and assist in the recovery of the light-footed clapper rail include pre-season nesting platform maintenance and replacement, monitoring during the nesting season, annual population estimates, occasional release of captive-bred rails into the marsh, and implementing predator management. All of these activities, which would continue under Alternative A, could result in potential adverse effects on the light-footed clapper rail. Additional activities conducted on the Refuge that could affect rails include: conducting monthly bird surveys; inspecting, removing trash and debris from the marsh; and maintaining and replacing culverts. To avoid impacts to nesting rails, all of these activities, with the exception of nesting season monitoring, predator management, and monthly bird surveys, would be conducted outside of the nesting season. This measure avoids the potential for disturbance-related impacts to rail fledgling success.

Outside of the breeding season, all activities that require access into the marsh are conducted in a manner that would avoid any direct impacts to rails, as well as minimize the potential for indirect impacts related to disturbance of individual rails and/or native marsh vegetation. Although most activities implemented on the Refuge occur on the edges of the marsh, some activities, such as the inspection or replacement of nesting platforms or conducting rail counts, require access into sensitive marsh habitat. To minimize disturbance to rails and vegetation, access into these areas is often obtain through the use of non-motorized boats, primarily canoes. The protocols followed when working in rail habitat have been established to ensure that no significant adverse impacts to rails would occur as a result of Refuge management activities.

**Pest Management**

Little, if any, herbicide application occurs in or near known light-footed clapper rail habitat, therefore, impacts related to disturbance and indirect impacts from the chemicals themselves would not be anticipated. Indirect impacts are also minimized by only applying herbicides in accordance with the product label.

The SUP issued each year to the OCVCD for mosquito management on the Refuge prohibits access into sensitive light-footed clapper rail habitat, therefore, impacts related to disturbance and indirect impacts from the mosquito control products currently used on the Refuge are not anticipated.

**Public Use**

No public use activities are permitted within the marsh; therefore, no impacts to the light-footed clapper rail are anticipated as a result of continuing the current public use program on the Refuge.

### 4.5.1.3 Effects to Western Snowy Plover

**Wildlife and Habitat Management**

<u>The first documented nesting of a western snowy plover on NASA Island occurred during the 2011 nesting season</u>. Prior to that, this species did not nest on the Refuge and was only observed on the Refuge in small numbers during the winter months. Other than general management of the coastal wetlands within the Refuge to benefit migratory birds, no programs or actions are implemented on this Refuge specifically to benefit the western snowy plover. <u>However, the actions taken to prepare NASA Island for annual California least tern</u>

nesting, as well as predator management and monitoring conducted at NASA Island during the nesting season, would benefit this species as well.

**Pest Management**

Herbicide treatment does not occur in proximity to potential western snowy plover foraging habitat and mosquito control does not occur during the time that plovers would be likely to occur on the Refuge; therefore, no adverse effects to plovers would result from the implementation of pest management on the Refuge under this alternative.

**Public Use**

The potential effects to the western snowy plover of continuing to implement the existing public use program on the Refuge would be the same as those described for waterbirds in Section 4.4.1.1.

#### 4.5.1.4 Effects to Salt Marsh Bird's-Beak

**Wildlife and Habitat Management**

Salt marsh bird's-beak is not currently known to occur on the Refuge; however, there are historic accounts of its presence around Anaheim Bay. Several unsuccessful attempts have been made in the past to establish a population of this species on the Refuge. Alternative A would not renew these attempts; therefore, this alternative would neither benefit nor impact this listed species.

**Pest Management**

Salt marsh bird's-beak is not currently known to occur on the Refuge, and Alternative A would not renew attempts to establish this species on the Refuge; therefore, no effects to this species would result from ongoing pest management.

**Public Use**

Salt marsh bird's-beak is not currently known to occur on the Refuge; therefore, no adverse or beneficial effects to salt marsh bird's-beak would result from the public use program carried out under Alternative A.

#### 4.5.1.5 Effects to Eastern Pacific Green Turtle

**Wildlife and Habitat Management**

Eastern Pacific green turtles have been observed in the $7^{th}$ Street Pond as well as the channel leading to the $7^{th}$ Street Pond, therefore, any enhancement work or culvert replacement projects proposed in this area, as well as throughout the Refuge, could adversely affect this species if appropriate measures are not implemented to ensure their safety. The Refuge Manager will coordinate with NOAA National Marine Fisheries Service staff, who initiated a sea turtle monitoring effort on the Refuge in 2011, to ensure that appropriate measures are implemented as part of future projects to protect turtles from harm during and after construction. Such measures include but are not limited to conducting presence/absence surveys for turtles prior to and during any proposed construction, using impingement barrier structures, rock filters, or other types of exclusion structures around temporary water intake structures to prevent turtle entrainment, prohibiting the placement of any materials into subtidal habitat that have the potential for entangling sea turtles, and considering potential turtle movement in the design and sizing of culverts and water control structures. Coordination with NOAA and the incorporation of these measures into future construction project specifications would avoid any adverse effects to sea turtles.

**Pest Management**

Activities associated with invasive plant control and mosquito management would not be expected to adversely affect the sea turtles that are occasionally present on the Refuge, provided all pesticides are applied in accordance with label requirements.

**Public Use**

The public uses permitted on the Refuge under Alternative A are restricted to the roads and pathway that traverse the upland areas surrounding the Refuge's sensitive wetland areas. The open water areas of the Refuge where sea turtles have been observed are closed to any public use; therefore, the potential for disturbance from the public is minimal and there is no potential for direct impacts related to public use on the Refuge. Therefore, no adverse effects to sea turtles would result from the public use program carried out under Alternative A.

#### 4.5.1.6 Effects to Belding's Savannah Sparrow

**Wildlife and Habitat Management**

Belding's savannah sparrows occur year-round on the Refuge. Under Alternative A, continuing management actions to support the State endangered Belding's savannah sparrow would include limiting human disturbance within Belding's savannah sparrow habitat, particularly during the nesting season, and accommodating the statewide Belding's savannah sparrow survey that is conducted approximately every five years. The potential effects to this species of implementing Alternative A would be similar to those described for waterbirds in Section 4.4.1.1.

**Pest Management**

Human activity associated with mosquito management could result in disturbance to Belding's savannah sparrow, which occur along the upper edges of the marsh and within the wetland/upland transition areas. To minimize disturbance to this species, mosquito monitoring and control is limited to specific locations on the Refuge (see Chapter 2 of the EA), and within those locations, all activity must be conducted on foot. Specifics regarding where and how access can occur in and around the marsh is provided in detail in the SUP that is prepared annually for this use. No significant adverse effects to this species are anticipated as a result of continuing the current mosquito control practices on the Refuge.

**Public Use**

Activities associated with the existing limited public use program, which includes Refuge tours and bird watching opportunities is generally confined to the existing streets and pathways within the Refuge. Further, in most cases, these streets and pathways extend around large areas of salt marsh rather than through the marsh. Considering the limited human presence on the Refuge (i.e., approximately two to three events per month) and the separation of that limited human activity from high quality Belding's savannah sparrow habitat, the levels of disturbance that could affect this species are low and do not represent a significant adverse effect.

### 4.5.2 Alternative B – Maximize Salt Marsh Restoration, Continue Current Public Uses

#### 4.5.2.1 Effects to California Least Tern

**Wildlife and Habitat Management**

In addition to those steps and measures undertaken on behalf of the California least tern under Alternative A, under Alternative B, the Refuge Manager would work with the Navy to reduce perching opportunities for raptors around the marsh. Potential actions could range from installing anti-perching materials on existing power poles and rooftops to relocating the existing poles well away from the marsh. Because several of the raptor species observed on Naval Weapons Station Seal Beach are known to prey on least tern adults and chicks, eliminating potential perching sites could reduce the incidence of avian predation and disturbance in the least tern colony, representing a benefit to least terns.

Other activities proposed under Alternative B, such as removal of concrete and debris from the marsh and installing a new water control structure to improve water circulation in the Bolsa Cell, would be implemented during the non-breeding season, therefore, these activities would have no effect on least terns. In addition, the implementation of a water quality monitoring program would have no effect on least terns, as monitoring stations would be established away from sensitive nesting and foraging areas.

**Pest Management**

Implementation of an IPM Plan, which is designed to minimize the potential for impacts to Refuge resources, would have effects similar to those described for waterbirds in Section 4.4.2.1. Mosquito management, which would involve mosquito control and monitoring, does not occur in the vicinity of NASA Island. Therefore, no adverse effects to the least tern are anticipated as a result of mosquito monitoring and control.

**Public Use**

The potential effects to least terns of implementing public use proposals as described in Alternative B would be the same as those described for waterbirds in Section 4.4.1.1.

#### 4.5.2.2 Effects to Light-footed Clapper Rail

**Wildlife and Habitat Management**

In addition to those actions to be undertaken on behalf of the light-footed clapper rail under Alternative A, under Alternative B, the Refuge Manager would work with the Navy to reduce perching opportunities for raptors around the marsh, as well as work with researchers and others to develop a better understanding of the habitat qualities and species dynamics of the natural rail nesting areas located between Hog Island and Perimeter Pond. Efforts will be made to identify those factors that may favor natural nesting in this area; to compare fledgling success rates for natural areas versus nesting platforms; and to determine what options might be available for improving nesting habitat quality for rails in other parts of the marsh. All of these actions could result in benefits for the rail population on the Refuge.

Among the other actions proposed under Alternative B that could benefit the rail is the installation of a water control structure in the Bolsa Cell levee. This water structure would allow the water levels in the Bolsa Cell to be adjusted to maintain tidal elevations in portions of the cell at levels optimal for supporting cordgrass habitat. The tide gate could also be adjusted in the future in response to sea level rise. Proposals to restore additional salt marsh habitat on the Refuge could also benefit rails once the habitat is established.

The construction of the water control structure, removal of concrete and debris from the marsh, and restoration adjacent to rail habitat could result in temporary adverse impacts to the rail. To minimize the potential direct and indirect effects of construction on the rail, various measures would be incorporated into the scope of work, including prohibiting any construction during the nesting season, conducting presence/absence surveys for rails in construction areas that could support rails, and providing temporary fencing of the construction site perimeter to discourage rails from entering the site and keeping construction equipment out of sensitive habitat. The implementation of these measures would reduce the potential for adverse effects to rails.

**Pest Management**

The potential effects to light-footed clapper rails of implementing the IPM Plan and mosquito monitoring would be essentially the same as those described for waterbirds in Section 4.4.2.1.

**Public Use**

The potential effects to light-footed clapper rails of implementing public use proposals as described in Alternative B would be the same as those described for waterbirds in Section 4.4.1.1.

#### 4.5.2.3 Effects to Western Snowy Plover

**Wildlife and Habitat Management**

The only recorded nesting of western snowy plover on the Refuge occurred during the 2011 nesting season. This nesting occurred on NASA Island; therefore, the potential effects to western snowy plover under Alternative B would be similar to those described for California least tern in Section 4.5.2.1.

**Pest Management**

The potential effects to the western snowy plover of implementing the pest management proposals described in Alternative B would be the same as those described in Section 4.5.1.3.

**Public Use**

The potential effects to western snowy plovers of implementing public use proposals as described in Alternative B would be the same as those described for waterbirds in Section 4.4.1.1.

#### 4.5.2.4 Effects to Salt Marsh Bird's-Beak

**Wildlife and Habitat Management**

Salt marsh bird's-beak does not presently occur on the Refuge; however, unsuccessful attempts to establish it here have been made in recent decades. Alternative B does not propose to renew these attempts; therefore, the implementation of Alternative B would have no effect on this listed species.

**Pest Management**

Salt marsh bird's-beak is not currently known to occur on the Refuge and Alternative B would not renew attempts to establish this species on the Refuge; therefore, no effects to this species would result from ongoing pest management.

**Public Use**

Salt marsh bird's-beak is not currently present on the Refuge, and no attempts to reestablish it on the Refuge are proposed under this alternative; therefore, no adverse or beneficial effects to salt marsh bird's-beak would result from the public use program carried out under Alternative B.

#### 4.5.2.5 Effects to Eastern Pacific Green Turtle

**Wildlife and Habitat Management**

Coordination with NOAA and incorporation of measures such as those described in Section 4.5.1.5 into the scope of the restoration and enhancement projects proposed under Alternative B would minimize the potential for impacts to sea turtles.

**Pest Management**

Implementation of the BMPs included in the IPM and conditions that will be included in annual SUPs for mosquito management would minimize the potential for impacts to water quality, thereby avoiding potential impacts to sea turtles.

**Public Use**

No adverse or beneficial effects to Pacific green sea turtle would result from the public use program carried out under Alternative B.

#### 4.5.2.6 Effects to Belding's Savannah Sparrow

**Wildlife and Habitat Management**

Under Alternative B, management actions such as limiting human disturbance in and around the marsh, particularly during the nesting season, and accommodating the statewide Belding's savannah sparrow survey, would continue. These actions provide direct and indirect benefits to the State endangered Belding's savannah sparrow, and would not result in any significant adverse effects to this species (refer to Section 4.5.1.5).

Other actions included in Alternative B, such as construction of the water control structure in the Bolsa Cell levee, the removal of concrete and debris from the marsh, species monitoring, and the restoration of various areas throughout the Refuge, could result in temporary adverse impacts to this species. To minimize the potential direct and indirect effects of construction on Belding's savannah sparrows, various measures would be incorporated into the scope of work, including prohibiting any construction during the nesting season and protecting sensitive salt marsh habitat adjacent to construction sites from temporary direct or indirect effects of construction by clearly delineating construction boundaries and monitoring construction activities throughout the duration of the project. In addition, time spent conducting monitoring and other activities in sensitive habitat areas would be limited to reduce the disturbance levels that could be associated with monitoring. The implementation of these measures would reduce the potential for adverse effects to Belding's savannah sparrows as a result of construction activities to below a level of significance.

Replacement of the existing culverts at the west end of the Bolsa Cell with a water control structure is expected to eliminate the fluctuations in tidal flow into the Cell that, over the years, have resulted in excessively high or low water levels and degraded water quality. This will in turn provide more consistent conditions in the Cell for supporting habitat preferred by the Belding's savannah sparrow. Based on previous modeling results (Sea Dyn, Inc. 1993), the higher high water and lower low water levels in the Bolsa Cell are directly influenced by the tidal regime in the mitigation channel. Therefore, the higher high water levels in the Bolsa Cell could achieve levels similar to those experienced in the Cell prior to the Port of Long Beach restoration project, while the lower low water levels would be approximately 0.3 feet higher than pre-restoration levels. The water control structure would therefore be used primarily to control the higher high tide levels in the cell, and these water levels would be regulated to optimize habitat for a range of wetland dependent species, including the Belding's savannah sparrow. The water control structure would also allow for adjustments in response to sea level rise.

Alternative B proposes to regulate water levels in the Bolsa Cell, as well as restore approximately 15 acres of coastal salt marsh. These proposals would benefit the Belding's savannah sparrow.

**Pest Management**

Herbicide treatments are generally limited to areas of disturbed weedy upland vegetation; therefore, impacts to Belding's savannah sparrow and its habitat are not anticipated. The implementation of the BMPs included in the IPM Plan for the Refuge would ensure that pesticides used during invasive plant control does not enter or drift over into occupied salt marsh habitat.

Potential effects to Belding's savannah sparrow as a result of mosquito management would be minimized through adherence to the conditions related to access and BMPs included in the annual SUP issued to the OCVCD. The potential for impacts related to specific control products used or proposed for use on the Refuge would be the same as those described in Sections 4.4.2.1 and 4.4.2.2.

**Public Use**

The effects of continuing the existing public use program, as proposed under Alternative B, would result in the same effects as described under Section 4.5.1.5.

### 4.5.3 Alternative C (Proposed Action) – Optimize Upland/Wetland Restoration, Improve Opportunities for Wildlife Observation

#### 4.5.3.1 Effects to California Least Tern

**Wildlife and Habitat Management**

The effects to the California least tern of implementing the actions described in Alternatives A and B would also be realized under Alternative C. Of the additional actions proposed under Alternative C, only the proposal to remove the drop tower would have an effect on the California least tern. Removal of the drop tower located at the end of $7^{th}$ Street would eliminate a significant avian predator perching spot. The drop tower is currently used by raptors, corvids, and great blue herons, all of which are known to prey on least tern adults, chicks, and/or eggs. Therefore, the removal of this tower would represent a benefit to the tern colony. Removal of the drop tower would occur outside of the breeding season to avoid any direct or indirect impacts to nesting least terns as a result of demolition. The differences in proposed habitat restoration between Alternatives B and C would have no effect on the least tern colony.

**Pest Management**

The analysis of potential effects to the California least tern from the implementation of the IPM Plan and mosquito management would be the same under this alternative as described previously for Alternative B.

**Public Use**

The limited increase in public use activities on the Refuge, as proposed under Alternative C, would have no effect on California least terns, as no public access is permitted in proximity to NASA Island during the tern nesting season. The elevated observation platform would be located a sufficient distance from the nesting colony to prevent its use as an avian predator perch and would therefore have no effect on least terns.

#### 4.5.3.2 Effects to Light-footed Clapper Rail

**Wildlife and Habitat Management**

The effects to the light-footed clapper rail of implementing the actions described in Alternatives A and B would also be realized under Alternative C. Of the additional actions proposed under Alternative C, the proposals to remove the drop tower and to study and implement actions to improve the quality of the cordgrass-dominated salt marsh habitat on the Refuge would have an effect on the light-footed clapper rail. Removal of the drop tower, which sits at the edge of the marsh, would eliminate a substantial perching structure, where avian predators known to prey on adult rails and chicks have been observed. The removal of this structure is therefore likely to benefit rails. Removal of the drop tower would occur outside of the breeding season to avoid any direct or indirect impacts to nesting rails as a result of demolition.

Proposals to better understand the natural nesting habitat requirements of the clapper rail and subsequent actions to improve habitat quality for the clapper rail are expected to benefit the rail population. However, measures will also be taken during the implementation of studies in the marsh to ensure that the Refuge's rail population is not subject to any significant adverse direct or indirect impacts. Disturbance during the nesting season to study nesting rails will be minimized to the maximum extent practicable and actions to improve habitat quality would only be implemented outside of the nesting season.

The effects to the clapper rail from the restoration proposals under Alternative C (more wetland/upland transitional habitat for refugia during higher high tides) would be different from those provided in Alternative B (more salt marsh habitat for foraging and/or nesting), but both would provide benefits to the rail following establishment.

**Pest Management**

The analysis of potential effects to the light-footed clapper rail from the implementation of the IPM Plan and mosquito management would be the same under this alternative as described previously for Alternative B.

**Public Use**

No public use activities are permitted within the marsh; therefore, no impacts to the light-footed clapper rail are anticipated as a result of the limited increase in public use proposed under Alternative C.

#### 4.5.3.3 Effects to Western Snowy Plover

**Wildlife and Habitat Management**

Other than general management of the coastal wetlands within the Refuge to benefit migratory birds, Alternative C does not include any programs or actions intended specifically for the benefit the western snowy plover. The potential effects to the western snowy plover of implementing Alternative C would be the same as those described for California least terns in Section 4.5.3.1 and for waterbirds in Section 4.4.3.1.

**Pest Management**

The analysis of potential effects to the western snowy plover from the implementation of the IPM Plan and mosquito management would be the same under this alternative as described previously for Alternative B.

**Public Use**
The visitor services opportunities described in Alternative A would continue to occur under Alternative C, and additional opportunities for public use would also be provided, including increasing the number of days available annually for Refuge tours and/or bird watching events and constructing a two-level, 20-foot-high observation tower along the east side of Kitts Highway across from the Refuge visitor contact station. Although the number of tours and bird watching events would increase, the areas used to accommodate these activities would remain the same. As result, the potential for flushing shorebirds, including wintering western snowy plovers, would remain relatively low and the frequency of disturbance would still be limited to just a few times a month. Therefore, public use program proposed under Alternative C would not be expected to result in any significant adverse effects to western snowy plovers.

### 4.5.3.4 Effects to Salt Marsh Bird's-Beak

**Wildlife and Habitat Management**
Under Alternative C, potential sites for the establishment of one or more populations of the salt marsh bird's-beak would be evaluated during the development of restoration plans for the area north of Case Road Pond, as well as for the area along the western edge of the Refuge. If appropriate locations are identified in one or both of these areas, actions to establish salt marsh bird's-beak would be initiated. The site would then be monitored for successful germination and plant development. If seeding is successful and plants produce flowers and set seeds, the site would be monitored annually to record the size and quality of the population at each site. Establishment of salt marsh bird's-beak at this location would represent a benefit to the species.

**Pest Management**
Herbicides, such as oryzalin (USEPA 1994), that have an acute risk to non-target plants, including threatened and endangered plants, would not be applied in proximity to any where attempts are being made to reestablish salt marsh bird's-beak. Additionally, implementation of the BMPs included in the IPM Plan would reduce the potential for unintended impacts to this species as a result of herbicide use on the Refuge.

If salt marsh bird's-beak is reestablished on the Refuge, the SUP prepared for annual mosquito monitoring and control would prohibit access to those areas where salt marsh bird's-beak is present. This would avoid any potential direct impacts to the species.

**Public Use**
Currently, no salt marsh bird's-beak is present on the Refuge; therefore, no adverse or beneficial effects to this species would result from the expanded public use program proposed under Alternative C. If establishment of this species on the Refuge is successful, appropriate measures would be implemented to keep the public out of areas where these plants are present.

### 4.5.3.5 Effects to Eastern Pacific Green Turtles

**Wildlife and Habitat Management**
Coordination with NOAA and incorporation of measures such as those described in Section 4.5.1.5 into the scope of the restoration and enhancement projects proposed under Alternative C would minimize the potential for impacts to sea turtles.

**Pest Management**
Implementation of the BMPs included in the IPM Plan and the conditions to be adhered to during mosquito management activities, as described in annual Special Use Permits, would minimize the potential for impacts to sea turtles.

**Public Use**
No adverse or beneficial effects to Pacific green sea turtle would result from the public use program carried out under Alternative B.

#### 4.5.3.6 Effects to Belding's Savannah Sparrow

**Wildlife and Habitat Management**
The effects to the Belding's savannah sparrow of implementing the actions described in Alternatives A and B would also be realized under Alternative C. Implementation of actions to protect other species, such as removing the drop tower and improving the quality of the cordgrass habitat on the Refuge, would occur outside of the breeding season and would be implemented in a manner that would minimize impacts to existing native habitat. No significant adverse effects to the Belding's savannah sparrow are anticipated as a result of implementing these actions.

**Pest Management**
The analysis of potential effects to the Belding's savannah sparrow from the implementation of the IPM Plan and mosquito management would be the same under this alternative as described previously for Alternative B.

**Public Use**
Recent research on the effects of disturbance on Belding's savannah sparrow indicates that overall tolerance of human disturbance varies depending upon the level of disturbance occurring in a given area, as well as between seasons (Fernández-Juricic et al. 2009).

In areas where there are little if any public use activities, alert and flight responses to human approaches were observed to be greater than those observed in higher use areas. Suggested reasons for this difference in response includes: habituation (birds become accustomed to some level of human disturbance) and, 2) existing vegetative structure (higher vegetation seems to screen approaching humans, some human activity can be closer before a bird takes flight). On the Refuge, the vegetation in the wetland/upland transition areas adjacent to Belding's savannah sparrow habitat is generally low; therefore, disturbance adjacent to remote areas of the Refuge would likely result in a trend for alert distance (the distance at which the bird becomes alert and flees the area) and flight distance (the distance fled) to be greater than in areas where human activity is slightly higher and/or the vegetation between the human use and the marsh is higher. There also appears to be a trend for greater alert distance and flight distance in the non-breeding season (Fernández-Juricic et al. 2009).

Public tours of the Refuge are conducted along an established route that directs people around the marsh, not through the marsh; therefore, the potential for disturbance to Belding's savannah sparrows is low. Increasing the number of tours permitted on the Refuge would not substantially change the overall effects of tours on Refuge resources, including the Belding's savannah sparrow. The proposed observation tower would be located in a disturbed area where no impacts to Belding's savannah sparrows are anticipated.

If changes in the tour routes are considered, the design of the route should take into consideration the recommendation that a setback of approximately 210 feet be provided between the public use area and existing breeding territories and/or areas frequently used by the Belding's savannah sparrow during the non-breeding season (Fernández-Juricic et al. 2009). With the implementation of these measures, no adverse or beneficial effects to the Belding's savannah sparrow would result from the expanded public use program proposed under Alternative C.

## 4.6 Effects to Cultural Resources

The National Historic Preservation Act (NHPA) of 1966, as amended, 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 National Register of Historic Places (NRHP), were described previously in Section 4.4.1 of the CCP. 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 Section 4.4.1 of the CCP.

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 State Historic Preservation Office/Tribal Historic Preservation Officer, and other interested parties, resulting in a Memorandum of Agreement (MOA); and
- Proceed in accordance with the MOA.

To determine if a proposed action could impact 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. For example, the APE for the restoration of salt marsh in several locations under Alternatives B and C would include those areas proposed for restoration. As described in Section 4.4.3 and shown in Figure 4-18 of the Final CCP, investigations, surveys and research have previously been conducted for various portions of the APE and cultural resources have been identified. By 1992, the majority of Naval Weapons Station Seal Beach had been surveyed, including all of the areas of dry land within the boundaries of the Refuge. One of the sites recorded during these surveys, CA-ORA-298, is located within the Refuge boundary. This site has been determined to be eligible for listing on the NRHP because the site is likely to yield information regarding coastal adaptation and settlement during the Late Prehistoric Period.

The Refuge's coastal wetland areas remain unsurveyed due to inaccessibility. The potential for archaeological resources to be present in the existing wetlands is low because these areas were also covered with water during the prehistoric occupation period. There is also the potential for yet undiscovered buried deposits to be present within the previously surveyed low-elevation dry areas within the Refuge. Surveys of these 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 or other activities that may affect historic resources.

An impact to cultural resources would be considered significant if it adversely affects a resource listed in or eligible for listing in the NRHP. In general, an adverse effect may occur if a cultural resource would be physically damaged or altered, isolated from the context considered significant, 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) Criteria of Adverse Effects</u>. 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) Examples of Adverse Effects</u>. Adverse effects on historic properties include but are not limited to:
>
> (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.

Cumulative impacts to cultural resources could result from individually minor but collectively significant actions taking place over a period of time.

### 4.6.1 Alternative A – No Action

**Wildlife and Habitat Management**

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. The Navy, as the landowner, also has responsibilities for insuring the protection of cultural resources within the Refuge.

In accordance with its responsibilities, the Navy has initiated cultural resource surveys for various projects on Naval Weapons Station Seal Beach and, as a result, all of the areas within the Refuge that are accessible have been surveyed for archaeological resources. These surveys resulted in the identification of one site (CA-ORA-298) within the Refuge boundary and several sites located on the adjacent Naval Weapons Station Seal Beach in proximity to the Refuge. The site located on the Refuge was previously tested and following evaluation was determined to be eligible for listing on the NRHP. Routine maintenance and monitoring activities, particularly when conducted with motorized vehicles, could adversely affect the site. The surface of the site has been subject to disturbance for decades, yet the integrity around the perimeter of the knoll is intact. A dirt road and turnabout on the top of the knoll are used periodically by the Refuge and Navy personnel, but the area is otherwise off-limits to the public. Because of the site's research potential, the current use of the road is being monitored for effects. It is recommended that if damage to the site is eminent, the site be protected or capped to prevent deterioration. The Service and Navy will coordinate the preservation efforts. Changes in the use of the area or the proposed preservation techniques will be assessed for effects in accordance with the regulations of the NHPA.

The Refuge's inaccessible wetlands have not been surveyed, and although there is a potential for archaeological resources to be present, this potential is low because these areas were also covered with water during the prehistoric occupation period. There is also the potential for yet undiscovered buried deposits to be present within the previous surveyed low elevation dry areas within the Refuge. Therefore, any ground-disturbing activities proposed within the Refuge boundary—either to accommodate wildlife and habitat management or public use—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.

The existing wildlife and habitat management activities implemented on the Refuge have limited or no potential for subsurface disturbance. For those activities that could result in ground disturbance, such as culvert replacement, the specific proposal is reviewed by the Service's Cultural Resources Program prior to implementation to ensure compliance with Section 106. The continuing to follow these established procedures would avoid any adverse impacts to cultural resources.

**Public Use**

The potential for ground-disturbing activities to occur in association with the Refuge's limited public use program is limited; therefore, no adverse effects to cultural resources are anticipated as a result of continuing the current public use program as proposed under Alternative A. Refuge staff will continue to work with the Navy to assess potential effects to CA-ORA-298 as a result of conducting special bird watching outings on the Refuge. If damage to the site is eminent, the site would be protected or capped to prevent deterioration. The Service and Navy will coordinate the preservation efforts.

### 4.6.2 Alternative B – Maximize Salt Marsh Restoration, Continue Current Public Uses

**Wildlife and Habitat Management**

All of the areas proposed for restoration have been previously surveyed and no cultural resources have been encountered. However, because two sites (P-30-001503 and P-30-001504) located on a low elevation dry area of Naval Weapons Station Seal Beach were found to contain buried archaeological deposits during excavation, low elevation dry areas within the Refuge may also have undiscovered buried deposits (Underwood and Cleland 2002). To avoid adverse effects to cultural resources, a map indicating the APE of all restoration projects along with a detailed project description would be submitted for review to the Service's Cultural Resources Program, as well as appropriate Navy cultural resources staff, prior to finalizing any proposed restoration plans. Based on this information, Service and Navy staff will determine the appropriate measures to be implemented to protect cultural resources. It is anticipated that the following measure would apply to all of the restoration projects proposed under this alternative:

> An archaeological monitor, meeting the Secretary of the Interior's guidelines, would be present during ground-disturbing activities in areas of sensitivity for archaeological resources. These areas include any dry section within the Refuge, as well as previously undisturbed wetland areas and any areas located in proximity to previously identified sites (e.g., CA-ORA-1463, CA-ORA-1455, P-30-001503, P-30-001504) whether they occur on the Refuge or on the adjacent Naval Weapons Station Seal Beach.

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 can 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 Office (SHPO), federally recognized tribes, and interested parties. Implementation of the procedures described is expected to avoid adverse effects to cultural resources.

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 Service would also work 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.

**Public Use**

The effects of implementing the public use proposals in Alternative B would be the same as those described under Alternative A.

### 4.6.3 Alternative C (Proposed Action) – Optimize Upland/Wetland Restoration, Improve Opportunities for Wildlife Observation

**Wildlife and Habitat Management**

Like Alternative B, Alternative C proposes habitat restoration for various locations within the Refuge. The measures described in Alternative B would also be implemented under Alternative C; therefore, with the implementation of these measures, no significant adverse effects to cultural resources as a result of habitat restoration are anticipated.

The only other wildlife and habitat management action proposed under Alternative C that could have an effect on cultural resources is the proposal to remove the drop tower. If the tower is still standing after 2014, it will have been in place for 50 years and would be required to be evaluated for listing on the NRHP prior to formally proposing its removal. If the structure is determined to be eligible to the NRHP, plans to demolish the structure would have to be assessed for potential effects to the historic property. Because the proposal calls for the removal of the structure, if it is deemed eligible to the NRHP, mitigation must be developed and stipulated in a Memorandum of Agreement (MOA) with SHPO and the Advisory Council on Historic Preservation. Other interested parties, such as local historical societies, would likely be interested parties in this process and would be invited to participate in the MOA. Following this procedure would ensure compliance with all applicable Federal policies related to the protection of historic properties; however, additional NEPA analysis would be required prior to removal if the structure were to be deemed eligible for listing on the NRHP. If the structure is removed before 2014 or it is determined that the structure does not meet the criteria for eligibility to the NRHP, then no adverse effects related to cultural resources would result from the removal of this structure.

**Public Use**

There is little potential for ground-disturbing activities to occur in association with an increase in the Refuge's limited public use program; therefore, no adverse effects to cultural resources are anticipated under Alternative C. As described under Alternative A, Refuge staff would continue to work with the Navy to assess potential effects to CA-ORA-298 as a result of conducting special bird watching outings on the Refuge.

Constructing the proposed observation tower could result in some ground disturbance associated with site preparation and footings, therefore, a map indicating the project's APE along with a detailed project description would be submitted for review to the Service's Cultural Resources Program, as well as appropriate Navy cultural resources staff. Based on this information, Service and Navy staff will determine the appropriate measures to be implemented to protect cultural resources. It is anticipated that an archaeological monitor, meeting the Secretary of the Interior's guidelines, would be required to be present during all ground-disturbing activities.

## 4.7 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, public safety, traffic circulation, public utilities/easements, vectors and odors, 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 would occur.
- Substantial changes in use or the intensity of use are proposed, where the resulting activity or use pattern would create significant noise, traffic, public safety, or similar environment impacts that would adversely affect the existing or future the use of adjacent areas.

The analysis of impacts related to public safety considers the level to which various current and past activities on or adjacent to the Refuge could pose a hazard to Refuge visitors and/or personnel. Adverse effects related to public safety would be considered significant if:

- Refuge visitors or personnel are present in areas identified by the Navy as potentially hazardous due to the presence or potential presence of ordnance or active small arms fire.

The analysis of impacts related to traffic circulation considers the estimated level of traffic that could be generated by the implementation of the strategies proposed under each alternative. Also included in this section is an analysis of the potential effects of increased traffic on local and regional traffic circulation. Adverse effects related to traffic would be considered significant if:

- Project-related traffic would exceed accepted increases in roadway volume to capacity ratios as established by the affected jurisdictions.

The public utilities/easements 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.
- Utilities or other public facilities would be relocated, either permanently or temporarily to accommodate a proposed action.
- Disruption of access to a public utility or other facility or temporary obstruction of an easement would occur during implementation of a proposed action.

With regard to vectors and odors, this section discusses the potential prevalence of vector populations under each of the alternatives, as well as the potential generation of unpleasant odors. Effects related to vectors would be considered significant if:

- Habitat changes would necessitate substantially increasing levels of mosquito abatement programs to maintain mosquito populations at pre-project levels (adverse).
- Habitat changes would result in a substantial decline of available mosquito breeding habitat (beneficial).

The generation of offensive odors could represent a nuisance to adjacent residents located in adjacent recreational areas, work sites, and commercial areas. Offensive odors can represent a significant adverse effect if the strength and/or the persistence of the odors are substantial and if the odors would affect a substantial number of people.

With regard to economics/employment, this section discusses the direct and indirect economic effects on the regional economy of implementing the various alternatives presented for the Refuge. 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).

The environmental justice 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.

## 4.7.1 Alternative A – No Action

### 4.7.1.1 Effects to Land Use

**<u>Wildlife and Habitat Management</u>**

Under Alternative A, all existing uses and activities on the Refuge would continue. These uses and activities, all of which would continue to be oriented towards wildlife conservation and habitat management, are consistent and compatible with the surrounding mix of land uses on the Naval Weapons Station Seal Beach and the adjacent City of Seal Beach as shown in Figure 4-16 in the Final CCP. Thus, no adverse effects to land use from the wildlife and habitat management associated with Alternative A are anticipated.

**<u>Public Use</u>**

Proposed public use opportunities at the Refuge, including public tours and bird watching opportunities, would be implemented in compliance with Naval Weapons Station Seal Beach's public access policies; therefore, no adverse effect to the uses on the Naval Weapons Station Seal Beach or the surrounding area would result from the continuation of this public use program.

### 4.7.1.2 Effects Related to Public Safety

**<u>Wildlife and Habitat Management</u>**

Management of the California least tern nesting population on NASA Island has historically included the use of volunteers to monitor and haze potential avian predators, such as crows and ravens, from the nesting site. The monitoring site for this activity is located in proximity to an existing small arms range located in the southeast corner of the intersection of Bolsa Avenue and Case Road. Having volunteers present in this area when the range is active or "hot" represents a potentially significant hazard to volunteers and Refuge staff. To avoid any significant safety issues, standard operating procedures have been developed between the Refuge and the Navy that requires coordination between Eyes on the Colony volunteers and the operators at the shooting range. Volunteers must be outside the area of potential effect of the shooting ranges at all times when the red flags are up signifying that the range is "hot."

To avoid the potential for impacts to Refuge personnel and volunteers implementing other wildlife and habitat management activities in the vicinity of the small arms range, advanced coordination with Naval Weapons Station Seal Beach is required.

Because of the military activities that have occurred on the lands within the Refuge in the past, Refuge staff coordinates with Naval Weapons Station Seal Beach prior to any significant ground disturbance in areas with the potential to support unexploded ordinance or other discarded munitions. Two areas of particular concern at within and surrounding 7th Street Pond (MRP Site UXO1) and around the drop tower (MRP Site APC2).

**Pest Management**

The PUP review process is employed to ensure that all chemical pesticides approved for use on the Refuge have been reviewed for their potential impacts not only to the environment, but also to Refuge staff and visitors. Refuge staff and other agencies permitted to apply pesticides on the Refuge are required to comply with use and application instructions on the pesticide labels, which include specifications for personal protective equipment, user safety, storage and disposal, mixing, application, and, where necessary, appropriate signage to keep the public out of recently sprayed areas. Adherence to these specifications would minimize the potential for public safety impacts related to the use of pesticides on the Refuge.

**Public Use**

To ensure public safety, visitors are escorted onto the Refuge by Refuge staff and volunteers. Pedestrian access is supervised at all times and is restricted to the existing pedestrian pathway that extends along Bolsa Avenue between the native plant garden at the visitor contact station to the existing observation deck. Other public access onto the Refuge, such as special tours, are also conducted by volunteers and supervised by Refuge staff.

#### 4.7.1.3 Effects to Traffic Circulation

The current vehicle trips generated as a result of Refuge-related management and public use activities are estimated at a maximum of 10 trips per day during the work week. About 50 to 60 trips may be generated on a weekend day when a public event is occurring on the Refuge. Because the volume of traffic generated by Refuge uses is very low and the majority of the trips occur during non-peak hours, activities on the Refuge have no observable effects on the local and regional transportation system.

#### 4.7.1.4 Effects to Public Utilities/Easements

**Wildlife and Habitat Management**

The Refuge works closely with Naval Weapons Station Seal Beach's Public Works Department to ensure that none of the wildlife and habitat management activities implemented on the Refuge would result in impacts to existing public utilities or easements within or outside of the Refuge boundaries. Therefore, Alternative A would not adversely affect public utilities or easements.

**Public Use**

Continuation of the existing public use program currently implemented on the Refuge would have limited impacts on public utilities (i.e., limited water consumption and utilization of the sewage system during public tours) and no impacts to existing easements. Therefore, the implementation of the public uses proposed under Alternative A would not result in any significant adverse effects to existing public utilities and easements.

#### 4.7.1.5 Effects Related to Vectors and Odors

**Wildlife and Habitat Management**

The only management activity that would be implemented on the Refuge under Alternative A that could have an effect on vectors and odors is the proposal to maintain the existing culverts within the restored wetlands. Maintaining these culverts in a manner that ensures adequate tidal circulation with the restored wetlands would reduce the potential for habitat beneficial to mosquito production. The majority of the areas on the Refuge that currently provide habitat for mosquitoes would remain unchanged under this alternative.

**Pest Management**

As described in Chapter 3 of the CCP, Section 4.3.4.4 of the CCP, and elsewhere in this chapter, mosquitoes, generally considered a vector requiring some level of control, occur on the Refuge. Mosquito control on the Refuge is implemented by the OCVCD in accordance with conditions included in a Refuge SUP, which is issued annually by the Refuge Manager. Mosquito control would continue under Alternative A, and stipulations in the Compatibility Determination for Mosquito Management (Appendix E-3 of the Final CCP) would ensure that no adverse effects to Refuge resources would result from the implementation of mosquito management on the Refuge.

Given Anaheim Bay's status as a reasonably well-flushed coastal salt marsh, characterized by healthy levels of dissolved oxygen, odors do not appear to be a problem at present for nearby residents and visitors. This would not change under Alternative A, and thus this alternative would have no impact related to odors.

**Public Use**

The public use activities proposed under Alternative A would have no adverse effects related to vectors and odors.

#### 4.7.1.6 Effects to Economics/Employment

**Wildlife and Habitat Management**

Under Alternative A, the Refuge would continue to maintain its existing staffing levels (i.e., one full-time permanent Refuge Manager and one part-time term maintenance worker). Therefore, the effects to economics and employment at the local and regional level of implementing Alternative A would be negligible.

**Public Use**

Since the Refuge would continue to have limited opportunities for public access, the economic benefit of the Refuge to the regional economy is low. The Refuge does, however, provide some regional economic benefits. An estimate of these benefits was developed using the procedures and data in *Banking on Nature 2006: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation* (Carver and Caudill 2007).

The estimate took into consideration the following information. The Refuge's average total number of visitors annually is approximately 1,000, with an average visit lasting four hours. The two special event days draw additional visitors. Since hunting and fishing are not allowed on this Refuge, all of the Refuge's visitors participate in non-consumptive activities such as interpretation and wildlife observation. The retail sales associated with Refuge visitation were calculated using visitor days and the average recreation expenditures per person per visitor day for the Region 1 area, which included California at the time the 2006 study was prepared. Retail sales include lodging and transportation. Table 4-3 depicts the estimated visitation and expenditures for the Seal Beach NWR in 2006 based on this study. Expenditures are likely to be somewhat lower in 2010 as a result of the current economic downturn.

| Table 4-3 Estimated Visitation and Expenditures for the Seal Beach NWR in 2009 | | | |
|---|---|---|---|
| | **Number of Visitors** | **Visitor Days** | **Retail Sales** |
| Resident | 1,216 | 607.75 | $18,165 |
| Non-Resident | 215 | 107.25 | $11,687 |
| **Total Impacts** | **1,431** | **715** | **$29,852** |

Using these retail expenditures and a regional multiplier, the final demand was calculated, which is the difference in all final consumers' expenditures in the area attributable to Refuge visitation (Carver and Caudill 2007). This spending creates jobs. The IMPLAN software was used to calculate the jobs and tax revenue generated from the visitation of the Refuge using Orange County and Los Angeles County data (pers. comm. J. Caudill, 2008). These economic benefits are provided in Table 4-4. All of these benefits would continue under Alternative A.

| Table 4-4 Economic Impacts from Seal Beach NWR Visitation in 2006 | | | | | |
|---|---|---|---|---|---|
| | **Final Demand[1]** | **Jobs** | **Job Income** | **Federal Tax Revenue** | **State and Local Tax Revenue** |
| Resident | $32,384 | 0.6 | $13,587 | $2,798 | $2,458 |
| Non-Resident | $21,589 | 0.35 | $7,539 | $1,963 | $1,654 |
| **Total Impacts** | **$53,973** | **0.95** | **$21,126** | **$4,761** | **$4,112** |

[1] Final demand is the difference in all final consumers' expenditures in the area attributable to Refuge visitation.

#### 4.7.1.7 Effects to Environmental Justice

**Wildlife and Habitat Management**

The wildlife and habitat management activities that would be implemented under Alternative A would have no effects on any areas outside of the Refuge boundary; therefore, there would be no disproportionate adverse impacts on any residents in the region, particularly minority or low-income residents.

**Public Use**

The continuation of the existing public use program on the Refuge would provide the surrounding public with opportunities to visit the Refuge, as well as provide the public with off-Refuge opportunities to better understand Refuge purposes and the purposes of the NWRS. The public use program would result in no adverse effects on any areas outside of the Refuge boundary; therefore, there would be no disproportionate adverse impacts on any residents in the region, particularly minority or low-income residents.

## 4.7.2 Alternative B – Maximize Salt Marsh Restoration, Continue Current Public Uses

### 4.7.2.1 Effects to Land Use

**Wildlife and Habitat Management**

The wildlife and habitat management actions currently implemented on the Refuge would continue under Alternative B, and the effects of implementing these actions would be the same as described for Alternative A. In addition, Alternative B includes proposal to restore approximately 36 acres of non-native upland habitat on the Refuge to appropriate coastal habitats. None of these proposals are expected to impact the current uses implemented by the Navy on the lands adjacent to the Refuge. To avoid any potential for conflicts, these restoration proposals would be coordinated with Naval Weapons Station Seal Beach staff prior to final design. This process would also be implemented for other proposals in Alternative B, including the installation of a new water control structure for the Bolsa Cell, removal of concrete debris from the marsh, and implementation of an IPM program. Therefore, no adverse effects to land use from the wildlife and habitat management associated with Alternative A are anticipated.

**Public Use**

The effects on land use of continuing the existing public use program under Alternative B would be the same as those described for Alternative A.

### 4.7.2.2 Effects Related to Public Safety

**Wildlife and Habitat Management**

Under Alternative B, the effects related to public safety of implementing the wildlife and habitat management practices on the Refuge would be the same as those described for Alternative A. <u>Restoration projects, particularly those related to restoration in the vicinity of the 7th Street Pond and the drop tower, would be coordinated with Naval Weapons Station Seal Beach to ensure that issues related to Munitions Response Program sites are resolved prior to project implementation</u>.

**Pest Management**

Under Alternative B, pest management would be implemented in accordance with an IPM Plan, and <u>mosquito management would be implemented in accordance with the conditions included in annual SUPs issued to the OCVCD</u>. Both of these documents include BMPs and/or conditions for ensuring the no adverse effects to the environment or public safety would result from the use of pesticides on the Refuge. These documents also address the need for posting pesticide application areas when certain products have been applied in order to ensure public and staff safety.

**Public Use**

The effects related to public safety of continuing the current public use program on the Refuge under Alternative B would be the same as those described for Alternative A.

### 4.7.2.3 Effects to Traffic Circulation

**Wildlife and Habitat Management**

The day-to-day effects to traffic circulation under this alternative would be similar to those described under Alternative A. However, this alternative also includes several restoration proposals that would likely result in short-term increases in the number of truck and car trips generated as a result of the construction activity associated with restoration. To minimize the number of trips generated during construction, efforts will be made to dispose of graded material within the boundaries of Naval Weapons Station Seal Beach. If material must be trucked off the site, appropriate traffic control measures will be implemented to minimize the effects of these trucks on local traffic. In addition, truck trips will be timed to avoid peak traffic periods. The implementation of these measures would minimize the potential for impacts to traffic circulation.

**Public Use**
The effects related to traffic circulation of continuing the current public use program on the Refuge under Alternative B would be the same as those described for Alternative A.

#### 4.7.2.4 Effects to Public Utilities/Easements

**Wildlife and Habitat Management**
To avoid any potential for adversely affecting public utilities and easements as a result of restoring habitat on the Refuge, Refuge staff would coordinate all restoration efforts, as well as culvert/water control structure projects, with Naval Weapons Station Seal Beach prior to finalizing restoration or construction plans. This would ensure that any potential adverse effects to utilities and easements would be avoided.

**Public Use**
The effects on public utilities/easements of continuing the existing public use program under Alternative B would be the same as those described for Alternative A.

#### 4.7.2.5 Effects Related to Vectors and Odors

**Wildlife and Habitat Management**
The proposal to restore approximately 36 acres of non-native upland to native coastal habitat is expected to reduce existing habitat for salt marsh mosquito breeding. Areas that currently pond as a result of higher high tides would be recontoured to support high quality native habitat and to reduce the potential for ponding during high tides.
Given Anaheim Bay's status as a reasonably well-flushed coastal salt marsh, characterized by healthy levels of dissolved oxygen, odors do not appear to be a problem at present for nearby residents and visitors. This would not change under the proposal to increase salt marsh habitat, as described in Alternative B; therefore, this alternative would not result in any significant adverse effects related to odors.

**Pest Management**
Under this alternative, mosquito control would be implemented in accordance with annual issued Special Use Permits to the OCVCD. Mosquito management would involve the implementation of pesticide and non-pesticide strategies for reducing threats from mosquitoes to human and wildlife populations. Through the continuation of mosquito management in accordance with a SUP, which focuses on the control of mosquito larvae and pupae, the potential impacts to human health and safety as a result of mosquito production on the Refuge would be expected to be minimal. If a human health emergency is declared that involves mosquitoes present on the Refuge, consideration would be given to the application of adulticides on the Refuge; however, this would require additional review under NEPA and through the Compatibility Determination process, approval of proposed adulticides through the PUPS process, and approval by the Service's Integrated Pest Management Coordinator. In the event of an emergency, review and evaluation would be expedited.

**Public Use**
The public use activities proposed under Alternative B would have no adverse effects related to vectors and odors.

#### 4.7.2.6 Effects to Economics/Employment

**Wildlife and Habitat Management**
Under Alternative B, the Refuge would continue to maintain its existing staffing levels (i.e., one full-time permanent Refuge Manager and one part-time term maintenance worker). Additionally, several opportunities for contractor work would be created as a result of implementing the restoration, enhancement, and infrastructure proposals included in Alternative B. Carrying out the habitat restoration projects included in Alternative B would inject approximately $3 million into the local economy, temporarily increasing employment and expenditures. However, in the context of the multi-billion dollar Orange County economy, which includes nearly 1.5 million workers, this effect would be negligible.

**Public Use**
Effects of public use under Alternative B to economics/employment would be identical to those described for Alternative A.

#### 4.7.2.7 Effects to Environmental Justice

**Wildlife and Habitat Management**
The expanded wildlife and habitat management activities associated with Alternative B would not create any adverse impacts that could disproportionally affect minority or low-income residents in the region.

**Public Use**
The benefits of implementing the current public use program, which is proposed to continue under Alternative B, would be identical to those described for Alternative A.

### 4.7.3 Alternative C (Proposed Action) – Optimize Upland/Wetland Restoration, Improve Opportunities for Wildlife Observation

#### 4.7.3.1 Effects to Land Use

**Wildlife and Habitat Management**
The effects to land use of implementing the wildlife and habitat management actions proposed under Alternative C would be essentially the same as those described for Alternative B.

**Public Use**
Despite limited increases in public use opportunities at the Refuge under Alternative C, overall public use opportunities would remain at a sufficiently small scale and would have no adverse effects to land uses on the Naval Weapons Station Seal Beach or properties within the City of Seal Beach.

#### 4.7.3.2 Effects Related to Public Safety

**Wildlife and Habitat Management**
The effects to public safety of implementing the wildlife and habitat management practices on the Refuge associated with Alternative C would be the same as those described for Alternative B. In addition, removal of the drop tower would be coordinated with the Navy to ensure compliance with the Station's Munitions Response Program.

**Pest Management**

The effects to public safety under Alternative C as they relate to pest management would be the same as those described under Alternative B.

**Public Use**

The effects related to public safety of increasing the number of public events permitted on the Refuge as described under Alternative C would be the same as those described for Alternative A. In addition, any new public use facilities, such as the proposed observation platform, would be constructed well away from the small arms range and selection of construction sites would be coordinated with the Navy to avoid potential hazards associated with ordnance.

#### 4.7.3.3 Effects to Traffic Circulation

Some short-term increases in construction traffic, similar to those described under Alternative B, would occur as a result of the restoration proposals included under this alternative. Through the implementation of the measures described under Alternative B, no adverse impacts to traffic circulation would be anticipated. Also under Alternative C, the total number of Refuge staff could increase by one, generating potentially four additional trips per day. This would increase the total trips generated as a result of everyday Refuge-related management activities to 14 trips per day during the work week. Expansion of the public use programs would increase the number of weekends in which trips to and from the Refuge would be generated, but the estimate of about 50 to 60 trips generated per weekend day when a public event is occurring on the Refuge would remain the same. Therefore, under this alternative, the volume of traffic generated by Refuge uses would remain low and the majority of the trips would continue to occur during non-peak hours. Therefore, no observable effects on the local and regional transportation system are anticipated.

#### 4.7.3.4 Effects to Public Utilities/Easements

**Wildlife and Habitat Management**

The effects on public utilities/easement of implementing the wildlife and habitat management actions proposed under Alternative C would be essentially the same as those described for Alternative B.

**Public Use**

Even with minor increases in public use, as proposed under Alternative C, the Refuge's public use program would have limited impacts on public utilities (i.e., limited water consumption and utilization of the sewage system during public tours) and no impacts to existing easements. Therefore, the implementation of the public uses proposed under Alternative C would not result in any significant adverse effects to existing public utilities and easements.

#### 4.7.3.5 Effects Related to Vectors and Odors

**Wildlife and Habitat Management**

Effects to surrounding areas related to vectors and odors that could be generated on the Refuge would be similar to those described for Alternative B. Additionally, as described under Alternative B, the implementation of the restoration proposals on the Refuge are not expected to result in adverse impacts related to odors.

**Pest Management**

The effects of the pest management proposals included under Alternative C would be same as those described under Alternative B.

**Public Use**
The public use proposals included in Alternative C would have no adverse effects related to vectors and odors.

#### 4.7.3.6 Effects to Economics/Employment

**Wildlife and Habitat Management**
The effects to economics/employment of implementing the wildlife and habitat management plans included in Alternative C would be essentially the same as those described for Alternative B. The cost of restoration would be slightly lower under Alternative C, as less excavation would be required to achieve wetland/upland transitional and native upland habitat.

**Public Use**
Effects to economics/employment of expanding the public use program as proposed in Alternative C would be somewhat larger than those of Alternatives A and B (refer to Sections 4.7.1.5), as several hundred additional visits to the Refuge could be realized under Alternative C. In spite of this increase, these economic benefits of implementing Alternative C would still be negligible in comparison with the economies and employment bases of Orange County and metro Los Angeles.

#### 4.7.3.7 Effects to Environmental Justice

**Wildlife and Habitat Management**
Wildlife and habitat management activities proposed under Alternative C would not have disproportionate adverse impacts on minority or low-income residents in the region.

**Public Use**
The public use program proposed under Alternative C would expand opportunities for the public to observe and better understand the habitats and wildlife supported on the Refuge. The availability of this resource in proximity to several lower income communities would represent a benefit to these communities and would not result in disproportionate adverse impacts on minority or low-income residents in the region.

## 4.8 Indian Trust Assets

Indian trust assets (ITAs) are legal interests in assets that are held in trust by the United States Government for federally recognized Indian tribes or individuals. The trust relationship usually stems from a treaty, Executive order, or act of Congress. The Secretary of the Interior is the trustee for the United States on behalf of federally recognized Indian tribes. “Assets” are anything owned that holds monetary value. “Legal interests” means there is a property interest for which there is a legal remedy, such as compensation or injunction, if there is improper interference. Assets can be real property, physical assets, or intangible property rights, such as a lease, or right to use something. ITAs cannot be sold, leased, or otherwise alienated without the United States’ approval. Trust assets may include lands, minerals, and natural resources, as well as hunting, fishing, and water rights. Indian reservations, rancherias, and public domain allotments are examples of lands that are often considered trust assets. In some cases, ITAs assets may be located off trust land.

The Service shares the responsibility with all other agencies of the executive branch to protect and maintain ITAs reserved by or granted to Indian tribes, or Indian individuals by treaty, statute, or Executive order.

There are no known tribes possessing legal property interests held in trust by the United States in the lands or natural resources addressed in the alternatives for this CCP.

## 4.9 Cumulative Effects

Cumulative effects can result from the incremental effects of a project when added to other past, present, and reasonably foreseeable future projects in the area. Cumulative impacts can result from individually minor but cumulatively significant actions over a period of time. Such impacts can be difficult to quantify, as this would require speculative estimates of impacts such as the geographic diversity of impacts (i.e., impacts associated with various developments may affect different areas) and variations in timing of impacts (i.e., impacts from the various proposals would likely occur at different times, particularly in the case of temporary construction impacts). Complete data are not available for all future development, and data for future development may change following subsequent approvals. Despite these limitations, a qualitative cumulative impact analysis is presented that describes the combined effect of and relationship between projects in the general vicinity of the Seal Beach NWR.

In conducting this analysis, the interaction of activities at Seal Beach NWR with other actions occurring over a larger spatial reference and a temporal reference of about 15 years (the intended life of this CCP) has been considered. For purposes of this analysis, a list of recently approved, currently proposed, and reasonably foreseeable future projects within a 10-mile radius of the Refuge have been compiled and are presented here.

**Integrated Natural Resources Management Plan Naval Weapons Station Seal Beach**
The purpose of the INRMP is to provide Naval Weapons Station Seal Beach with a viable framework for future management of natural resources on lands it owns or controls. When completed, the INRMP, a five-year, ecosystem-based plan to be developed in cooperation with the Service and the California Department of Fish and Game, will facilitate compliance with natural resource protection laws, integrating the military mission of the Naval Weapons Station Seal Beach with the natural resource component of existing plans for Naval Weapons Station Seal Beach. The proposals in the INRMP cover all of Naval Weapons Station Seal Beach, including the Refuge, and the INRMP proposals for the Refuge are consistent with the proposals in the draft CCP. In addition to the proposals described for the Refuge, the INRMP also includes a number of conceptual restoration proposals for areas of the station located beyond the Refuge boundary. These include the restoration of high to mid-marsh habitat at the southeast corner of the station, coastal grassland enhancement, and bluff and beach dune special status species enhancement.

**Harmony Cove Residential Condo and Marina Development**
This project, which would be constructed on a 2.28-acre site located approximately 1.5 miles to the southeast of the Refuge, involves a proposal to construct 15 condominiums and a 25-boat slip marina. Construction of the marina would require replacement of an existing revetment of rock riprap with a vertical seawall. Approximately 16,000 cubic yards of material would be dredged from the submerged portion of the site, which is part of the Huntington Harbour channels. Impervious areas on the site would increase from 80 percent coverage to 90 percent coverage, representing a slight increase in runoff over existing conditions.

**Los Cerritos Wetlands Conceptual Restoration Plan**
Approximately 600 acres of disturbed and functional wetlands are included within an area referred to as the Los Cerritos Wetlands. This wetland complex, situated approximately two miles northeast of the Refuge, is located on both the north and south side of the San Gabriel River. Conceptual restoration planning envisions full tidal flushing, if possible, for the entire wetland complex. Funding and a timetable for implementation of a phased restoration project have not yet been identified.

**Alamitos Bay Marina Rehabilitation Project**
The project site consists of various marina basins located throughout Alamitos Bay. The project, which is situated approximately 2.5 miles north of the Refuge, proposes to rehabilitate existing marina facilities by restoring existing boats slips; dredge approximately 300,000 cubic yards of material from various basins within the bay to restore the original design depths; and repair and/or replace associated marina facilities, such as restrooms, seawalls, and parking lots. The proposed project is anticipated to be implemented in 12 phases over approximately six years.

**Bahia Marina**
This project, located approximately 2.5 miles north of the Refuge, involves maintenance dredging for the Cerritos Bahia Marina to maintain sufficient water depth for marina operations. The volume of material to be removed is 26,867 cubic yards and the project will take approximately 66 days to complete.

**Shops at Rossmoor**
Three separate building construction projects are proposed for this area, which is located near the corner of Seal Beach Boulevard and St. Cloud Drive, approximately three miles to the north of the Refuge. The proposed construction includes a 17,500-square-foot drug store, a 6,000-square-foot retail building, and a 3,500-square-foot fast food facility.

**Second+PHC Project**
This mixed-use development with retail, residential, hotel, restaurant, and entertainment uses would be constructed on approximately 11 acres located about three miles north of the Refuge. Located between the San Gabriel River and the Los Cerritos Channel at the southwest corner of Pacific Coast Highway and 2nd Street in the City of Long Beach, this development would include retail uses, 325 residential units, a 100-room hotel, a theater, restaurant space, and a marine/science learning center.

**Bolsa Chica Lowlands Restoration**
Major construction activity for the Bolsa Chica Lowlands Restoration project, located approximately four miles south of the Seal Beach NWR, was completed at the end of 2006. The restoration process continues, with biological, physical, and beach conditions monitoring programs being implemented to document the changing conditions over time. The project involved excavation of the project site to restore approximately 560 acres of tidally influenced habitat within the Bolsa Chica Ecological Preserve. To restore the site, approximately 1.8 million cubic yards of material was removed to create full tidal and muted tidal basins. The project is expected to result in the creation of subtidal, tidal flats, cordgrass- and pickleweed-dominated salt marsh, and native upland habitats.

**Colorado Lagoon Restoration**
This project involves the restoration and enhancement of an approximately 12-acre tidally influenced body of water, Colorado Lagoon. Colorado Lagoon, which is located approximately five miles north of the Refuge, is connected to Alamitos Bay and the Pacific Ocean through an underground tidal culvert to Marine Stadium. The purpose of the proposed project is to restore the site's ecosystem, improve the estuarine habitat, provide enhanced recreation facilities, improve water and sediment quality, and manage storm water.

**Goldenwest Assisted Living Facility**
This project involves the construction of a 120,000-square-foot convalescent facility on 3.38 acres of previously developed property located approximately six miles southeast of the Refuge. The proposed convalescent facility would include senior assisted living and Alzheimer's/memory care components with 13 studio units, 85 one-bedroom units, and 23 two-bedroom units. Approximately 70 people will be employed within the facility, with a maximum of 36 employees per shift.

**The Ridge – A 22-Unit Single-Family Development**
This project proposes the development of 22 single-family units on five acres located approximately seven miles southeast of the Seal Beach NWR. The project also involves the construction of infrastructure improvements, including street, curbs, sidewalks, and storm drain facilities.

**Orizaba Park Expansion Project**
The Orizaba Park Expansion Project is a comprehensive master plan for an existing park located approximately seven miles north of the Refuge. The project also involves the acquisition of a 1.10-acre parcel to accommodate expansion of the existing park. Construction to implement proposed park improvements began in late 2009.

**Aquarium of the Pacific**
The proposed project involves the construction of a 23,330-square-foot addition, representing a 14 percent floor area increase, to the existing 166,447-square-foot aquarium facility in Long Beach, approximately eight miles north of the Refuge. The project consists of a new wing with a "media-based chamber," an expanded retail store, and a new front entrance.

**Magnolia Marsh Restoration**
The restoration of the Magnolia Marsh, located about 10 miles south of the Seal Beach NWR, involved the excavation of approximately 40,000 cubic yards of fill to recreate a historical channel system, remove the seaward levee of the Huntington flood control channel to restore tidal influence, and restore approximately 41 acres of coastal wetlands. Excavation was completed in spring 2010.

**Seawater Desalination Project at Huntington Beach**
Poseidon Resources Corporation proposes to construct and operate a 50-million gallon per day seawater desalination facility within the City of Huntington Beach. The proposed desalination project would consist of a seawater intake system, pretreatment facilities, a seawater desalination facility utilizing reverse osmosis technology, post-treatment facilities, product water storage, chemical storage, electrical substation, on- and off-site booster pump stations, and 48- to 54-inch diameter product water transmission pipelines in Huntington Beach and Costa Mesa. The project site is located approximately 10 miles to the south of the Seal Beach NWR on a 13-acre site located at 21730 Newland Street in Huntington Beach.

Off-site construction associated with underground booster pump stations, a bypass station, and two metering stations is also proposed in the vicinity of the proposed plant. Optional water transmission pipeline routes and pump stations are also being considered for installation in Huntington Beach, Fountain Valley, Westminster, Garden Grove, Santa Ana, and Costa Mesa.

**Newland Street Widening**
The widening of Newland Street between Pacific Coast Highway and Hamilton Avenue, including widening reinforced concrete bridge at Huntington Channel, installation of storm drain in Newland Street, and miscellaneous utility relocations, is currently underway. The project site is located approximately 10 miles south of the Seal Beach NWR.

**Edison Community Center**
This proposal by the City of Huntington Beach Community Services Department involves the establishment of a park Master Plan to reconfigure existing open space areas at the Edison Community Center, located approximately 10 miles southeast of the Refuge. The project proposes to construct additional recreational amenities, reconfigure an existing parking lot and construct new parking areas, install new landscape and hardscape, and construct four lighted practice soccer fields and a lighted multi-purpose field. The master plan is proposed to be carried out in four phases of construction over eight years.

This list of projects includes a combination of development and habitat enhancement projects. The majority of the construction projects represent redevelopment in previously disturbed areas, while a few represent new development. All would involve temporary impacts associated with the use of construction equipment, but only the development projects would result in long-term use of resources, such as power and water and long-term effects related to air emissions and urban runoff.

### 4.9.1 Cumulative Effects to the Physical Environment

The projects included in the cumulative effects analysis range from new development and redevelopment to habitat restoration. 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. Habitat restoration and management proposals, such as those proposed as part of the Seal Beach NWR CCP, would alter the existing character of the land by converting disturbed uplands and wetlands to higher quality habitat areas that are reminiscent of prior undisturbed historic conditions. All of these proposals would result in incremental changes in community character and/or visual quality but would not be considered of a sufficient magnitude to constitute a significant cumulative effect.

With respect to water quality, the redevelopment and development projects would result in increases in impervious surfaces, resulting in incremental increases in urban runoff entering existing flood control channels, natural and developed waterways, estuaries, and the Pacific Ocean. The habitat restoration projects 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. Following restoration, these wetlands would provide incremental benefits to downstream water quality as a result of the natural filtering process provided by wetland vegetation. The proposal to implement the Seal Beach NWR CCP would not, however, significantly contribute to cumulative water quality impacts or benefits in the general area.

Impacts from the operation of construction equipment associated with development, facilities improvements or maintenance, and restoration, although relatively short in duration, would contribute incrementally to the overall concentration of fugitive dust and particulate matter in the air, as well as incrementally contribute to temporary increases in ozone levels within the Region.

These operations would also result in the generation of GHG emissions. The cumulative effect of these temporary increases in air emissions is difficult to quantify because the projects would be implemented at different times, with only a portion of the projects occurring at any given time. Because the generation of fugitive dust, particulate matter, ozone, and GHGs as a result of implementing the restoration proposals included in the Seal Beach NWR CCP would be relatively low and only generated for a limited time, the cumulative contributions from this project to the local, regional, and global environment are not considered significant. Implementation of the Seal Beach NWR CCP would not result in any measurable increases in the existing operational emissions associated with Refuge management, nor would Refuge operations exceed regional pollutant emission thresholds of significance. Therefore, the proposal would not contribute cumulatively to long-term regional air quality impacts or the production of long-term GHG emissions.

### 4.9.2 Cumulative Effects to Biological Resources

The majority of the development projects proposed in the vicinity of the Refuge are redevelopment projects that are not expected to impact significant biological resources. A few projects are proposed in or adjacent to sensitive habitat areas and could result in disturbance to wildlife, impacts to native habitat, or impacts to the marine environment. The restoration projects proposed in the area could result in temporary impacts to biological resources; however, these impacts would be minimized by avoiding construction activity during the breeding seasons, while other impacts would be offset by the benefits of restoration. Any adverse effects to biological resources as a result of the implementation of the CCP would be minor and would not represent a significant cumulative effect to biological resources.

### 4.9.3 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 various projects listed; therefore, the proposed project would not result in any adverse cumulative impacts to cultural resources.

### 4.9.4 Cumulative Effects to the Social and Economic Environment

Although several of the projects being considered for development in the vicinity of the Refuge would generate traffic volumes that could have cumulative effects on the local and regional circulation systems, the minor increases in the already low levels of traffic generated as a result of Refuge activities would not contribute cumulatively to localized or regional traffic impacts.

Although the development proposals in the vicinity of the Refuge would result in a cumulative increase in the demand for water, sewer, and energy, the proposals in the CCP would not result in any increases in the long-term demand for water, sewer, or energy on the Refuge.

A number of restoration proposals are under consideration in the project vicinity that, when implemented, could provide habitat for various vectors, primarily salt marsh mosquitoes. The restored conditions on these sites would, however, be less likely to support the diversity and abundance of mosquitoes currently supported within disturbed wetland areas. Therefore, the restoration proposals on the Refuge, as well as those proposed in the general project vicinity, would not result in a significant cumulative impact related to vectors.

The proposals included in the CCP would have no 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 the implementation of the other projects under consideration in the general vicinity of the project.

## 4.10 Summary of Effects

Provided in Table 4-5 is a summary of the potential effects associated with each of the alternatives evaluated as part of the Seal Beach NWR CCP.

**Table 4-5**
**Summary of Potential Effects of Implementing Alternatives A, B, or C for the Seal Beach National Wildlife Refuge Comprehensive Conservation Plan**

| Resource | Alternative A | Alternative B | Alternative C |
|---|---|---|---|
| ***Physical Environment*** | | | |
| **Topography** | No changes to the existing topography on the Refuge occur as a result of implementing ongoing Refuge activities | Proposed restoration efforts would change the topography and elevations on approximately 36 acres of the Refuge;  these changes would not result in any adverse effects to the existing topographic character on the Refuge | Same as Alternative B |
| **Visual Quality** | No adverse effects to the existing visual quality of the Refuge lands occur as a result of implementing ongoing Refuge activities | Temporary, minor adverse effects to visual quality would occur during site preparation for habitat restoration; the long-term effect of the restoration process would be improved visual quality within the restoration sites | Same as Alternative B; the installation of an elevated observation platform would alter the visual character of the area near the intersection of Kitts Highway and Bolsa Avenue, however, this change in visual character would not represent a significant impact on the environment |
| **Geology/Soils** | No adverse effects related to geology and soils occur on the Refuge as a result of implementing ongoing Refuge activities, including annual preparation of the least tern nesting site on NASA Island | Habitat restoration would remove artificial fill to achieve elevations supportive of type of habitat proposed for each site. BMPs to minimize erosion would be implemented, reducing potential impacts to below a level of significance | Same as Alternative B |
| **Agricultural Resources** | No agricultural resources are present on the Refuge; current Refuge operations have no effect on adjacent agricultural fields | Same as Alternative A | Same as Alternative A |

| Table 4-5<br>Summary of Potential Effects of Implementing Alternatives A, B, or C<br>for the Seal Beach National Wildlife Refuge Comprehensive Conservation Plan | | | |
|---|---|---|---|
| **Resource** | **Alternative A** | **Alternative B** | **Alternative C** |
| **Hydrology** | Ongoing Refuge activities such as culvert replacement, as needed, result in improvements in tidal circulation within the marsh; no activities are implemented that adversely affect tidal circulation within the Refuge | Installation of a water control structure to control tidal flows entering and exiting the Bolsa Cell would provide benefits to the tidal circulation within the Bolsa Cell and is not expected to impact tidal circulation elsewhere on the Refuge; other culvert and/or water control structures could be replaced if needed to improve tidal circulation | Same as Alternative B |
| **Water Quality** | Periodic application of EPA and Service-approved herbicides as part of chemical control of invasive plants is not anticipated to adversely impact water quality | No adverse effects are anticipated, water quality monitoring and coordination with other agencies to improve water quality entering the marsh from upstream could eventually improve water quality throughout the marsh; BMPs would be implemented during restoration/enhancement projects, and BMPs would be implemented per the IPM Plan and conditions in SUPs for mosquito management | Same as Alternative B |
| **Air Quality** | No change in existing air quality conditions and no adverse effects | Temporary, localized, impacts to air quality from construction equipment used to implement habitat restoration; no significant long-term impacts to air quality would occur; implementing BMPs in the IPM and Mosquito Management Plans would avoid impacts to local air quality | Same as Alternative B |

**Table 4-5**
**Summary of Potential Effects of Implementing Alternatives A, B, or C for the Seal Beach National Wildlife Refuge Comprehensive Conservation Plan**

| Resource | Alternative A | Alternative B | Alternative C |
|---|---|---|---|
| ***Biological Resources*** | | | |
| **Native Habitat** | No adverse impacts to existing native habitats would result; habitat maintenance and management would benefit these habitats | The overall acreage of native habitats would increase as a result of proposed restoration; invasive plant removal and replacement with native upland species would also provide minor benefits | Same as Alternative B |
| **Waterfowl, Seabirds, Shorebirds and Other Waterbirds** | Not likely to result in any changes to the current diversity and abundance | Habitat restoration and enhancement activities would provide minor benefits to these birds | Same as Alternative B |
| **Landbirds** | Not likely to result in any changes to the current diversity and abundance of these birds on the Refuge | Would likely result in a minor, indirect adverse effect to landbirds due to conversion of existing disturbed upland habitat to salt marsh and wetland/upland transitional habitat | Less likely to result in a minor, indirect adverse effect to landbirds as existing disturbed upland habitat would be converted to upland and wetland/upland transitional habitat |
| **Fish and other Marine Organisms** | Ongoing Refuge maintenance projects, such as culvert replacement, indirectly benefits fish by improving water circulation in the marsh | Proposed restoration and enhancement would be expected to result in some indirect beneficial effects to fish; implementing BMPs during the application of pesticides would minimize the potential for adverse effects; the use of Natular in coastal wetlands could adversely affect fish/marine organisms | Same as Alternative B, except potential adverse effects to fish and marine organisms associated with Natular would not occur, as the use of this product is not proposed under this alternative |
| **Invertebrates, Amphibians, and Reptiles** | Presence/ distribution of invertebrates, amphibians, and reptiles would be unlikely to change | Minor, indirect adverse effects could result from restoration/enhancement projects due to loss of transitional habitat; BMPs during pesticide use will minimize adverse effects from pesticides | Generally the same as Alternative B, but under Alternative C, a tiger beetle management plan would be prepared to address tiger beetle protection on the Refuge |

| Table 4-5<br>Summary of Potential Effects of Implementing Alternatives A, B, or C<br>for the Seal Beach National Wildlife Refuge Comprehensive Conservation Plan | | | |
|---|---|---|---|
| **Resource** | **Alternative A** | **Alternative B** | **Alternative C** |
| **Mammals** | Presence, distribution, and abundance of mammals would remain unchanged; but predator management could result in the removal of animals believed to be preying on listed species | No adverse effects to mammals are anticipated | Same as Alternative B |
| ***Endangered and Threatened Species*** | | | |
| **California Least Tern** | Management actions would continue to benefit nesting terns on NASA Island | Same as Alternative A, plus habitat restoration/ enhancement actions would provide minor benefits to fish species preyed upon by foraging least terns; removal of potential avian predator perches would benefit tern chicks and eggs; activities near the tern nesting site would be limited to the non-nesting season to reduce the potential for disturbance | Same as Alternative B, plus the removal of the drop tower would further reduce the ability of potential avian predators to perch in the vicinity of NASA Island |
| **Light-footed Clapper Rail** | Management actions, including monitoring, predator control, and nesting platform maintenance would continue to benefit this species | Same as Alternative A, plus benefits from actions to improve nesting conditions, remove potential avian predator perching sites, and restore/enhance habitat. Construction would be restricted seasonally near rail habitat; BMPs and site restrictions would be imposed to minimize impacts related to pesticide use | Same as Alternative B, plus the removal of the drop tower would further reduce perching sites for potential avian predators, upland and wetland/upland transitional habitat restoration areas would provide cover for rails during periods of high tide, proposals to improve cordgrass vigor would also benefit rails |
| **Western Snowy Plover** | Management actions are not implemented specifically to benefit the plover | No adverse effects to this species would occur under this alternative | Same as Alternative B |

**Table 4-5**
**Summary of Potential Effects of Implementing Alternatives A, B, or C for the Seal Beach National Wildlife Refuge Comprehensive Conservation Plan**

| Resource | Alternative A | Alternative B | Alternative C |
|---|---|---|---|
| **Salt Marsh Bird's Beak** | Not currently present on the Refuge; therefore no adverse or beneficial effects to this species are realized | Same as Alternative A | Reintroduction of this species to the Refuge, if successful, would represent a significant benefit to the species and its possible future recovery |
| **Eastern Pacific Green Turtle** | No management actions are implemented specifically to benefit this species | Restoration and enhancement projects could impact this species; coordination with NOAA and design/construction specifications included within the scope of these projects would minimize the potential for impacts | Same as Alternative B |
| **Belding's Savannah Sparrow** | No management actions are implemented specifically to benefit this species | Restoration and enhancement of salt marsh habitat could benefit this species; construction and public use activities would be planned to avoid impacts during the nesting season | Potential benefits would be less than under Alternative B, as this alternative emphasizes restoration of upland and wetland/upland transitional habitat |
| ***Cultural Resources*** | | | |
| **Cultural, Historical, and Archaeological Resources** | Adherence to existing regulations and/or policies would minimize the potential for impacts to cultural resources | Same as Alternative A | Same as Alternative A |
| ***Social and Economic Environment*** | | | |
| **Land Use** | No adverse effects to land use | Same as Alternative A | Same as Alternative A |
| **Public Safety** | Potential for adverse effects to public safety are minimized through access policies | Refuge staff would coordinate with the Navy regarding activities occurring near Installation Restoration/ Munitions Response Program sites | Same as Alternative B |

| Table 4-5<br>Summary of Potential Effects of Implementing Alternatives A, B, or C<br>for the Seal Beach National Wildlife Refuge Comprehensive Conservation Plan | | | |
|---|---|---|---|
| **Resource** | **Alternative A** | **Alternative B** | **Alternative C** |
| **Traffic Circulation** | Trips generated as a result of Refuge activities would be too low to result in an observable impacts to traffic circulation | Same as Alternative A | Same as Alternative A |
| ***Social and Economic Environment*** | | | |
| **Public Utilities/ Easements** | No adverse effects on existing public utilities and easements | Same as Alternative A | Same as Alternative A |
| **Vectors and Odors** | Mosquitoes are known to occur on the Refuge, impacts are minimized through existing monitoring and control activities by OCVCD; odors are not an issue on the Refuge | Continued coordination with OCVCD and issuance of annual Special Use Permits to allow mosquito management on the Refuge would ensure the protection of wildlife while also addressing the need to protect public health and safety | Same as Alternative B |
| **Economics and Employment** | Effects to economics and employment both locally and regionally would be negligible | Same as Alternative A | Same as Alternative A |
| **Environmental Justice** | No adverse impacts on minority or low-income residents as a result of Refuge activities; however, the proximity of the Refuge to large urban populations would increase opportunities for the public to connect with the resources protected in the NWRS | Same as Alternative A | Same as Alternative A |

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# Appendix F-1: List of Preparers and Persons/Agencies Consulted

## Document Preparation

**U.S. Fish and Wildlife Service Preparers:**

| | |
|---|---|
| Victoria Aires Touchstone | Refuge Planner/Principal Writer |
| Kirk Gilligan | Refuge Manager/Writer/Reviewer |
| Slader Buck | Deputy Project Leader/Reviewer |
| Tony McKinney | GIS Coordinator/Graphics |
| Randy Nagel | GIS Technician/Graphics |
| Pek Pum | GIS Technician/Graphics |
| Lou Ann Speulda-Drews | Regional Historian/Historical Archaeologist/Cultural Resource Review |

**Consultants:**

| | |
|---|---|
| Leon Kolankiewicz | Mangi Environmental Group/Writer/Editor |
| Mark Blevins | Mangi Environmental Group/Graphics |
| Carmen Zepeda-Herman | RECON/Cultural Resource Review |
| David Cannon | Everest International Consultants, Inc./Hydrology |
| Seamus Innes | Everest International Consultants, Inc./Hydrology |

## Persons and Agencies Consulted

| | |
|---|---|
| Marco Buske | USFWS, Region 8 IPM Coordinator |
| Brian Collins | USFWS, Refuge Wildlife Biologist |
| Patricia Roberson | USFWS, Region 8 NEPA Coordinator |
| Erinn Wilson | California Department of Fish and Game |
| Kelly O'Reilly | California Department of Fish and Game |
| Robert Hoffman | NOAA, National Marine Fisheries Service |
| Eric Chavez | NOAA, National Marine Fisheries Service |
| Jim Green | Orange County Vector Control District |
| Dr. Bruno Pernet | Dept. of Biological Sciences, California State University, Long Beach |
| Erica Cunningham | Tierra Data |

Naval Weapons Station Seal Beach
City of Seal Beach, Planning Department
County of Orange, Planning
Tim Anderson
Charlie Collins
Pete Bloom
John Fitch
Susan Hoffman
Kate Jirik
Richard Zembal

# Appendix F-2: Distribution List

The following elected officials, Tribes, agencies, organizations, and interested individuals received notice of the availability of the Seal Beach National Wildlife Refuge Draft Comprehensive Conservation Plan/Environmental Assessment:

**U.S. Elected Officials**
Honorable Barbara Boxer, U.S. Senate
Honorable Dianne Feinstein, U.S. Senate
Congressman Ed Royce, District 40
Congressman Dana Rohrabacher, District 46
Congresswoman Loretta Sanchez, District 47

**California State Legislature**
State Senator Alan Lowenthal, District 27
State Senator Tom Harman, District 35
State Assemblywoman Bonnie Lowenthal, District 54
State Assemblyman Jim Silva, District 67

**Federal Agencies**
NOAA Marine Fisheries
U.S. Army Corps of Engineers
U.S. EPA, Region IX
U.S. Coast Guard
USFWS, Carlsbad Fish and Wildlife Office
USFWS, Pacific Southwest Regional Office
USFWS, Region 1 and 8 Cultural Resources Team
USFWS, Migratory Birds
U.S. Geological Survey, San Diego Field Station
U.S. Navy, Naval Weapons Station Seal Beach

**California State Agencies**
California State Clearinghouse
California Resources Agency
California Coastal Commission, Federal Consistency
California Office of Historic Preservation
California Department of Boating and Waterways
California Department of Conservation
California Department of Fish and Game, Los Alamitos Field Office
California Department of Fish and Game, Marine Region
Fish and Game Commission
Native American Heritage Commission
Santa Ana Regional Water Quality Control Board, Region 9, Executive Officer
State Lands Commission, Executive Officer
State Water Resources Control Board
Wetlands Recovery Project
Wildlife Conservation Board

**Tribes**
Cahuilla Band of Indians
Gabrieleno/Tongva Indians of California
Juaneno Band of Mission Indians

**City Governments**
City of Huntington Beach, Mayor and City Council
City of Huntington Beach, Planning Department
City of Los Alamitos, Mayor and City Council
City of Seal Beach, Mayor and City Council
City of Seal Beach, Manager and Planning Department
City of Westminster, Mayor and City Council

**County Government**
Orange County Board of Supervisor Janet Nguyen, District 1
Orange County Board of Supervisor John Moorlach, District 2
Orange County Watershed Program
Orange County Vector Control District
Orange County Resources and Development Management, Flood Control Division
Orange County Community Planning
Orange County Operations and Maintenance

**Other Local Agencies**
Orange County Fire Authority
South California Association of Governments
South Coastal Air Quality Management District

**Local Libraries**
Seal Beach Mary Wilson Public Library

**Organizations**
Amigos de Bolsa Chica
Animal Protection Institute
California Audubon
California Native Plant Society
California State University, Long Beach, Department of Biological Sciences
California State University, Fullerton, Department of Biological Sciences
Center for Biodiversity
Defenders of Wildlife
Ducks Unlimited
El Dorado Audubon
Endangered Habitats League
Friends of the Seal Beach National Wildlife Refuge
Laguna Hills Audubon Society
National Audubon Society
National Fish and Wildlife Foundation
National Wildlife Federation
National Wildlife Refuge Association
Orange County Conservation Corps
Palos Verdes/South Bay Audubon Society
Point Reyes Bird Observatory

San Diego Audubon
Sea and Sage Audubon Society
Sierra Club
Sunset Aquatic Regional Park
Sunset Beach Community Association
Surfrider Foundation
The Nature Conservancy
The Wilderness Society
Westchester Bay HOA
Wildlife Management Institute

**Interested Public**
Breitburn Energy
Tierra Data Inc.
Tim Anderson
Charlie Collins
Kristen Bender
Dick Zembal
Susan Hoffman
Pete Bloom
John Bradley

**Media**
Huntington Beach News
Huntington Beach Wave
Los Angeles Times, Orange County Addition
Orange County Register
Seal Beach News Enterprise
Seal Beach Sun
SBTV Channel 3
Westminster Herald

# *Appendix F-3: Response to Comments*

## Comment

STATE OF CALIFORNIA
GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH
STATE CLEARINGHOUSE AND PLANNING UNIT

JERRY BROWN
GOVERNOR

May 12, 2011

Victoria Touchstone
U.S. Fish and Wildlife Service, San Diego NWR Complex
6010 Hidden Valley Road, Suite 101
Carlsbad, CA 92011

Subject: Seal Beach National Wildlife Refuge Draft Comprehensive Conservation Plan / Environmental Assessment
SCH#: 2011034007

Dear Victoria Touchstone:

**1-1** The State Clearinghouse submitted the above named Environmental Assessment to selected state agencies for review. The review period closed on May 11, 2011, and no state agencies submitted comments by that date. This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act.

Please call the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process. If you have a question about the above-named project, please refer to the ten-digit State Clearinghouse number when contacting this office.

Sincerely,

Scott Morgan
Director, State Clearinghouse

1400 10th Street P.O. Box 3044 Sacramento, California 95812-3044
(916) 445-0613 FAX (916) 323-3018 www.opr.ca.gov

## Response

1.1 No comment necessary.

## Comment

**Document Details Report**
**State Clearinghouse Data Base**

***SCH#*** **2011034007**
***Project Title*** Seal Beach National Wildlife Refuge Draft Comprehensive Conservation Plan / Environmental Assessment
***Lead Agency*** U.S. Fish and Wildlife Service

***Type*** **EA** Environmental Assessment
***Description*** Note: review per lead

The U.S. Fish and Wildlife Service proposes to implement a comprehensive conservation plan (management plan) for the 965-acre Seal Beach National Wildlife Refuge that will guide refuge management for the next 15 years. The plan addresses protection, restoration, and enhancement of native coastal wetland and upland habitat; protections of listed species, migratory birds, fish, and other wildlife; protections of cultural resources; integrated pest management; mosquito management; and provisions for compatible public uses such as wildlife observation, interpretation, environmental education, and scientific research that would support Refuge purposes.

### Lead Agency Contact

***Name*** Victoria Touchstone
***Agency*** U.S. Fish and Wildlife Service, San Diego NWR Complex
***Phone*** 760 431 9440 x 349 ***Fax***
***email***
***Address*** 6010 Hidden Valley Road, Suite 101
***City*** Carlsbad ***State*** CA ***Zip*** 92011

### Project Location

***County*** Orange
***City*** Seal Beach
***Region***
***Lat / Long*** 33° 44' N / 118° 5' 00" W
***Cross Streets*** Seal Beach Blvd & Pacific Hwy
***Parcel No.***
***Township*** 5S ***Range*** 12W ***Section*** 12 ***Base***

### Proximity to:

***Highways*** I-405, SR-1
***Airports***
***Railways***
***Waterways*** Anaheim Bay, Pacific Ocean
***Schools***
***Land Use*** National Wildlife Refuge located on Naval Weapons Station Seal Beach

***Project Issues*** Agricultural Land; Archaeologic-Historic; Biological Resources; Coastal Zone; Minerals; Soil Erosion/Compaction/Grading; Vegetation; Water Quality; Wetland/Riparian; Landuse

***Reviewing Agencies*** Resources Agency; Department of Boating and Waterways; California Coastal Commission; Department of Conservation; Department of Fish and Game, Region 5; Department of Fish and Game, Marine Region; Office of Historic Preservation; Department of Parks and Recreation; Department of Water Resources; Caltrans, District 12; Regional Water Quality Control Board, Region 9; Native American Heritage Commission; State Lands Commission

***Date Received*** 03/25/2011 ***Start of Review*** 03/25/2011 ***End of Review*** 05/11/2011

## Comment

**DEPARTMENT OF THE NAVY**
NAVAL WEAPONS STATION SEAL BEACH
800 SEAL BEACH BOULEVARD
SEAL BEACH, CA 90740-5607

IN REPLY REFER TO
5090
Ser N45W/0069
JUN 24 2011

Victoria Touchstone, Refuge Planner
San Diego NWR Complex
1080 Gunpowder Point Drive
Chula Vista, CA 91910

Dear Ms. Touchstone,

Naval Weapons Station, Seal Beach has completed its review of the Seal Beach National Wildlife Refuge Draft Comprehensive Conservation Plan/Environmental Assessment. Thank you for the opportunity to review and comment on this important guidance document. Enclosure (1) includes a comment matrix with detailed comments, but the following are specific comments that raised some concern from the installation.

2-1 a. There is no mention of the Installation Restoration Program/Munitions Response Program (IRP/MRP) in the document. As there are several active IRP/MRP sites within the boundary of the NWR, this needs to be addressed.

2-2 b. It is the understanding of this office that the Mosquito Management Plan (Appendix D) has been removed from the overall plan pending updates. Please confirm that this is the case.

2-3 c. The proposed action (Alternative C) proposes the "establishment of one or more populations of the Federally-listed endangered plant, salt marsh bird's -beak" (*Cordylanthus maritimus* ssp. *Maritimus*). Per Navy policy enclosure (2) any proposal to introduce federally protected species onto Navy property must undergo review and approval by the Deputy Chief of Naval Operations.

2-4 d. The Draft Integrated Pest Management Program (IPMP) (Appendix C) does not address requirements of the Installations Integrated Pest Management Program, which has requirements for reporting pest management operations through the Navy Online Pesticide Reporting System (NOPRS). Please include the Navy requirements into the NWR IPMP.

## Response

2-1 A discussion of the Installation Restoration (IR) Program for Naval Weapons Station Seal Beach was included in Section 4.2.9 of the draft CCP/EA, with locations of those sites that occur within or in proximity to the Refuge depicted in Figure 4-12 and described in Table 4-4. The Environmental Consequences section of the draft EA (Sections 5.2.1.10, 5.2.2.10 and 5.2.3.10) also addressed this program. The presence of ordnance on the Refuge was addressed in Section 4.5.2 (Public Safety). However, to ensure that future refuge managers are fully aware of the IR Program and the Munitions Response Program (MRP), the locations of the MRP sites located on the Refuge have been added to Figure 4-12 in the Final CCP, a discussion of the MRP has been added to Sections 4.2.9 and 4.5.2 of the Final CCP, and these programs are now also acknowledged in Section 5.8.2 of the Plan Implementation chapter of the Final CCP.

2-2 The draft Mosquito Management Plan, provided as Appendix D of the draft CCP/EA, has been withdrawn from consideration until such time as the Service approves a final Mosquito and Mosquito-Borne Disease Management Policy for the National Wildlife Refuge System. Until a Mosquito Management Plan is approved for the Refuge, mosquito management on the Refuge will be conducted in accordance with the conditions included in annually issued Special Use Permits and the stipulations included in the Compatibility Determination for Mosquito Management.

2-3 All proposals for habitat restoration, including those involving the seeding of salt marsh bird's-beak will be developed in coordination with the Navy per the Refuge establishment documents.

2-4 The information provided in Section 3.4.3.2 of the draft CCP/EA regarding the Navy's approval and reporting requirements for pesticides used on the Refuge has been added to the Final Integrated Pest Management Plan (Appendix D, page D-2, of the Final CCP). Similar language was also been added to Chapter 5, page 5-4, of the Final CCP.

## Comment

5090
Ser N45W/0069

My point of contact is Mr. Robert Schallmann, Conservation Program Manager. He can be reached at (562)626-7290, or via email at robert.schallmann@navy.mil.

Sincerely,

T. W. RUBERRY
Captain, U.S. Navy
Commanding Officer

Enclosures: 1. Comment matrix
2. Navy Endanger Species guidance

## Comment

**COMMENT MATRIX**

| | |
|---|---|
| **COMMENT INCORPORATOR** | **DATE**<br>1 MAY 2011 |
| **COMMENTOR**<br>Bob Schallmann | **ORGANIZATION OF COMMENTOR**<br>NAVWPNSTA Seal Beach |
| **TITLE OF DOCUMENT**<br>Seal Beach National Wildlife Refuge Draft Comprehensive Conservation Plan/Environmental Assessment | **DATE OF DOCUMENT**<br>FEB 2011 |

| | NO. | PAGE NO. | PARA-GRAPH | LINE NO. | FIGURE/ TABLE NO. | RECOMMENDED CHANGES *(Exact wording of suggested change)* | INCORP? *(Yes/No)* |
|---|---|---|---|---|---|---|---|
| 2-5 | 1. | GLOBAL | | | | **Change "NWSSB" to "NAVWPNSTA Seal Beach"** | |
| 2-6 | 2. | 4-34<br>3-35<br>3-36 | | | | There is no mention of the Munitions Response Program (MRP) in the document. The area surrounding the drop tower is an active MRP site, thus any removal action must be completed once the MRP investigation and/or cleanup has been completed | |
| 2-7 | 3. | APP D | | | | It is the understanding of this office that the Mosquito Management Plan (Appendix D) has been removed from the overall plan pending updates. Please confirm that this is the case. | |
| 2-8 | 4. | 3-34<br>4-68 | | | | The proposed action (Alternative C) proposes the "establishment of one or more populations of the Federally-listed endangered plant, salt marsh bird's –beak" (Cordylanthus maritimus ssp. Maritimus). Per Navy policy (Attachment 2), any proposal to introduce federally protected species onto Navy property must undergo review and approval by the Deputy Chief of Naval Operations. | |
| 2-9 | 5. | APP C | | | | The Draft Integrated Pest Management Program (IPMP)(Appendix C) does not address requirements of the Installations Integrated Pest Management Program, which has requirements for reporting pest management operations through the Navy Online Pesticide Reporting System (NOPRS). Please include the Navy requirements into the NWR IPMP. | |
| 2-10 | 6. | 3-4<br>3-6 | 3.3.3 | | | Environmental Programs and Services Office vice Department | |
| 2-11 | 7. | APP F | | | | Name of Nelson's Sharp-tailed Sparrow has been changed to Nelson's Sparrow | |
| 2-12 | 8. | APP F | | | | Unsure if the following nest in NWR: AMKE, BAOW, GHOW, BUOW, BLPH, SAPH, WEKI, LOSH, CLSW, BARS, WEBL, HOOR | |
| 2-13 | 9. | i | TOC | | | 2.5 Refuge Access……2-5 format to match rest of TOC | |

**Navy Enclosure 1**

## Response

2-5 Comment noted.

2-6 Refer to Response 2-1.

2-7 Refer to Response 2-2.

2-8 Refer to Response 2-3.

2-9 Refer to Response 2-4.

2-10 Text has been revised accordingly.

2-11 Text has been revised accordingly.

2-12. Appendix E (previously Appendix F) has been revised.

2-13. Comment noted.

## Comment

**DEPARTMENT OF THE NAVY**
OFFICE OF THE SECRETARY
1000 NAVY PENTAGON
WASHINGTON, D.C. 20350-1000

25 November 2002

MEMORANDUM FOR CHIEF OF NAVAL OPERATIONS
COMMANDANT OF THE MARINE CORPS

SUBJECT: Policy Guidance for Endangered Species Actions

Active Navy and Marine Corps participation in Endangered Species Act (ESA) listing decisions, critical habitat designation, and recovery planning is essential to prevent or minimize restrictions on mission related activities. Providing timely comments on ESA rule-making provides us the opportunity to communicate to the regulators about potential military mission impacts, and to demonstrate that a proposed action may not be warranted, in certain situations, because of on-going military conservation efforts and implementation of installation Integrated Natural Resources Management Plans.

As a matter of policy, Navy and Marine Corps installations and commands shall properly staff through their chain of command ESA actions that have potential to affect mission readiness. Moreover, comments in response to any proposal to designate critical habitat or to introduce federally protected species onto Navy and Marine Corps property, shall undergo review and approval by the Deputy Chief of Naval Operations (N4) or the Deputy Commandant of the Marine Corps (I&L). This will ensure that the final determination on such matters is consistent with the Department's obligations under Title 10 of the U.S. Code to maintain ready forces.

This guidance does not alter the Department's commitment and obligation under the ESA to use its authority to enhance the recovery of federally listed species and their habitats. Federal agencies are responsible for conserving endangered species as part of their normal activities. The Navy and Marine Corps will continue to play a vital role in support of the ESA. However, we have a duty to balance that effort with the need to use our lands to support the Defense mission. We count on you to help ensure that we find and maintain that balance.

Gordon R. England
Secretary of the Navy

2002U128007814

Encl (2)

## Comment

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY    EDMUND G. BROWN Jr., Governor

**DEPARTMENT OF TRANSPORTATION**
District 12
3347 Michelson Drive, Suite 100
Irvine, CA 92612-8894
Tel: (949) 724-2241
Fax: (949) 724-2592

*Flex your power!*
*Be energy efficient!*

**May 10, 2011**

Victoria Touchstone
U.S. Fish and Wildlife Service
San Diego NWR Complex
6010 Hidden Valley Road, Suite 101
Carlsbad, California 92011

File: IGR/CEQA
SCH#: 2011034007
Log #: 2677
SR-1

**Subject: Seal Beach National Wildlife Refuge**

Dear Ms. Touchstone,

Thank you for the opportunity to review and comment on the **Draft Comprehensive Conservation Plan/Environmental Assessment (CCP/EA) for the Seal Beach National Wildlife Refuge.** The proposed project includes a 15-year conservation plan for the 965-acre Seal Beach National Wildlife Refuge. The plan would address protection, restoration, and enhancement of native coastal wetland and upland habitat; protection of listed species, migratory birds, fish, and other wildlife; protection of cultural resources; integrated pest management; mosquito management; and provisions for compatible public uses such as wildlife observation, interpretation, environmental education, and scientific research that would support Refuge purposes. The project area is located within the U.S. Naval Weapons Station, northwest of the intersection of Pacific Coast Highway and Seal Beach Boulevard in the City of Seal Beach. The nearest State route to the project site is SR-1.

**3-1** **The Department of Transportation (Department) is a commenting agency** on this project and has no comment at this time. However, in the event of any activity in the Department's right-of-way, an encroachment permit will be required.

Please continue to keep us informed of this project and any future developments that could potentially impact State transportation facilities. If you have any questions or need to contact us, please do not hesitate to call Marlon Regisford at (949) 724-2241.

Sincerely,

Christopher Herre

Christopher Herre, Branch Chief
Local Development/Intergovernmental Review

*"Caltrans improves mobility across California"*

## Response

3-1 Comment noted.

## Comment

KAREN LEE
<knlee@verizon.net>
05/04/2011 04:11 PM

To Victoria_Touchstone@fws.gov
cc Donna Bray <donnabray@charter.net>, Mary Parcell <mfp2001@hotmail.com>, Pei-fen Tamashiro <pei-fen.tamashiro@navy.mil>
bcc
Subject Seal Beach CCP - Comments from Larry T. Lee

History: This message has been forwarded.

4-1 First Comment – I do not understand why the CCP appears to be totally silent about the impacts to the Refuge of the Weapons Station's on-going Installation Restoration Program (IRP) and Munitions Response Program (MRP). There is one IR site and two MRP sites that directly impact the Refuge. While these activities will be funded by the Navy, I would think any Refuge planning activity, such as this one, needs to be coordinated with IRP and MRP activities.

4-2 IRP site 74, the old skeet range, extends onto the refuge and is heavily contaminated with lead shot. In March of 2011 20 dead geese were found on the Weapons Station which were found to have died from lead poisoning. Where they ingested the lead shot is subject to speculation. All of the remediation alternatives being considered for this site have impacts to the Refuge.

4-3 MRP – Site UXO 1, includes the POLB Mitigation Pond on the south east part of the Refuge. It will also prevent any invasive plant control on the adjacent land until the "Time Critical Removal Action" is complete. Right now this whole area is Off Limits.

MRP – Site AOC 2 (which will become Site UXO 7 in the future) is the Explosive Drop Test Tower. This site is the number 4 improvement activity identified in Alternative C. Clearly the Refuge cannot touch this site until the munitions issues are resolved. And how the munitions issues are resolved will impact what needs to be done by the Refuge.

4-4 Second Comment – The total costs shown in Table 6-2 do not add up correctly. I get totals of 4,193,000 and 16,500 not 4,213,000 and 160,500.

4-5 Third Comment – I think all of the alternatives should give a little more attention to nesting opportunities for non-target, but water related species, such as Great Blue Herons and Ospreys.

Larry T. Lee

## Response

4-1 Refer to Response 2-1. In addition, Section 4.2.9 (Contaminants) of the draft CCP/EA described the effects of the various constituents of concern identified at these sites on Refuge resources.

4-2 The presence of this site is acknowledged in the draft CCP/EA in Table 4-4. As indicated in that table, the Navy is currently evaluating action plans to address the site and has involved Refuge staff in these discussions. The Navy will be responsible for complying with NEPA prior to implementing any remediation actions for IR Site 74.

4-3 Although a discussion of the need to coordinate with the Navy regarding known buried and exposed ordnance on the Refuge is included in the draft CCP/EA, a more detailed discussion of MRP Sites UXO1 and AOC2 has been added to the Final CCP. The Refuge will continue to coordinate with the Navy on these sites and will obtain prior Navy approval for implementation of any projects located in proximity to these sites.

4-4 This table has been revised accordingly.

4-5 To achieve the Refuge objectives for the California least tern and light-footed clapper rail, the CCP includes strategies for reducing perching opportunities for avian predators. Providing nesting opportunities for osprey and great blue heron would increase potential perching sites for avian predators rather than reduce them. The draft CCP/EA addresses the effects of retaining (Alternative B) and eliminating (Alternative C) the drop tower, which currently provides nesting opportunities for non-target species, some of which are considered potential predators of listed species.

## Comment

Debbie_Allen@nps.gov
04/26/2011 07:08 PM

To victoria_touchstone@fws.gov
cc Alan_Schmierer@nps.gov, waso_eqd_extrev@nps.gov, oepcsfn@aol.com, susmita_penduthi@ios.doi.gov
bcc
Subject Re: DEC-11/0056:Seal Beach National Wildlife Refuge, Comprehensive Conservation Plan

5-1 PWR has no comment regarding subject document.

Debbie Allen
National Park Service
Partnerships Programs, PWR
1111 Jackson Street #700
Oakland, CA 94607
510/817-1446
510/817-1505 Fax

"Don't dwell on what went wrong. Instead, focus on what to do next. Spend your energies on moving forward toward finding the answer." -- Denis Waitley

Dale_Morlock@nps.gov
03/30/2011 07:52 PM

To Debbie_Allen@nps.gov
cc
Subject DEC-11/0056:Seal Beach National Wildlife Refuge, Comprehensive Conservation Plan

NPS External Affairs Program: ER2000 Program Email Instruction Sheet

United States Department of the Interior
National Park Service Environmental Quality Division
7333 W. Jefferson Avenue
Lakewood, CO 80235-2017

EIS/Related Document Review: Detail View

## Response

5-1 No comment necessary.

# *Appendix F-4: Glossary of Terms*

# Glossary of Terms

## 1. Acronyms and Abbreviations

| | |
|---|---|
| ACHP | Advisory Council on Historic Preservation |
| ACOE | United States Army Corps of Engineers |
| ADA | Americans with Disabilities Act |
| ADT | average daily traffic volumes |
| AHPA | Archaeological and Historic Preservation Act |
| Ai | active ingredient |
| APE | Area of Potential Effect |
| APHIS-PPQ | Animal and Plant Health Inspection Service, Plant Protection and Quarantine |
| AQMD | Air Quality Management District |
| AQMP | Air Quality Management Plan |
| ARB | California Air Resources Board |
| ARPA | Archaeological Resources Protection Act |
| ATV | all-terrain vehicle |
| Basin | South Coast Air Basin |
| BCC | Birds of Conservation Concern |
| BCRs | Bird Conservation Regions |
| BLM | Bureau of Land Management |
| BMPs | Best Management Practices |
| BOD | biological oxygen demand |
| CAAQS | California Ambient Air Quality Standards |
| Caltrans | California Department of Transportation |
| CARB | California Air Resources Board |
| CCP | Comprehensive Conservation Plan |
| CDFG | California Department of Fish and Game |
| CDPH | California Department of Public Health |
| CEQ | Council on Environmental Quality |
| CEQA | California Environmental Quality Act |
| CESA | California Endangered Species Act |
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| CFWO | Carlsbad Fish and Wildlife Office |
| cm | centimeter |
| CNDDB | California Natural Diversity Database |
| CNEL | Community Noise Equivalent Level |
| CNPS | California Native Plant Society |
| CO | Carbon monoxide |
| Code | California Fish and Game Code |
| Complex | San Diego National Wildlife Refuge Complex |
| CRMP | Cultural Resources Management Program |
| CWA | California Waterfowl Association |
| dB | decibel |
| dBA | A-weighted noise scale |

| | |
|---|---|
| DDE | Dichloro-Diphenyl-Ethylene |
| DDT | Dichloro-diphenyl-trichloroethane |
| DMG | California Division of Mines and Geology |
| DOC | California Department of Conservation |
| DOI | Department of the Interior |
| EA | environmental assessment |
| EEC | estimated environmental concentration |
| EFH | Essential Fish Habitat |
| EIS | Environmental Impact Statement |
| EO | Executive Order |
| EPA | U.S. Environmental Protection Agency (also USEPA) |
| ESA | Endangered Species Act of 1973 as amended |
| FEMA | Federal Emergency Management Agency |
| FIFRA | Federal Insecticide, Fungicide, and Rodenticide Act |
| FMP | Fire Management Plan |
| FR | Federal Register |
| FTE | full-time equivalent |
| FY | Fiscal Year |
| GHGs | greenhouse gases |
| GIS | Geographic Information System |
| gpm | gallons per minute |
| HAPC | Habitat Areas of Particular Concern |
| HMP | Habitat Management Plan |
| HUD | U.S. Department of Housing and Urban Development |
| IBA | Important Bird Area |
| Improvement Act | National Wildlife Refuge System Improvement Act of 1997 |
| INRMP | (Naval Weapons Station Seal Beach) Integrated Natural Resources Management Plan |
| IPCC | Intergovernmental Panel on Climate Change |
| IPM | Integrated Pest Management |
| IR | Installation Restoration |
| kV | kilovolt |
| LCC | Landscape Conservation Cooperative |
| LCP | Local Coastal Program |
| Ldn | Day/Night Average Sound Level |
| LOC | Level of Concern |
| LOS | Level of Service |
| $m^2$ | square meter |
| MBTA | Migratory Bird Treaty Act |
| mg/l | milligrams per liter |
| MHHW | mean higher high water |
| MHW | mean high water |
| MLLW | mean lower low water |
| mm/yr | millimeters per year |
| MOA | Memorandum of Agreement |
| MOU | Memorandum of Understanding |
| MPAs | Marine Protected Areas |
| mph | miles per hour |
| MRP | Munitions Response Program |
| MSCP | Multiple Species Conservation Program |
| MSDS | Material Safety Data Sheet |

| | |
|---|---|
| MSL | mean sea level |
| Municipal Permit | Municipal Storm Water NPDES Permit |
| NAAQS | National Ambient Air Quality Standards |
| NAGPRA | Native American Graves Protection and Repatriation Act |
| NEPA | National Environmental Policy Act |
| NGDV | National Geodetic Vertical Datum |
| NGOs | non-governmental organizations |
| NHPA | National Historic Preservation Act |
| NIFZ | Newport-Inglewood Fault Zone |
| NMFS | National Marine Fisheries Service |
| $NO_2$ | Nitrogen dioxide |
| NOAA | National Oceanic and Atmospheric Administration |
| NOAEC | no observed concentration |
| NOEC | no observed effect concentration |
| NOI | Notice of Intent |
| NOx | Oxides of nitrogen |
| NPDES | National Pollutant Discharge Elimination System |
| NRHP | National Register of Historic Places |
| NWI | National Wetlands Inventory |
| NWR | National Wildlife Refuge |
| NWRS | National Wildlife Refuge System |
| NWSSB | Naval Weapons Station Seal Beach |
| OCVCD | Orange County Vector Control District |
| $O_3$ | Ozone |
| OEHHA | Office of Environmental Health Hazard Assessment |
| PAHs | polycyclic aromatic hydrocarbons |
| PCBs | polychlorinated biphenyls |
| $PM_{10}$ | fugitive dust emissions or "inhalable particles" that are 10 microns (millionths of a meter) or less in diameter |
| $PM_{2.5}$ | fine inhalable particles that are 2.5 microns and smaller |
| Port | Port of Long Beach |
| ppm | parts per million |
| ppt | parts per thousand |
| PUP | Pesticide Use Proposal |
| PUPS | Pesticide Use Proposal System |
| ROD | Record of Decision |
| RONS | Refuge Operating Needs System |
| RQ | risk quotients |
| RWQCB | Regional Water Quality Control Board |
| SAMMS | Service Asset Maintenance Management System |
| SCAQMD | South Coast Air Quality Management District |
| Service | U.S. Fish and Wildlife Service (also, USFWS) |
| SHC | Strategic Habitat Conservation |
| SJV | Sonoran Joint Venture |
| SHPO | State Historic Preservation Office |
| $SO_4$ | Sulfates |
| SQO | sediment quality objective |
| SSC | California Species of Special Concern |
| State | California Department of Fish and Game |
| SUP | Special Use Permit |
| SWRCB | California State Water Resources Control Board |

| | |
|---|---|
| TBT | tributyltin |
| TMDL | total maximum daily load |
| TOT | transit occupancy taxes |
| TRPH | total recoverable petroleum hydrocarbons |
| USC | United States Code |
| USDA APHIS | U.S. Department of Agriculture, Animal Plant Health Inspection Service |
| USDA | U.S. Department of Agriculture |
| USEPA | U.S. Environmental Protection Agency (also EPA) |
| USFWS | U.S. Department of the Interior, Fish and Wildlife Service (also, Service) |
| USGS | United States Geological Survey |
| VOC | volatile organic compounds |
| WCB | Wildlife Conservation Board |
| WNV | West Nile Virus |
| WQA | water quality assessment |
| WQCP | Water Quality Control Plan |
| WSA | wilderness study area |

## 2. Glossary of Terms

**Abiotic.** The non-living parts of an ecosystem (e.g. light, temperature, water, oxygen, and other nutrients or gases).

**Accessibility.** The state or quality of being easily approached or entered, particularly as it relates to complying with the Americans with Disabilities Act.

**Accumulation.** The build-up of a chemical in an organism due to repeated exposure.

**Action Threshold.** Mosquito population levels that trigger IPM actions to manipulate mosquito populations.

**Adaptive Management.** The rigorous application of management, research, and monitoring to gain information and experience necessary to assess and modify management activities. A process that uses feedback from refuge research and monitoring and evaluation of management actions to support or modify objectives and strategies at all planning levels. Analysis of results help managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.

**Adulticide**. Killing adult mosquitoes or a pesticide that kills adult mosquitoes.

**Alluvial.** Clay, silt, sand, gravel or other sedimentary matter transported and deposited in a delta or riverbed by flowing water.

**Alternative.** A reasonable way to resolve identified issues; a different set of objectives and strategies to achieve refuge goals and the desired future condition.

**Aquatic.** Pertaining to water, in contrast to land.

**Arthropod-borne viruses (arboviruses)**. Viruses that are maintained in nature through biological transmission between susceptible vertebrate hosts by blood-feeding arthropods.
**Artifact.** An object used or made by humans, usually in reference to projectile points, tools, utensils, art, food remains, and other products of human activity.

**Benthic.** Refers to organisms associated with the bottom of the ocean, bay, lake, or river.

**Biological Diversity**. The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and communities and ecosystems in which they occur. (See 601 FW 3 for more information on biological diversity.)

**Biological Integrity.** Biotic composition, structure, and functioning at the genetic, organism, and community levels consistent with natural conditions, including the natural biological processes that shape genomes, organisms, and communities.

**Biota.** The plant and animal life of a region.

**Bivalve.** Common term for pelecypods (members of Mollusca) in which the hard parts are composed of two sections fitting together to enclose a space that contains the soft part of the organism.

**Categorical Exclusion.** A category of actions that do not individually or cumulatively have a significant effect on the human environment and have been found to have no such effect in procedures adopted by a Federal agency pursuant to the National Environmental Policy Act.

**Compatibility Determination.** A written determination that a proposed or existing use of a National Wildlife Refuge is a compatible use or is not a compatible use.

**Compatible Use.** A proposed or existing wildlife-dependent recreational use or any other use of a National Wildlife Refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System Mission or the purposes of the Refuge on which the use would occur.

**Comprehensive Conservation Plan (CCP).** A document that describes the desired future conditions of the refuge or planning unit and provides long-range guidance and management direction to achieve the purposes of the refuge, helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the ecological integrity of each refuge and the Refuge System; helps achieve the goals of the National Wilderness Preservation System; and meets other mandates.

**Critical Habitat.** According to U.S. Federal law, the ecosystems upon which endangered and threatened species depend.

**Cultural Resource Inventory.** A professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined geographic area. Inventories may involve various levels, including background literature search, comprehensive field examination to identify all exposed physical manifestations of cultural resources, or sample inventory to project site distribution and density over a larger area. Evaluation of identified cultural resources to determine eligibility for the National Register follows the criteria found in 36 CFR 60.4.

**Cultural Resource Overview.** A comprehensive document prepared for a field office that discusses, among other things, its prehistory and cultural history, the nature and extent of known cultural resources, previous research, management objectives, resource management conflicts or issues, and a general statement on how program objectives should be met and conflicts resolved.

**Cultural Resource.** The physical remains of human activity (e.g., artifacts, ruins, historic sites, petroglyphs) and conceptual content or context of an area such as a traditional sacred site. It includes historically, archaeologically, and architecturally significant resources.

**Detritus.** An accumulation of decomposing plant and animal remains.

**Dioxin.** A family of toxic chemicals, including polychlorinated biphenyls (PCBs), that all share a similar chemical structure and a common mechanism of toxic action. Dioxin levels in the environment have been declining; however, current exposures levels still remain a concern.

**Disturbance.** Significant alteration of habitat structure or composition. May be natural (e.g., fire) or human-caused events (e.g., aircraft overflight). Also see wildlife disturbance.

**Easement.** A privilege or right that is held by one person or other entity in land owned by another.

**Ecological Integrity.** The integration of biological integrity, natural biological diversity, and environmental health; the replication of natural conditions.

**Ecoregion.** A territory defined by a combination of biological, social, and geographic criteria, rather than geopolitical considerations; generally, a system of related, interconnected ecosystems.

**Ecosystem Approach.** Protecting or restoring the natural function (processes), structure (physical and biological patterns), and species composition of an ecosystem, recognizing that all components are interrelated.

**Ecosystem Management. M**anagement of an ecosystem that includes all ecological, social and economic components that makes up the whole of the system.

**Ecosystem.** A dynamic and interrelated complex of plant and animal communities and their associated non-living environment.

**Effect.** A change in a resource, caused by a variety of events including project attributes acting on a resource attribute (direct), not directly acting on a resource attribute (indirect), another project attributes acting on a resource attribute (cumulative), and those caused by natural events (e.g., seasonal change).

**Endangered Species (Federal).** A plant or animal species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range.

**Endangered Species (State).** A plant or animal species in danger of becoming extinct or extirpated in California within the near future if factors contributing to its decline continue.

**Environment.** The sum total of all biological, chemical, and physical factors to which organisms are exposed; the surroundings of a plant or animal.

**Environmental Assessment (EA).** A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an Environmental Impact Statement or Finding of No Significant Impact.

**Environmental Education.** A process designed to develop a citizenry that has the awareness, concern, knowledge, attitudes, skills, motivation, and commitment to work toward solutions of current environmental problems and the prevention of new ones. Environmental education within the National Wildlife Refuge System incorporates materials, activities, programs, and products that address the citizen's course of study goals, the objectives of the refuge or unit, and the mission of the Refuge System.

**Environmental Health**. Composition, structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment. (See 601 FW 3.)

**Environmental Impact Statement (EIS).** A detailed written statement required by Section 102(2)(C) of the National Environmental Policy Act, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR 1508.11).

**Epibenthic.** Pertaining to the environment and conditions of organisms living near the water bottom.

**Estuarine.** Deepwater tidal habitats and adjacent tidal wetlands that are usually partly enclosed by land but have some access to the open ocean and are diluted by freshwater.

**Estuary.** The wide lower course of a river into which the tides flow. The area where the tide meets a river current.

**Euryhaline.** Organisms that are tolerant of a wide range of salinity.

**Exotic Species.** Species that have been intentionally introduced to or have inadvertently infiltrated an area in which they are not natural found. Exotic species compete with native species for food or habitat.

**Fallow.** Allowing land that normally is used for crop production to lie idle.

**Federal Trust Resources.** A trust is something managed by one entity for another who holds the ownership. The Service holds in trust many natural resources for the people of the United States of America as a result of Federal acts and treaties. Examples are species listed under the Endangered Species Act, migratory birds protected by the Migratory Bird Treaty Act and other international treaties, and native plant or wildlife species found on the Refuge System.

**Finding of No Significant Impact (FONSI).** A document prepared in compliance with the National Environmental Policy Act, supported by an environmental assessment, that briefly presents why a Federal action will have no significant effect on the human environment and for which an environmental impact statement, therefore, will not be prepared (40 CFR 1508.13).

**Fiscal Year.** Federal Government budget year beginning October 1 and ending September 31.

**Floodplain.** The relatively flat area along the sides of a river which is naturally subjected to flooding.

**Flyway.** A route taken by migratory birds between their breeding grounds and their wintering grounds. Four primary migration routes have been identified for birds breeding in North America: the Pacific, Central, Mississippi, and Atlantic Flyways.

**Foraging.** The act of feeding; another word for feeding.

**Forb.** A broad-leaved, herbaceous plant.

**Fragmentation.** The process of reducing the size and connectivity of habitat patches.

**Gastropod.** Any of a large class of mollusks, usually with a univalve shell or no shell and a distinct head bearing sensory organs, such as snails and slugs.

**Goal.** Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units.

**Habitat Restoration.** Management emphasis designed to move ecosystems to desired conditions and processes, and/or to healthy ecosystems.

**Habitat Type.** See Vegetation Type.

**Habitat.** Suite of existing environmental conditions required by an organism for survival and reproduction. The place where an organism typically lives.

**Health Threat**. An adverse impact to the health of human or wildlife populations from mosquitoes identified and documented by Federal, State, and/or local public health authorities.

**Hydrologic Regime.** The local pattern and magnitude of water flow influenced by season.

**Hydrology.** The science dealing with the properties, distribution, and circulation of water on and below the earth's surface and in the atmosphere. The distribution and cycling of water in an area.

**Impact.** Refer to Effect.

**Integrated Pest Management (IPM)**. A sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks.

**Interpretation.** Interpretation can be an educational and recreational activity that is aimed at revealing relationships, examining systems, and exploring how the natural world and human activities are interconnected.

**Intertidal Mudflat.** Expanses of mud contiguous to a water body often covered and exposed by tides.

**Invasive Species.** Refer to Exotic Species.

**Inversion.** A state in which the temperature of the air increases with increasing altitude and keeps the surface air and pollutants down.

**Invertebrate.** Animals that do not have backbones. Included are insects, spiders, mollusks (clams, snails, etc.), and crustaceans (shrimp, crayfish, etc.).

**Issue.** Any unsettled matter that requires a management decision (e.g., a Service initiative, opportunity, resource management problem, a threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition).

**Landbird.** A category of birds that obtains at least part of their food from the land and nest in mainland areas (though some can also be found on islands). Landbirds include raptors and songbirds among others.

**Landform.** The physical shape of the land reflecting geologic structure and processes of geomorphology that have sculpted the structure.

**Landowner:** A person or entity indicated as the owner of property on the various ownership maps maintained by the Office of the County Assessor.

**Larvicide**. Killing mosquito larvae, or a pesticide that kills mosquito larvae.

**Lease.** A legal contract by which rights to use land or water are acquired for a specified period of time for a specified rent or compensation.

**Macroinvertebrates.** Invertebrates large enough to be seen with the naked eye (e.g., most aquatic insects, snails, and amphipods).

**Management Alternative.** A set of objectives and the strategies needed to accomplish each objective [FWS Manual 602 FW 1.4].

**Management Concern.** Refer to Issue.

**Marsh Habitat.** Habitat that is characterized by shallow water and emergent vegetation; unless otherwise specified, this term does not apply to similar habitat found in rivers, drains, or canals.

**Marsh.** A periodically wet or continually flooded area where water is shallow enough to allow the growth of emergent vegetation; a marsh can be influenced by freshwater, tides, or both.

**Migration.** The seasonal movement from one area to another and back.

**Migratory Bird.** A bird that seasonally moves between geographic areas.

**Mitigation.** To avoid or minimize impacts of an action by limiting the degree or magnitude of the action; to rectify the impact by repairing, rehabilitating, or restoring the affected environment; to reduce or eliminate the impact by preservation and maintenance operations during the life of the action.

**Model.** A mathematical formula that expresses the actions and interactions of the elements of a system in such a manner that the system may be evaluated under any given set of conditions.

**Monitoring.** The process of collecting information to track changes of selected parameters over time. Monitoring is necessary to identify, track and analyze results of management actions at the Refuge so that future management actions may be adapted to obtain the best benefits to wildlife and habitat. See also Adaptive Management.

**Mosquito Management**. Any activity designed to inhibit or reduce populations of flies in the family

**Mosquito Population Monitoring**. Activities associated with collecting quantitative data to determine mosquito species composition and to estimate relative changes in mosquito population sizes over time.

**Mosquito-Borne Disease Surveillance**. Activities associated with detecting pathogens causing mosquito-borne diseases, such as testing adult mosquitoes for pathogens or testing reservoir hosts for pathogens or antibodies.

**Mosquito-Borne Disease**. An illness produced by a pathogen that mosquitoes transmit to humans and other vertebrates. The major mosquito-borne pathogens presently known to occur in the United States that are capable of producing human illness are the viruses causing eastern equine encephalitis, western equine encephalitis, St. Louis encephalitis, West Nile encephalitis/fever, LaCrosse encephalitis, and dengue, as well as the protozoans causing malaria.

**National Environmental Policy Act (NEPA).** An act which encourages productive and enjoyable harmony between humans and their environment, to promote efforts that will prevent or eliminate damage to the environment and atmosphere, to stimulate the health and welfare of humans. The act also established the Council on Environmental Quality. The Act requires all agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision making.

**National Wildlife Refuge (Refuge or NWR).** A designated area of land or water or an interest in land or water within the Refuge System, including National Wildlife Refuges, Wildlife Ranges, Wildlife Management Areas, Waterfowl Production Areas, and other areas (except Coordination Areas) under Service jurisdiction for the protection and conservation of fish and wildlife.

**National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).** Under the Refuge Improvement Act, the Service is required to develop 15-year Comprehensive Conservation Plans for all National Wildlife Refuges outside Alaska. The Act also describes the six public uses given priority status within the NWRS (i.e., hunting, fishing, wildlife observation, photography, environmental education, and interpretation).

**National Wildlife Refuge System Mission.** "The mission of the 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."

**National Wildlife Refuge System.** Various categories of areas administered by the Secretary of the Interior for the conservation of fish and wildlife, including species threatened with extinction; all lands, waters, and interests therein administered by the Secretary as wildlife refuges; areas for the protection and conservation of fish and wildlife that are threatened with extinction; wildlife ranges; games ranges; wildlife management areas; or waterfowl production areas.

**Native Species.** Species that normally live and thrive in a particular ecosystem.

**Natural Recruitment.** Plant establishment through natural processes.

**Neotropical Migratory Birds.** Migratory birds that breed in North American and winter in Central and South America.

**No Action Alternative.** An alternative under which existing management would be continued.

**Non-target Organisms**. Species or communities other than those designated for population control.

**Notice of Intent (NOI).** A notice that is published in the Federal Register announcing that an Environmental Impact Statement will be prepared and considered for a specific action.

**Objective.** An objective is a concise target statement of what will be achieved, how much will be achieved, when and where it will be achieved, and who is responsible for the work. Objectives are derived from goals and provide the basis for determining management strategies. Objectives should be attainable and time-specific and should be stated quantitatively to the extent possible. If objectives cannot be stated quantitatively, they may be stated qualitatively.

**Opportunities.** Potential solutions to issues.

**Ordinary High Water Mark.** That line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

**Outreach.** Two-way communication between the Service and the public to establish mutual understanding, promote involvement, and influence attitudes and actions, with goal of improving joint stewardship of our natural resources.

**Passerine Bird.** A songbird or other perching bird that is in the order Passeriformes (blackbirds, crows, warblers, sparrows, and wrens for example).

**Perennial.** In reference to a body of water, one that contains water year-to-year and that rarely goes dry.

**Permeability.** The property or capacity of porous rock, sediment, or soil to transmit water.

**Phenology.** The life cycle of particular species.

**Planning Team.** A team or group of persons working together to prepare a document. Planning teams are interdisciplinary in membership and function and generally consist of a planning team leader, refuge manager and staff biologists, a state natural resource agency representative, and other appropriate program specialists (e.g., social scientist, ecologist, recreation specialist).

**Planning Unit or Unit.** A single refuge, an ecologically or administratively related refuge complex, or distinct unit of a refuge. The planning unit also may include lands currently outside refuge boundaries.

**Plant Association.** A classification of plant communities based on the similarity in dominants of all layers of vascular species in a climax community.

**Plant Community.** An assemblage of plant species of a particular composition. The term can also be used in reference to a group of one or more populations of plants in a particular area at a particular point in time; the plant community of an area can change over time due to disturbance (e.g., fire) and succession.

**Pollutant or Contaminant.** Any introduced gas, liquid, or solid that makes a resource unfit for a specific purpose.

**Polychaetes.** Any of a class (Polychaeta) of chiefly marine annelid worms (such as clam worms), usually with paired segmental appendages, separate sexes, and a free-swimming trochophore larva.

**Polychlorinated Biphenyls (PCBs).** A mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment.

**Polycyclic Aromatic Hydrocarbons (PAHs).** A group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

**Population.** All the members of a single species coexisting in one ecosystem at a given time.

**Preferred Alternative.** This is the alternative determined by the decision maker to best achieve the Refuge purpose, vision, and goals; contributes to the Refuge System mission, addresses the significant issues; and is consistent with principles of sound fish and wildlife management.

**Prime Farmland.** Farmland in an area or region that is considered to be the most ideal farmland based on several criteria; usually soil types and land productivity of the land are two of the most important criteria.

**Priority Public Uses.** Compatible wildlife-dependent recreation uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).

**Proposed Action.** The management alternative that the Planning Team feels could best achieve Refuge purposes, vision, and goals while helping to fulfill the Refuge System mission.

**Public Health Authority**. A Federal, State, and/or local agency that has health experts with training and expertise in mosquitoes and mosquito-borne diseases and that has the official capacity to identify health threats and determine when there is a high risk for serious human disease or death from mosquitoes.

**Public Health Emergency.** An imminent risk of serious human disease or death, or an imminent risk to populations of wildlife or domestic animals. A health emergency represents the highest level of mosquito-associated health threats, as documented and determined by Federal, State, and/or local public health authorities.

**Public Involvement.** A process that offers impacted and interested individuals and organizations an opportunity to become informed about, and to express their opinions on Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for refuge management.

**Public Scoping:** See Public Involvement.

**Public.** Individuals, organizations, and groups; officials of Federal, State, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have indicated an interest in Service issues and those who do or do not realize that Service decisions may affect them.

**Pupacide**. A pesticide that kills the pupal stage of mosquitoes.

**Purpose(s) of the Refuge.** The purpose of a refuge is specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorization, or expanding a refuge, refuge unit, or refuge subunit.

**Raptor.** A category of carnivorous birds, most of which have heavy, sharp beaks, strong talons, and take live prey (e.g., peregrine falcon, northern harrier). Also referred to as a bird of prey.

**Record of Decision (ROD).** A concise public record of decision prepared by the Federal agency, pursuant to NEPA, that contains a statement of the decision, identification of all alternatives considered, identification of the environmentally preferable alternative, a statement as to whether all practical means to avoid or minimize environmental harm from the alternative selected have been adopted (and if not, why they were not), and a summary of monitoring and enforcement where applicable for any mitigation.

**Recruitment.** The annual increase in a population as determined by the proportion of surviving offspring produced during a specific period (usually expressed per year).

**Refuge Goal.** Refer to Goal.

**Refuge Operating Needs System (RONS).** A national database that contains the unfunded operational needs of each refuge. The Service includes projects required to implement approved plans and meet goals, objectives, and legal mandates.

**Refuge Purposes.** Refer to Purposes of a Refuge.

**Refuge Revenue Sharing Program.** Provides payments to counties in lieu of taxes using revenues derived from the sale of products from refuges.

**Refuge Use.** Any activity on a refuge, except administrative or law enforcement activity carried out by or under the direction of an authorized service employee.

**Refuge Vision.** A succinct statement of the unit's purpose and reason for being.

**Restoration.** The return of an ecosystem to an approximation of its former unimpaired condition.

**Revetment.** A facing of stone, concrete, or other material placed on a riverbank to protect it from erosion.

**Rhizomes.** Rootlike stem growing horizontally below the surface. The rhizome is used for food storage and can produce roots and shoots.

**Scoping.** A process for determining the range of issues to be addressed by a Comprehensive Conservation Plan and for identifying the significant issues that involves input from a range of government agencies, including Tribes, as well as private organizations, landowners, other interested parties, and the public.

**Seabird.** A group of birds that obtain at least some food from the ocean by traveling some distance over its surface. They also typically breed on islands and along coastal areas. Seabirds include gulls, terns, pelicans, and cormorants, among others.

**Sediment.** Any material, carried in suspension by water, which ultimately settles to the bottom of water courses. Sediments may also settle on stream banks or flood plains during high water flow.

**Shorebirds.** Long-legged birds, also known as waders, belonging to the order Charadriiformes, which use shallow wetlands and mud flats for foraging and nesting.

**Soil Erosion.** The wearing away of the land's surface by water, wind, ice, or other physical process.

**Songbirds.** A category of birds that are medium to small, perching landbirds. Most are territorial singers and migratory. (Refer also to Passerines.)

**Sound Professional Judgment.** A finding, determination, or decision that is consistent with principles of sound fish and wildlife management and administration, available science and resources, and adherence to the requirements of the Refuge Administration Act of 1966 (16 U.S.C. 668dd-668ee), and other applicable laws. Included in the finding, determination, or decision is a refuge manager's field experience and knowledge of the particular refuge's resources.

**Southern California Bight.** A curve in the southwestern California coastline that extends for Point Conception to just south of the Mexican border; the marine ecosystem and overall biodiversity in this area are influenced by the dramatic change in the angle of the coastline, which creates a significant backwater eddy. This backwater eddy results in the northern flow of equatorial waters along the nearshore and the southern flow of subarctic waters offshore, creating a biological transition zone between the warm and cold waters that supports approximately 500 marine fish species and more than 5,000 invertebrate species (*Southern California Coastal Water Research Project 1998*).

**Species Composition.** A group of species that inhabit a specific habitat type in its healthy state.

**Species Diversity.** Usually synonymous with "species richness," but may also include the proportional distribution of species.

**Species.** A distinctive kind of plant or animal having distinguishable characteristics, and that can interbreed and produce young. A category of biological classification.

**Step-down Management Plan.** A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, safety) or groups of related subjects. It describes strategies and implementation schedules for meeting CCP goals and objectives.

**Strategy.** A specific action, tool, or technique or combination of actions, tools, and techniques used to meet unit objectives.

**Study Area.** The area reviewed in detail for wildlife, habitat, and public use potential. For purposes of this CCP/EIS the study area includes the land and water within the approved Refuge boundary.

**Sublittoral.** Relating to or describing an organism living immediately below low-tide level.

**Submergent Vegetation.** Plants that grows completely submerged except when flowering.

**Subsidence.** Movement to a lower level or elevation.
**Surface Water.** A body of water that has its upper surface exposed to the atmosphere.

**Threatened Species (Federal).** A plant or animal species identified and defined in accordance with the 1973 Endangered Species Act and published in the Federal Register, as likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

**Tiering.** The coverage of general matters in broader environmental impact statements with subsequent narrower statements of environmental analysis, incorporating by reference, the general discussions and concentrating on specific issues.

**Trace Elements.** Metallic elements generally occurring in trace amounts in water, including iron, manganese, copper, chromium, arsenic, mercury, and vanadium.

**Turbidity.** Cloudiness of a water body caused by suspended silt, mud, pollutants, or algae.

**U.S. Fish and Wildlife Service Mission.** "Working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.

**Understory.** Shrubs and herbaceous plants that typically grow beneath larger trees or shrubs.

**Upland.** An area where water normally does not collect and where water does not flow on an extended basis. Uplands are non-wetland areas.

**Vector**. An organism, such as an insect or tick, that is capable of acquiring and transmitting a disease-causing agent, or pathogen, from one vertebrate host to another, or the act of transmitting a pathogen in such a manner.

**Vegetation Community.** Refer to Plant Community.

**Vegetation Type or Habitat Type.** A land classification system based upon the concept of distinct plant associations.

**Vegetation.** The composition of plant species, their frequency of occurrence, density, and age classes at a specified scale.

**Waterfowl.** A group of birds that include ducks, geese, and swans (belonging to the order Anseriformes).

**Watershed.** The entire land area that collects and drains water into a river or river system.

**Wetland.** Areas such as lakes, marshes, and streams that are inundated by surface or ground water for a long enough period of time each year to support, and that do support under natural conditions, plants and animals that require saturated or seasonally saturated soils.

**Wildfire or Wildland Fire.** A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands.

**Wildlife.** All non-domesticated animal life; included are vertebrates and invertebrates.

**Wildlife-Dependent Recreational Use.** "A use of a refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation." These are the six priority public uses of the Refuge System as established in the National Wildlife Refuge System Administration Act, as amended.

# *Appendix G*
# *Final Integrated Pest Management Plan*

# Integrated Pest Management Plan for the Seal Beach National Wildlife Refuge

**(September 2011)**

Prepared by: ______________________ Date: 9/22/11
Victoria Touchstone
Refuge Planner

Concurrence: ______________________ Date: 9/22/11
Regional Integrated Pest
Management Coordinator

Concurred: ______________________ Date: 9/30/11
Refuge Supervisor

Approved: ______________________ Date: 9/30/11
Assistant Regional Director, Refuges
(Pacific Southwest Region)

# *Integrated Pest Management Plan – Seal Beach NWR*

## 1.0 Introduction

This document explains the concept of integrated pest management (IPM) and its application to the Seal Beach National Wildlife Refuge (Refuge or NWR). It provides guidance for controlling or managing pests on the Refuge in a manner that will provide the most benefit to Refuge trust species and their habitats. IPM is also addressed in the objectives and strategies developed for the Seal Beach NWR in the Refuge's Comprehensive Conservation Plan (CCP).

In August 2010, the U.S. Fish and Wildlife Service (Service) approved an IPM policy for pest management activities on and off Service lands. This IPM policy (Part 569, FW1 of the Service Manual), which is consistent with the Department of the Interior (Department) IPM policy (517 DM 1) and other applicable authorities, establishes procedures and responsibilities for pest management activities, adopts IPM as the Service's method for making pest management decisions; and provides guidance to employees on how to implement IPM for all pest management activities. Although the IPM policy does not require each Refuge to prepare a separate IPM plan, it does encourage a Refuge with employees engaging in pest management practices to include a separate pest management plan or incorporate IPM strategies into other resource planning documents, such as a CCP. Further, preparation of an IPM plan benefits Refuge operations because it provides the opportunity for the Refuge to receive multi-year approvals of certain proposed pesticide uses that would normally require regional or national level review.

IPM is an interdisciplinary approach utilizing methods to prevent, eliminate, contain, and/or control pest species in concert with other management activities on Refuge lands and waters to achieve wildlife and habitat management goals and objectives. IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks. Examples of tools listed in the IPM definition include but are not limited to:

- Biological tools (e.g., predators, parasites, and pathogens);
- Cultural tools (e.g., crop rotation, alterations in planting dates, and sanitation);
- Physical tools (e.g., barriers, traps, hand-pulling, hoeing, mowing, and tilling); and
- Chemical tools (e.g., pesticides, such as herbicides, insecticides, or fungicides).

IPM is also a scientifically based, adaptive management process where available scientific information and best professional judgment of the Refuge staff, as well as other resource experts, is used to identify and implement appropriate management strategies that can be modified and/or changed over time to ensure effective, site-specific management of pest species to achieve desired outcomes. In accordance with 43 CFR 46.145, adaptive management is particularly relevant where long-term impacts may be uncertain and future monitoring will be needed to make adjustments in subsequent implementation decisions. After a tolerable pest population (threshold) is determined considering achievement of refuge resource objectives and the ecology of pest species, one or more methods, or combinations thereof, will be selected that are feasible, efficacious, and most protective of non-target resources, including native species (e.g., fish, wildlife, and plants), Service personnel, Service authorized agents, volunteers, and the public. Staff time and available funding will be considered when determining feasibility and practicality of various treatments.

In the Final Seal Beach NWR CCP, IPM techniques to address pests are presented as strategies in an adaptive management context to achieve Refuge objectives. To satisfy the requirements for IPM planning as identified in the Director's Memo (dated September 9, 2004) entitled *Integrated Pest Management Plans and Pesticide Use Proposals: Updates, Guidance, and an Online Database*, the following elements of an IPM program have been incorporated into the CCP:

- Habitat and/or wildlife objectives that identify pest species and appropriate thresholds to indicate the need for and successful implementation of IPM techniques; and
- Monitoring before and/or after treatment to assess progress toward achieving objectives including pest thresholds.

Where pesticides would be necessary to address pests, this appendix provides a structured procedure to evaluate potential effects of proposed uses involving ground-based applications to refuge biological resources and environmental quality in accordance with effects analyses presented in Chapter 4 (Environmental Consequences) of the final Environmental Assessment. The pesticides allowed for use within the National Wildlife Refuge System (Refuge System or NWRS), including the Seal Beach NWR, are those that are likely to only cause minor, temporary, or localized effects to Refuge biological resources and environmental quality. Pesticide use on the Refuge will include the implementation of appropriate best management practices (BMPs) to further minimize or avoid adverse effects.

Pesticide use on the Refuge will also conform to the Integrated Pest Management Plan approved for Naval Weapons Station Seal Beach and the details of pesticide application on the Refuge will be documented on the Navy Online Pesticide Reporting System.

This appendix does not describe the more detailed process to evaluate potential effects associated with aerial applications of pesticides, as they are not permitted on the Seal Beach NWR. Moreover, it does not address the effects of pesticide use (i.e., larvicide, pupacide, adulticide applications) to control mosquitoes. However, the basic framework to assess potential effects to Refuge biological resources and environmental quality from the use of insecticides for mosquito management would be similar to the process described in this appendix for other pesticides.

## 2.0 Pest Management Laws and Policies

In accordance with Service Policy 569 FW 1 (Integrated Pest Management), plant, invertebrate, and vertebrate pests on units of the National Wildlife Refuge System can be controlled to assure balanced wildlife and fish populations in support of refuge-specific wildlife and habitat management objectives. Pest control on Federal (refuge) lands and waters is also authorized under the following legal mandates:

- National Wildlife Refuge System Administration Act of 1966, as amended (16 USC 668dd-668ee);
- Plant Protection Act of 2000 (7 USC 7701 *et seq.*);
- Noxious Weed Control and Eradication Act of 2004 (7 USC 7781-7786, Subtitle E);
- Federal Insecticide, Fungicide, and Rodenticide Act of 1996 (7 USC 136-136y);
- National Invasive Species Act of 1996 (16 USC 4701);
- Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (16 USC 4701);
- Food Quality Protection Act of 1996 (7 USC 136);
- Executive Order 13148, Section 601(a);

- Executive Order 13112; and
- Animal Damage Control Act of 1931 (7 USC 426-426c, 46 Stat. 1468).

Pests are defined as "…living organisms that may interfere with the site-specific purposes, operations, or management objectives or that jeopardize human health or safety" from Department Policy 517 DM 1 (Integrated Pest Management Policy). Similarly, 569 FW 1 defines pests as "…invasive plants and introduced or native organisms, that may interfere with achieving our management goals and objectives on or off our lands, or that jeopardize human health or safety." 517 DM 1 also defines an invasive species as "a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health." Throughout the remainder of this document, the terms pest and invasive species are used interchangeably because both can prevent/impede achievement of Refuge wildlife and habitat objectives and/or degrade environmental quality.

In general, control of pests on the Seal Beach NWR would conserve and protect the fish, wildlife, and plant resources on the Refuge, as well as maintain environmental quality. The IPM Policy states that animal or plant species, which are considered pests, may be managed if the following criteria are met:

- The pest is causing a threat to human health and well being or private property, the acceptable level of damage by the pest has been exceeded, or State or local government has designated the pest as noxious;
- The pest is detrimental to resource objectives as specified in a refuge resource management plan (e.g., CCP, habitat management plan); and
- The planned pest management actions will not interfere with attainment of resource objectives or the purposes for which a refuge was established.

The specific justifications for pest management activities on the Seal Beach NWR include:

- Protecting human health and safety;
- Preventing substantial damage to important refuge resources;
- Protecting newly introduced or re-established native species;
- Controlling non-native (exotic) species in order to support existence for populations of native species; and
- Providing the public with quality, compatible wildlife-dependent recreational opportunities.

Service Policy 620 FW 1 (Habitat Management Plans) provides additional management directives regarding invasive species found on refuge lands and waters. Specifically, the Service is "prohibited by Executive , law, and policy from authorizing, funding, or carrying out actions that are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere." The Habitat Management Plan Policy requires that we: "Manage invasive species to improve or stabilize biotic communities to minimize unacceptable change to ecosystem structure and function and prevent new and expanded infestations of invasive species," and to conduct "refuge habitat management activities to prevent, control, or eradicate invasive species..."

Animal species identified as damaging or destroying Federal property and/or considered detrimental to the management program of a refuge may be controlled as described in 50 CFR 31.14 (Official Animal Control Operations) and generally do not require a pesticide use proposal. For example, the trapping and/or shooting of crows that prey on California least tern eggs or chicks may be conducted without a pest control proposal. Additionally, ground squirrels, whose burrowing activities in the Refuge's dikes and levees can affect the integrity of these structures, can be controlled, if necessary, using the most effective techniques considering site-specific factors without a pest control proposal.

Trespass and feral animals also may be controlled on refuge lands. Based upon 50 CFR 28.43 (Destruction of Dogs and Cats), dogs and cats running at large on a national wildlife refuge and observed 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 the wildlife. Feral animals should be disposed of by the most humane method(s) available and in accordance with relevant Service directives (including Executive Order 11643). Disposed wildlife specimens may be donated or loaned to public institutions. Donation or loans of resident wildlife species will only be made after securing State approval (50 CFR 30.11 [Donation and Loan of Wildlife Specimens]).

## 3.0 Strategies

To fully embrace IPM as identified in 569 FW 1, the following strategies, where applicable, would be carefully considered on the Seal Beach NWR for each pest species:

### Prevention

Prevention is the most effective and least expensive long-term management option for pests. It encompasses methods to prevent new introductions or the spread of established pests to un-infested areas. It requires identifying potential routes of invasion to reduce the likelihood of infestation. Hazard Analysis and Critical Control Points planning can be used to determine if current management activities on a refuge may introduce and/or spread invasive species in order to identify appropriate BMPs for prevention. See http://www.haccp-nrm.org/ for more information about this type of planning.

Prevention may include source reduction, using pathogen-free or weed-free seeds or fill; exclusion methods (e.g., barriers); and/or sanitation methods (e.g., wash stations) to prevent introductions by various mechanisms, including Service vehicles, construction equipment, or boats. Because invasive species are frequently the first to establish newly disturbed sites, prevention would require a reporting mechanism for early detection of new pest occurrences with quick response to eliminate any new satellite pest populations. Prevention would require consideration of the scale and scope of land management activities that may promote pest establishment within un-infested areas or promote reproduction and spread of existing populations. Along with preventing initial introduction, prevention would involve halting the spread of existing infestations to new sites (Mullin et al. 2000). The primary reason for prevention is to keep pest-free lands or waters from becoming infested. Executive Order 11312 emphasizes the priority for prevention with respect to managing pests.

The following methods will be implemented, as appropriate, to prevent the introduction and/or spread of pests on the Seal Beach NWR:

- Before beginning ground-disturbing activities (e.g., disking, grading), inventory and prioritize pest infestations in project operating areas and along access routes. Refuge staff will identify pest species on site and/or in areas adjacent to the work site. Where possible, project activities will begin in un-infested areas before working in pest-infested areas.

- Refuge staff will attempt to locate and, to the extent possible, use pest-free project staging areas. Travel through pest-infested areas will be avoided or minimized; where this is not possible, travel will be restricted to those periods when spread of seed or propagules of invasive plants is least likely.
- Refuge staff will determine the need for and, when appropriate, identify sanitation sites where equipment can be cleaned of pests. Where possible, Refuge staff will clean equipment before entering lands at on-Refuge approved cleaning site(s). This practice does not pertain to vehicles traveling frequently in and out of the project area that will remain on roadways. Seeds and plant parts of pest plants will need to be collected, where practical. Refuge staff will remove mud, dirt, and plant parts from project equipment before moving it into a project area.
- Refuge staff will clean all equipment before leaving the project site if operating in areas infested with pests, and determine the need for, and when appropriate, identify sanitation sites where equipment can be cleaned.
- Refuge staff, authorized agents, and Refuge volunteers will, where possible, inspect, remove, and properly dispose of seed and parts of invasive plants found on their clothing and equipment. Proper disposal means bagging the seeds and plant parts and then properly discarding of them.
- Refuge staff will revegetate disturbed soil (except travel ways on surfaced projects) to optimize plant establishment for each specific site. Revegetation may include weed-free topsoil replacement, planting, seeding, and weed-free mulching as necessary. Refuge staff will use native species appropriate to the specific site. If needed, refuge staff will use certified weed-free or weed-seed-free hay or straw where certified materials are reasonably available.
- Refuge staff will provide information, training, and appropriate pest identification materials to refuge staff, permit holders, and recreational visitors. The refuge staff will educate them about pest identification, biology, impacts, and effective prevention measures.
- Refuge staff will inspect borrowed material for invasive plants prior to use and transport onto and/or within Refuge lands.
- Refuge staff will restrict off-road travel to designated routes to the maximum extent practicable.
- Refuge staff will coordinate with the Navy to ensure that all projects located within or adjacent to the Refuge utilize sediment that is free of invasive plant seed.

The following methods will be implemented, as appropriate, to prevent the introduction and/or spread of pests within the tidal and intertidal habitats that dominate this Refuge:

- Before allowing contact with Refuge waters, all boats, downriggers, anchors, nets, floors of boats, propellers, axles, trailers, and other boating equipment used by Refuge staff, volunteers, or researchers working in Refuge waters will be inspected for the presence of pests and all visible plants, animals, or mud present on the equipment will be removed.
- Where construction equipment is to be used in wetland areas, Refuge staff will inspect and clean equipment, if necessary, before allowing the equipment to enter the wetland.

These prevention methods to minimize/eliminate the introduction and/or spread of pests were developed from information provided in Appendix E of "Preventing and Managing Invasive Plants Final Environmental Impact Statement" (U.S. Forest Service 2005).

**Mechanical/Physical Methods**

Mechanical and physical methods will be used as appropriate to remove and destroy, disrupt the growth of, or interfere with the reproduction of pest species. For plants species, these treatments can be accomplished by hand, hand tool (manual), or power tools (mechanical) and can include pulling, grubbing, digging, tilling/disking, cutting, swathing, grinding, sheering, girdling, mowing, or mulching of the pest plants.

For animal species, Service employees or their authorized agents may use mechanical/physical methods (including trapping) to control pests as a refuge management activity. As described in the CCP, the Seal Beach NWR has an approved predator management plan that permits trapping to control species that prey on nesting endangered birds, including California least terns and light-footed clapper rails. Trapping is permitted on Refuges in accordance with 50 CFR 31.2, which allows trapping to reduce surplus wildlife populations for a "balanced conservation program" in accordance with Federal or State laws and regulations. In some cases, non-lethally trapped animals would be relocated to off-Refuge sites with prior approval from the California Department of Fish and Game.

Depending upon the circumstances, each of these methods provides variable degrees of success and is generally applicable to a specific situation. If timed correctly, mechanical controls can effectively suppress most annual and biennial pest plants. To control perennial plants, the root system has to be destroyed or it will resprout and continue to grow and develop. Mechanical controls are typically not capable of destroying a perennial plants root system. Although some mechanical tools (e.g., disking, plowing) may damage root systems, they may stimulate regrowth producing a denser plant population that may aid in the spread of the plant depending upon the target species (e.g., giant cane [*Arundo donax*], perennial pepperweed [*Lepidium latifolium*]). In addition, proximity to salt marsh habitat and existing soil conditions are factors that can limit the use of many mechanical control methods.

Combining mechanical control methods (e.g., mowing, stump cutting) with the use of herbicides can be a very effective technique for controlling perennial species. For example, cutting perennial plants, followed sequentially by treating the cut stump with a systemic herbicide, often improves the efficacy of the herbicide compared to herbicide treatment only. The combination of mechanical and herbicide control will be used from time to time on the Refuge to control invasive plants such as Brazilian peppertree (*Schinus terebinthifolius*), Peruvian peppertree (*Schinus molle*), tree tobacco (*Nicotiana glauca*), and tree-of-heaven (*Ailanthus altissima*).

**Cultural Methods**

Cultural methods involve manipulating habitat to increase pest mortality by reducing its suitability to the pest. Cultural methods could include water-level manipulation, mulching, moisture management, addition of beneficial insect habitat, reducing clutter, proper trash disposal, planting or seeding desirable species to out-compete invasive plants, and other habitat alterations. On the NASA Island least tern nesting site, various cultural methods have been used in an effort to reduce the invasive of the nesting area by weedy species. These include the addition of salt to some areas of the site to make the soils unsuitable for plant growth and the placement of additional sand on areas prone to supporting weedy species to minimize exposure of soils suitable for weed establishment.

**Biological Control Agents**

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 and 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 Seal Beach NWR, but it is an option that could be employed in the future for species such as Russian thistle (*Salsola tragus*).

Many of the most ecologically or economically damaging pest species in the United States originated in foreign countries. These newly introduced pests, which are free from natural enemies found in their country or region of origin, may have a competitive advantage over cultivated and native species. This competitive advantage often allows introduced species to flourish, potentially causing widespread economic damage to crops, or to out-compete and displace native vegetation. Once the introduced pest species population reaches a certain level, traditional methods of pest management may be cost prohibitive or impractical. It is typically when a pest populations has become so widespread that eradication or effective control would be difficult or no longer practical that biological controls are implemented.

Biological control has advantages and disadvantages. Benefits include reducing pesticide usage, host specificity for target pests, long-term self-perpetuating control, low cost per acre, capacity for searching and locating hosts, synchronizing biological control agents to hosts' life cycles, and the unlikelihood that hosts will develop resistance to agents. Disadvantages include limited availability of agents from their native lands, the dependence of control on target species density, slow rate at which control occurs, biotype matching, the difficulty and expense of conflicts over control of the target pest, and host specificity when host populations are low.

A reduction in target species populations from biological controls is typically a slow process, and efficacy can be highly variable. It may not work well in a particular area although it does work well in other areas. Biological control agents would require specific environmental conditions to survive over time. Some of these conditions are understood, whereas others are only partially or not at all understood.

The use of biological control agents would not eradicate a target pest; rather, when using biological control agents, residual levels of the target pest typically are expected. The agent population level or survival would be dependent upon the density of its host. After the pest population decreases, the population of the biological control agent would decrease correspondingly. This is a natural cycle. Some pest populations (e.g., invasive plants) would tend to persist for several years after a biological control agent becomes established due to seed reserves in the soil, inefficiencies in the agents search behavior, and the natural lag in population buildup of the agent.

The full range of pest groups potentially found on Refuge lands and waters would include diseases, invertebrates (e.g., insects, mollusks), vertebrates, and invasive plants (the most common group). Often it is assumed that biological control would address many if not most of these pest problems. There are several well-documented success stories of biological control of invasive weed species in the Pacific Northwest including Mediterranean sage, St. Johnswort (Klamath weed), and tansy ragwort. Emerging success stories include Dalmatian toadflax, diffuse knapweed, leafy spurge, purple loosestrife, and yellow star thistle. However, historically, each new introduction of a biological control agent in the United States has only about a 30 percent success rate (Coombs et al. 2004).

Before a natural enemy of an invasive species can be released in the United States for biological control, the potential agent must undergo rigorous testing to ensure that it will not harm other organisms. If a biological control agent is proposed for release on the Refuge, Refuge staff will ensure that the particular agent has been approved by the applicable authorities.

Except for a small number of formulated biological control products registered by U.S. Environmental Protection Agency (USEPA) under the Federal Insecticide, Fungicide and Rodenticide Act of 1996 (FIFRA), most biological control agents are regulated by the U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service, Plant Protection and Quarantine unit (APHIS-PPQ). APHIS-PPQ review includes independent analysis by the Technical Advisory Group for Biological Control Agents of Weeds, an independent voluntary committee, that is responsible for reviewing release petitions and providing an exchange of views, information and advice to researchers. In addition, the State of California has additional approval authority. The statuary authority of the State program is provided in the State's Food and Agricultural Code. Section 403 of the Code states that the Department of Food and Agriculture "shall prevent the introduction and spread of injurious insect or animal pests, plant diseases, and noxious weeds;" and Section 405(a) states that "with the prior approval of the Department of Fish and Game and the Office of Environmental Health Hazard Assessment, the Department of Food and Agriculture and the Department of Pesticide Regulation may reproduce or distribute biological control organisms that are not detrimental to the public health and safety which are known to be useful in reducing or preventing plant or animal damage due to pests or diseases." The Orange County Agricultural Commissioner may have additional approval authority; therefore, contact will be made with the Agricultural Commissioner prior to implementing any proposal to release a biological control agent on the Refuge.

Federal permits (USDA-APHIS-PPQ Form 526) are required to import biological control agents from another state. Form 526 may be obtained by writing: USDA-APHIS-PPQ, Biological Assessment and Taxonomic Support, 4700 River Road, Unit 113, Riverdale, Maryland 20737; or through the Internet at URL address: http://www.aphis.usda.gov/ppq/permits/biological/weedbio.html.

The State of California Department of Food and Agriculture and the Orange County Agricultural Commissioner may also be sources for biological control agents, or they may have information about where biological control agents may be obtained. Commercial sources should have an Application and Permit to Move Live Plant Pests and Noxious Weeds (USDA-PPQ Form 226 USDA-APHIS-PPQ, Biological Assessment and Taxonomic Support, available from 4700 River Road, Unit 113, Riverdale, MD 20737) to release specific biological control agents in a state and/or county. Furthermore, certification regarding the biological control agent's identity (genus, specific epithet, subspecies and variety) and purity (e.g., parasite free, pathogen free, and biotic and abiotic contaminants) should be specified in purchase orders.

Biological control agents are subject to 7 RM 8 (Exotic Species Introduction and Management). In addition, Refuge staff must follow the International Code of Best Practice for Classical Biological Control of Weeds (http://sric.ucdavis.edu/exotic/exotic.htm) as ratified by delegates to the X International Symposium on Biological Control of Weeds, Bozeman, Montana, July 9, 1999. This code states the following:

- Release only approved biological control agents;
- Use the most effective agents;

- Document releases; and
- Monitor for impacts to the target pest, non-target species, and the environment.

Biological control agents formulated as pesticide products and registered by the USEPA (e.g., *Bti*) are also subject to Pesticide Use Proposal (PUP) review and approval, as described later in this appendix.

A record of any releases will be maintained by the Refuge staff with date(s), location(s), and environmental conditions of the release site(s); the identity, quantity, and condition of the biological control agents released; and other relevant data and comments such as weather conditions. Systematic monitoring to determine the establishment and effectiveness of the release is also recommended.

Prior to using any biological control agents, the Service would prepare a National Environmental Policy Act (NEPA) document (e.g., environmental assessment, environmental impact statement) that addresses the potential biological and other environmental effects of using the proposed biological control agent. The Service would also review, and where appropriate, incorporate by reference, information included in NEPA documents prepared by another Federal agency, where the scope is relevant to evaluation of releases on refuge lands. Possible source agencies for such NEPA documents include the Bureau of Land Management, U.S. Forest Service, National Park Service, U.S. Department of Agriculture Animal and Plant Health Inspection Service, and the military services. It might be appropriate to incorporate by reference parts or all of existing document(s) from the review. Incorporating by reference (43 CFR 46.135) is a technique used to avoid redundancies in analysis. It also can reduce the bulk of a Service NEPA document, which only must identify the documents that are incorporated by reference. In addition, relevant portions must be summarized in the Service NEPA document to the extent necessary to provide the decision maker and public with an understanding of relevance of the referenced material to the current analysis.

## Pesticides

The selective use of pesticides on the Refuge will be based upon pest ecology (including mode of reproduction), the size and distribution of its populations, site-specific conditions (e.g., soils, topography), known efficacy under similar site conditions, and the capability to utilize BMPs to reduce and/or eliminate potential effects to non-target species, sensitive habitats, and the potential to contaminate surface and groundwater. All pesticide usage, including the type of product used, target species, application rate, and method of application, will comply with the applicable Federal (FIFRA) and State regulations pertaining to pesticide use, safety, storage, disposal, and reporting. Before pesticides can be used to eradicate, control, or contain pests on Refuge lands and waters, pesticide use proposals (PUPs) must be prepared and approved in accordance with section 569 FW 1 of the Service Manual. PUP records will provide a detailed, time-, site-, and target-specific description of the proposed use of pesticides on the Refuge. All PUPs will be created, approved or disapproved, and stored in the Pesticide Use Proposal System (PUPS), which is a centralized database only accessible on the Service's intranet (https://systems.fws.gov/pups). Only Service employees would be authorized to access PUP records in this database. As of 2010, the pesticides approved for the use on the Refuge include the herbicides Aquamaster®, Glyphosate Pro™ 4, Surflan® A S, and Habitat®. Aquamaster and Glyphosate Pro 4 contain the active ingredient glyphoste; Surflan A S contains the active ingredient oryzalin; and Habitat contains the active ingredient isopropylamine salt of imazapyr. More information about these products can be found in the Chemical Profiles provided in Attachment B, and information about how these products are used on the Refuge can be found in Chapter 3 of the Comprehensive Conservation Plan.

Pesticide application equipment is selected to provide site-specific delivery to target pests while minimizing or eliminating direct or indirect (e.g., drift) exposure to non-target areas and degradation of surface and groundwater quality. Where possible, target-specific equipment (e.g., backpack sprayer, wiper) will be used to treat target pests. Other target-specific equipment to apply pesticides could include use of a hand wand attached to an all-terrain vehicle sprayer, soaked wicks or paint brushes for wiping vegetation and lances, hatchets, or syringes for direct injection into stems. If used, granular pesticides would be applied using seeders or other specialized dispensers. No aerial spraying (e.g., fixed wing or helicopter) is proposed on this Refuge.

Because repeated use of one pesticide may allow resistant organisms to survive and reproduce, multiple pesticides with variable modes of action will be considered for treatments on refuge lands and waters. This is especially important if multiple applications within years and/or over a growing season are necessary for habitat maintenance and restoration activities to achieve resource objectives. Integrated chemical and non-chemical controls also are highly effective, where practical, because pesticide resistant organisms can be removed from the site.

Cost may not be the primary factor in selecting a pesticide for use on a refuge. If the least expensive pesticide could result in harm to natural resources or people, then a different product will be selected. The most efficacious pesticide available with the least potential to degrade environment quality (e.g., soils, surface water, and groundwater), as well as the least potential effect to native species and communities of fish, wildlife, plants, and their habitats would be acceptable for use on the Refuge in the context of an IPM approach.

**Habitat Restoration and/or Maintenance**

Restoration and/or proper maintenance of Refuge habitats associated with achieving wildlife and habitat objectives is the most important step that can be taken to ensure the long-term prevention, eradication, or control (at or below threshold levels) of pests. Promoting desirable plant communities through the manipulation of species composition, plant density, and growth rate is an essential component of invasive plant management (Masters et al. 1996, Masters and Shelly 2001, Brooks et al. 2004). Although herbicide treatment may eliminate or suppress pest species in the short term, the resulting gaps and bare soil create niches that are conducive to further invasion by the species and/or other invasive plants. On degraded sites where desirable species are absent or in low abundance, revegetation with site-appropriate native plant species is necessary to direct and accelerate plant community recovery and to achieve site-specific objectives in a reasonable time frame. The selection of appropriate species for revegetation would be dependent on a number of factors, including resource objectives and site-specific, abiotic factors (e.g., soil texture, precipitation/ temperature regimes, and shade conditions). Seed or plant availability and cost, ease of establishment, seed production, and competitive ability are also important considerations.

The CCP for the Seal Beach NWR includes objectives and associated strategies for managing existing habitats to maximize habitat quality. The strategies proposed for implementation to achieve this objective include: monitoring and maintaining native plant restoration areas near Hog Island, along Kitts Highway and Bolsa Avenue, and to the north of Case Street Pond to ensure that these areas are not reinvaded with invasive non-native plants; and revegetate with appropriate native plant species those areas of the Refuge where chemical or mechanical control of invasive plant species has occurred to reduce the potential for reinvasive of the treated sites. Additionally, the CCP includes objectives for restoring native wetland and upland habitat in upland areas that are currently dominated by non-native weedy species. The implementation of these various strategies will reduce the numbers of plant pests on the Refuge, as well as reduce the need for continued chemical and mechanical control of infested sites.

## 4.0 Priorities for Treatments

For many refuges, the magnitude (number, distribution, and sizes of infestations) of pest problems is too extensive and beyond the available capital resources to effectively address during any single field season. To manage pests on the Seal Beach NWR, it is essential that treatment of infestations be prioritized. Highest priority treatments would be focused on early detection and rapid response to eliminate infestations of new pests, if possible. This is especially important for aggressive pests potentially impacting species, species groups, communities, and/or habitats of species associated with Refuge purpose(s); NWRS resources of concern (e.g., federally listed species, migratory birds, and selected marine mammals); and native species needed to maintain and/or restore biological integrity, diversity, and environmental health on the Refuge.

The next priority would be treating established pests that appear in one or more previously un-infested areas. Moody and Mack (1988) demonstrated through modeling that small, new outbreaks of invasive plants eventually would infest an area larger than the established, source population. They also found that control efforts focusing on the large, main infestation rather than the new, small satellites reduced the chances of overall success. The lowest priority would be treating large infestations (sometimes monotypic stands) of well established pests. In this case, initial efforts would focus on containment of the perimeter, followed by work to control/eradicate the established infested area. If containment or control of a large infestation is not effective, then efforts would focus on halting pest reproduction or managing source populations. Maxwell et al. (2009) found treating fewer populations that are sources represents an effective long-term strategy for reducing the total number of invasive populations and decreasing metapopulation growth rates.

Although State listed noxious weeds are always of high priority for management, other pest species known to cause substantial ecological impact will also be considered. Pest control would likely require a multi-year commitment from Refuge staff. Essential to the long-term success of pest management would be pre- and post-treatment monitoring, assessment of the successes and failures of treatments, and the development of new approaches when proposed methods do not achieve desired outcomes.

## 5.0 Best Management Practices (BMPs)

BMPs can minimize or eliminate possible effects associated with pesticide usage to non-target species and/or sensitive habitats, as well as degradation of water quality from drift, surface runoff, or leaching. Based upon the Department of Interior Pesticide Use Policy (517 DM 1) and the Service Pest Management Policy and Responsibilities (30 AM 12), the use of applicable BMPs (where feasible) during the application of pesticides will minimize the potential for adverse effects to federally listed species and/or their critical habitats.

Presented here are the BMPs pertaining to the mixing, handling, and application of all ground-based treatments of pesticide that will considered and utilized, as appropriate, based upon target- and site-specific factors and time-specific environmental conditions on the Seal Beach NWR. Although not listed here, the most important BMP to eliminate and/or reduce potential impacts to non-target resources would be an IPM approach to prevent, control, eradicate, and contain pests.

**Pesticide Handling and Mixing**

- As a precaution against spilling, spray tanks will not be left unattended during filling.
- All pesticide spray equipment will be properly cleaned. Where possible, rinsate will be used as part of the makeup water in the sprayer tank and applied to treatment areas.
- All pesticide containers will be triple rinsed, and the rinsate will be used as water in the sprayer tank and applied to treatment areas.
- When a pesticide container is marked as recyclable, Refuge staff will deliver the triple rinsed pesticide containers to the appropriate herbicide container collection site.
- All unused pesticides will be properly discarded at a local "safe send" collection.
- Pesticides and pesticide containers will be lawfully stored, handled, and disposed of in accordance with the label and in a manner that will safeguard human, fish, and wildlife health and that will prevent soil and water contaminant.
- Refuge staff will consider the water quality parameters (e.g., pH, hardness) that are important to ensure the greatest efficacy, when specified on the pesticide label.
- All pesticide spills will be addressed immediately using procedures identified in the Refuge's spill response plan.

**Applying Pesticides**

- Pesticide treatments will only be conducted by or under the supervision of Service personnel and non-Service applicators with the appropriate, State or Bureau of Land Management (BLM) certification to safely and effectively conduct these activities on Refuge lands and waters.
- Refuge staff will comply with all Federal, State, and local pesticide use laws and regulations, as well as Departmental, Service, and NWRS pesticide-related policies. For example, Refuge staff will use application equipment and apply rates for the specific pest(s) identified on the pesticide label as required under FIFRA.
- Before each treatment season and prior to mixing or applying any product for the first time each season, all applicators will review the product label, Material Safety Data Sheet (MSDS), and PUP for each pesticide, determining the target pest, appropriate mix rate(s), personal protective equipment, and other requirements listed on the label.
- As applicable, a buffer from the water's edge, as defined in the Chemical Profiles under "Specific Best Management Practices," will be maintained when applying herbicides.
- 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, other larger tank wand applications), where practical.
- Refuge staff will use low volume rather than high volume foliar applications when the low impact methods described previously are not feasible or practical, to maximize herbicide effectiveness and ensure correct and 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 the largest droplet size that results in uniform coverage.
- Applicators will use drift reduction technologies such as low-drift nozzles, where possible.
- Where possible, spraying will occur during low (average <7 mph and preferably 3 to 5 mph) and consistent direction wind conditions with moderate temperatures (typically <85 °F).
- Applicators will not spray during inversion conditions (often associated with calm and very low wind conditions) that can cause large-scale herbicide drift to non-target areas.
- Surfactants used in conjunction with glyphosate-based herbicides shall be limited to surfactants classified as having slight acute toxicity or are practically non-toxic (>10 ppm) to aquatic organisms.

- Equipment will be calibrated regularly to ensure that the proper rate of pesticide is applied to the target area or species.
- 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 typically be conducted during early morning hours.
- Spray applications will not be conducted on days with >30 percent forecast for rain within six hours, except for pesticides that are rapidly rain fast (e.g., glyphosate in one hour) or pesticides that need rain to activate the product (e.g., oryzalin) so as to minimize or eliminate potential runoff.
- Where possible, applicators will use drift retardant adjuvants during spray applications, especially adjacent to sensitive areas.
- Where possible, applicators will use a non-toxic dye to aid in identifying treated target areas, as well as any areas of over spray or drift. A dye can also aid in detecting equipment leaks. If a leak is discovered, the application will be stopped until repairs can be made to the sprayer.
- When drift cannot be sufficiently reduced through altering equipment set up and application techniques, buffer zones may be identified to protect sensitive areas downwind of applications. When an application is required adjacent to a sensitive habitat area, it will only occur when the wind is blowing away from the habitat area.
- To eliminate unnecessary pesticide applications, Refuge staff will examine the target area for the presence of expected pests prior to applying a pesticide product.
- Refuge staff will consider the timing of a pesticide application to ensure that native plants are protected (e.g., senescence) while effectively treating invasive plants.
- Application equipment (e.g., backpack sprayer, transport vehicles) will be thoroughly cleaned and PPEs removed and properly disposed of on-site after treatments.

## 6.0 Safety

### 6.1 Personal Protective Equipment (PPE)

All applicators will wear the specific PPE identified on the pesticide label, and the appropriate personal protective equipment will be worn at all times during handling, mixing, and applying of the pesticide. Personal protective equipment can include disposable (e.g., Tyvek) or laundered coveralls, gloves (e.g., latex, rubber, or nitrile), rubber boots, protective eye wear, and/or an NIOSH-approved respirator. Because exposure to concentrated product is usually greatest during mixing, extra care will be taken while preparing pesticide solutions. Persons mixing these solutions can be best protected if they wear long gloves, an apron, appropriate footwear, and a face shield.

Coveralls and other protective clothing used during an application will be laundered separately from other laundry items. Transporting, storing, handling, mixing, and disposing of pesticide containers will be consistent with label requirements, USEPA and Occupational Safety and Health Administration (OSHA) requirements, and Service policy.

If a respirator is necessary for a pesticide use, the respirator will be used in accordance with the Service's Respiratory Protection policy (242 FW 14). Use of respirator in accordance with this policy requires that there be a written, site-specific respiratory protection plan for each work area where employees are required to wear respirators, a sufficiently trained Respiratory Protection Program Administrator to conduct and coordinate the respiratory protection plan at each facility requiring it, the availability of appropriate respirators and accessories for those who must wear them, and a clean storage area for respirators and their accessories at the work site. Respirators will only be issued to individuals who complete a Request for Respirator Clearance, pass a medical evaluation documenting that the individual is medically qualified for respirator use, complete the required respirator training, and successfully pass respirator fit testing. Respirators must be fit tested at least once a year. The policy also includes specific requirements for maintaining, cleaning, inspecting, and storing Service respirators.

### 6.2 Notification

The restricted entry interval is the time period required after the application at which point someone may safely enter a treated area without PPE. Refuge staff, authorized management agents of the Service, volunteers, and members of the public who could be in or near a pesticide treated area within the stated re-entry time period on the label will be notified about treatment areas. Posting will occur at any site where individuals might inadvertently become exposed to a pesticide during other activities on the Refuge. Where required by the label and/or State-specific regulations, sites will also be posted on its perimeter and at other likely locations of entry. Refuge staff will also notify appropriate Navy personnel of an application.

### 6.3 Medical Surveillance

Medical surveillance may be required for Service personnel and approved volunteers who mix, apply, and/or monitor the use of pesticides (see 242 FW 7 [Pesticide Users] and 242 FW 4 [Medical Surveillance]). In accordance with 242 FW 7.12A, Service personnel will be medically monitored if one or more of the following criteria is met: exposed or may be exposed to concentrations at or above the published permissible exposure limits or threshold limit values (see 242 FW 4); use pesticides in a manner considered "frequent pesticide use"; or use pesticides in a manner that requires a respirator (see 242 FW 14 for respirator use requirements). In 242 FW7.7A, "Frequent Pesticide Use means when a person applying pesticide handles, mixes, or applies pesticides, with a Health Hazard rating of 3 or higher, for 8 or more hours in any week or 16 or more hours in any 30-day period." Under some circumstances, individuals may be medically monitored who use pesticides infrequently, experience an acute exposure (sudden, short term), or use pesticides with a health hazard ranking of 1 or 2. This decision will consider the individual's health and fitness level, the pesticide's specific health risks, and the potential risks from other pesticide-related activities. Other authorized agents (e.g., State and county employees) will be responsible for their own medical monitoring needs and costs. Standard examinations (at the Refuge's expense) of appropriate Refuge staff will be provided by the nearest certified occupational health and safety physician as determined by Federal Occupational Health.

### 6.4 Certification and Supervision of Pesticide Applicators

Appropriate Refuge staff or approved volunteers handling, mixing, and/or applying or directly supervising others engaged in pesticide use activities will be trained and State or federally (BLM) licensed to apply pesticides on the Seal Beach NWR. In accordance with 242 FW7.18A and 569 FW 1.10B, certification is required to apply restricted use pesticides based upon USEPA regulations. For safety reasons, all individuals participating in pest management activities with general use pesticides also are encouraged to attend appropriate training or acquire pesticide applicator certification. A Qualified Applicator Certificate, as required by the State of California, will be obtained by any person on the Refuge who applies or supervises the application of federally restricted use pesticides or State restricted materials. New staff unfamiliar with proper procedures for storing, mixing, handling, applying, and disposing of pesticides and containers will receive orientation and training before handling or using any products. Documentation of training will be kept in the files at the Refuge office.

## 6.5 Recordkeeping

**Labels and Material Safety Data Sheets (MSDS)**

Approved PUPs stored in the PUPS database typically contain website links (URLs) to pesticide labels and MSDSs. Pesticide labels and MSDSs for all products approved for use on the Seal Beach NWR are maintained in a binder adjacent to the hazardous material and pesticide storage cabinets. These documents are also be carried by field applicators, where possible. A written reference (e.g., note pad, chalk board, dry erase board) for each tank to be mixed will also be kept in the mixing area for quick reference while mixing is in progress.

**Pesticide Use Proposals (PUPs)**

A PUP is prepared for each proposed pesticide use associated with annual pest management on Refuge lands and waters. A PUP includes specific information about the proposed pesticide use, including the common and chemical names of the pesticide(s), target pest species, size and location of treatment site(s), application rate(s) and method(s), and federally listed species determinations, where applicable.

In accordance with Service guidelines (Director's memo [December 12, 2007]), Refuge staff may receive up to five-year approvals for Washington Office and field reviewed proposed pesticide uses based upon meeting identified criteria, including an approved IPM plan, where necessary (see www.fws.gov/contaminants/Issues/IPM.cfm). This IPM plan for the Seal Beach NWR has been completed in association with a CCP, and the environmental effects of implementing the plan, as required by NEPA, are addressed in Appendix C of the final CCP.

**Pesticide Usage**. In accordance with 569 FW 1, the Refuge Project Leader is required to maintain records of all pesticides annually applied on lands or waters under Refuge jurisdiction. This would encompass pesticides applied by other Federal agencies; State and county governments; and non-government applicators, including cooperators and their pest management service providers with Service permission. For clarification, pesticide means all insecticides, insect and plant growth regulators, dessicants, herbicides, fungicides, rodenticides, acaricides, nematicides, fumigants, avicides, and piscicides.

The following usage information is reported for approved PUPs in the PUPS database: pesticide trade name(s), active ingredient(s), total acres treated, total amount of pesticides used (lbs or gallons), total amount of active ingredient(s) used (lbs), target pest(s), and efficacy (% control). To determine whether treatments are efficacious (i.e., eradicating, controlling, or containing the target pest) and achieving resource objectives, habitat and/or wildlife response is monitored both pre- and post-treatment, where possible. Considering available annual funding and staffing, appropriate monitoring data regarding characteristics (attributes) of pest infestations (e.g., area, perimeter, degree of infestation-density, % cover, density), as well as habitat and/or wildlife response to treatments may be collected and stored in a relational database (e.g., Refuge Habitat Management Database), preferably a geo-referenced data management system (e.g., Refuge Lands GIS [RLGIS]) to facilitate data analyses and subsequent reporting. In accordance with adaptive management, data analysis and interpretation would allow treatments to be modified or changed over time, as necessary, to achieve resource objectives considering site-specific conditions in conjunction with habitat and/or wildlife responses. Monitoring could also identify short- and long-term impacts to natural resources and environmental quality associated with IPM treatments in accordance with adaptive management principles identified in 43 CFR 46.145.

## 7.0 Evaluating Pesticide Use Proposals

Pesticides will only be used on the Seal Beach NWR for habitat management and facilities maintenance after approval of a PUP. Approval of a PUP generally is issued where there would likely be only minor, temporary, or localized effects to fish and wildlife species, minimal potential to degrade environmental quality, and pesticide application is proposed to be implemented with appropriate BMPs (see Section 4.0). Potential effects to listed and non-listed species are evaluated with quantitative ecological risk assessments and other screening measures. Potential effects to environmental quality are determined based upon pesticide characteristics of environmental fate (e.g., water solubility, soil mobility, soil persistence, and volatilization) and other quantitative screening tools. Ecological risk assessments, characteristics of environmental fate, and potential to degrade environmental quality are all documented in Chemical Profiles (see Section 7.6). These profiles are to include threshold values for quantitative measures of ecological risk assessments and screening tools for environmental fate that represent minimal potential effects to species and environmental quality.

### 7.1 Overview of Ecological Risk Assessment

An ecological risk assessment process would be used to evaluate potential adverse effects to biological resources as a result of a pesticide(s) proposed for use on the Refuge. This process is an established quantitative and qualitative methodology for comparing and prioritizing risks of pesticides and conveying an estimate of the potential risk for an adverse effect. This quantitative methodology provides an efficient mechanism to integrate best available scientific information regarding hazard, patterns of use (exposure), and dose-response relationships in a manner that is useful for ecological risk decision making. It provides an effective way to evaluate potential effects where there is missing or unavailable scientific information (data gaps) to address reasonable, foreseeable adverse effects in the field as required under 40 CFR Part 1502.22. Protocols for ecological risk assessment of pesticide uses on refuge lands and waters were developed through research and established by the USEPA (2004).

The toxicological data used in ecological risk assessments are typically results of standardized laboratory studies provided by pesticide registrants to the USEPA to meet regulatory requirements under FIFRA. These studies assess the acute (lethality) and chronic (reproductive) effects associated with short- and long-term exposure to pesticides on representative species of birds, mammals, freshwater fish, aquatic invertebrates, and terrestrial and aquatic plants. Other effects data publicly available would also be utilized for risk assessment protocols. Toxicity endpoint and environmental fate data are available from a variety of resources. Some of the more useful resources can be found in Section 7.6.

### 7.2 Determining Ecological Risk to Fish and Wildlife

The potential for pesticides used on the Seal Beach NWR to cause direct adverse effects to fish and wildlife would be evaluated using USEPA's Ecological Risk Assessment Process (USEPA 2004). The risks poses to the trust resources protected on the Seal Beach NWR are particularly important because the Refuge provides nesting and foraging habitat for several listed species including the endangered California least tern (*Sternula antillarum browni*), light-footed clapper rail (*Rallus longirostris levipes*), and Pacific green sea turtle (*Chelonia myda*).

The Ecological Risk Assessment Process, which is based upon a two-phase process involving estimation of environmental concentrations and then characterization of risk, integrates exposure estimates (estimated environmental concentration [EEC] and toxicological endpoints [e.g., $LC_{50}$ and oral $LD_{50}$]) to evaluate the potential for adverse effects to species groups (birds, mammals, and fish) representative of legal mandates for managing units of the NWRS. This integration is achieved through risk quotients (RQs) calculated by dividing the EEC by acute and chronic toxicity values selected from standardized toxicological endpoints or published effect (Table 1).

$$RQ = EEC/Toxicological\ Endpoint$$

**Table 1**
**Ecotoxicity Tests Used to Evaluate Potential Effects to Birds, Fish, and Mammals to Establish Toxicity Endpoints for Risk Quotient Calculations**

| Species Group | Exposure | Measurement Endpoint |
|---|---|---|
| Bird | Acute | Median Lethal Concentration ($LC_{50}$) |
| | Chronic | No Observed Effect Concentration (NOEC) or No Observed Adverse Effect Concentration (NOAEC)[1] |
| Fish | Acute | Median Lethal Concentration ($LC_{50}$) |
| | Chronic | No Observed Effect Concentration (NOEC) or No Observed Adverse Effect Concentration (NOAEC)[2] |
| Mammal | Acute | Oral Lethal Dose ($LD_{50}$) |
| | Chronic | No Observed Effect Concentration (NOEC) or No Observed Adverse Effect Concentration (NOAEC)[3] |

[1]Measurement endpoints typically include a variety of reproductive parameters (e.g., number of eggs, number of offspring, eggshell thickness, and number of cracked eggs).

[2]Measurement endpoints for early life stage/life cycle typically include embryo hatch rates, time to hatch, growth, and time to swim-up.

[3]Measurement endpoints include maternal toxicity, teratogenic effects or developmental anomalies, evidence of mutagenicity or genotoxicity, and interference with cellular mechanisms such as DNA synthesis and DNA repair.

The level of risk associated with direct effects of pesticide use are characterized by comparing calculated RQs to the appropriate Level of Concern (LOC) established by USEPA (1998 [Table 2]). The LOC represents a quantitative threshold value for screening potential adverse effects to fish and wildlife resources associated with pesticide use. The following are four exposure-species group scenarios that would be used to characterize ecological risk to fish and wildlife on a national wildlife refuge: acute listed species, acute non-listed species, chronic listed species, and chronic non-listed species.

Acute risk indicates the potential for mortality associated with short-term dietary exposure to pesticides immediately after an application. For characterization of acute risks, median values from $LC_{50}$ and $LD_{50}$ tests are used as toxicological endpoints for RQ calculations. In contrast, chronic risks indicate the potential for adverse effects associated with long-term dietary exposure to pesticides from a single application or multiple applications over time (within a season and over years). For characterization of chronic risks, the no observed concentration (NOAEC) or no observed effect concentration (NOEC) for reproduction are used as toxicological endpoints for RQ calculations. Where available, the NOAEC is preferred over a NOEC value.

Listed species are those federally designated as threatened, endangered, or proposed in accordance with the Endangered Species Act of 1973 (16 USC 1531-1544, 87 Stat. 884, as amended-Public Law 93-205). For listed species, potential adverse effects are assessed at the individual level because loss of individuals from a population could detrimentally impact a species. In contrast, risks to non-listed species are considered effects at the population level. A RQ<LOC indicates the proposed pesticide use "may affect, not likely to adversely affect" individuals (listed species) and it

would not pose an unacceptable risk for adverse effects to populations (non-listed species) for each taxonomic group (Table 2). In contrast, a RQ>LOC indicates a "may affect, likely to adversely affect" for listed species and it would also pose unacceptable ecological risk for adverse effects to non-listed species.

**Table 2**
**Presumption of Unacceptable Risk for Birds, Fish, and Mammals**

| Risk Presumption | | Level of Concern | |
|---|---|---|---|
| | | Listed Species | Non-listed Species |
| Acute | Birds | 0.1 | 0.5 |
| | Fish | 0.05 | 0.5 |
| | Mammals | 0.1 | 0.5 |
| Chronic | Birds | 1.0 | 1.0 |
| | Fish | 1.0 | 1.0 |
| | Mammals | 1.0 | 1.0 |

Source: (USEPA 1998)

**Environmental Exposure**

Following release into the environment through application, pesticides experience several different routes of environmental fate. Pesticides that are sprayed can move through the air (e.g., particle or vapor drift) and may eventually end up in other parts of the environment such as non-target vegetation, soil, or water. Pesticides applied directly to the soil may be washed off the soil into nearby bodies of surface water (e.g., surface runoff) or may percolate through the soil to lower soil layers and groundwater (e.g., leaching) (Baker and Miller 1999, Pope et. al. 1999, Butler et. al. 1998, Ramsay et. al. 1995, EXTOXNET 1993a). Pesticides that are injected into the soil may also be subject to the latter two fates. The aforementioned possibilities are by no means complete, but it does indicate that movement of pesticides in the environment is very complex, with transfers occurring continually among different environmental compartments. In some cases, these exchanges occur not only between areas that are close together, but may also involve transportation of pesticides over long distances (Barry 2004, Woods 2004).

**Terrestrial Exposure**. The EEC for exposure to terrestrial wildlife is quantified using a USEPA screening-level approach (USEPA 2004). This screening-level approach is not affected by product formulation because it evaluates pesticide active ingredient(s). This approach would vary depending upon the proposed pesticide and method of application to be used.

For spray applications, exposure is determined by using the Kanaga nomogram method (Pfleeger et al. 1996, USEPA 2004, USEPA 2005a) through the USEPA's Terrestrial Residue Exposure model (T-REX) version 1.2.3 (USEPA 2005b). To estimate the maximum (initial) pesticide residue on short grass (<20 cm tall) as a general food item category for terrestrial vertebrate species, T-REX input variables include the following from the pesticide label: maximum pesticide application rate (pounds active ingredient [acid equivalent]/acre) and pesticide half-life (days) in soil. Although there are other food item categories (tall grasses; broadleaf plants and small insects; and fruits, pods, seeds and large insects), short grass was selected because it would yield maximum EECs (240 ppm per lb ai/acre) for worse-case risk assessments. Short grass is not representative of forage for carnivorous species (e.g., raptors), but it would characterize the maximum potential exposure through the diet of avian and mammalian prey items. Consequently, this approach provides a conservative screening tool for pesticides that do not biomagnify.

For RQ calculations in T-REX, the model requires the weight of surrogate species and Mineau scaling factors (Mineau et al. 1996). Body weights of bobwhite quail and mallard are included in T-REX by default, but body weights of other organisms (Table 3) can be entered manually. The Mineau scaling factor accounts for small-bodied bird species that may be more sensitive to pesticide exposure than would be predicted only by body weight. Mineau scaling factors are entered manually with values, which are unique to a particular pesticide or group of pesticides, ranging from 1 to 1.55. If specific information to select a scaling factor is not available, then a value of 1.15 is used as a default. Alternatively, zero is entered if it is known that body weight does not influence toxicity of the pesticide(s) being assessed. The upper bound estimate output from the T-REX Kanaga nomogram is used as an EEC for calculation of RQs. This approach yields a conservative estimate of ecological risk.

**Table 3**
**Average Body Weight of Selected Terrestrial Wildlife Species Frequently Used in Research to Establish Toxicological Endpoints**

| Species | Body Weight (kg) |
|---|---|
| Mammal (15 g) | 0.015 |
| House sparrow | 0.0277 |
| Mammal (35 g) | 0.035 |
| Starling | 0.0823 |
| Red-winged blackbird | 0.0526 |
| Common grackle | 0.114 |
| Japanese quail | 0.178 |
| Bobwhite quail | 0.178 |
| Rat | 0.200 |
| Rock dove (aka pigeon) | 0.542 |
| Mammal (1000 g) | 1.000 |
| Mallard | 1.082 |
| Ring-necked pheasant | 1.135 |

Source: (Dunning 1984)

Granular pesticide formulations and pesticide-treated seed pose a unique route of exposure for avian and mammalian species. In these cases, the pesticide is applied in discrete units that birds or mammals might accidentally ingest with food items or intentionally ingest when actively seeking and picking up seed to eat or gravel or grit to aid digestion. Granules may also be consumed by wildlife foraging on earthworms, slugs, or other soft-bodied soil organisms to which the granules may adhere.

Terrestrial wildlife RQs for granular formulations or seed treatments are calculated by dividing the maximum milligrams of active ingredient (ai) exposed (e.g., EEC) on the surface of an area equal to one square foot by the appropriate $LD_{50}$ value multiplied by the surrogate's body weight (refer to Table 3). An adjustment to surface area calculations is made for broadcast, banded, and in-furrow applications. An adjustment is also made for applications with and without incorporation of the granules. Without incorporation, assumes that 100% of the granules remain on the soil surface available to foraging birds and mammals. Press wheels push granules flat with the soil surface, but they are not incorporated into the soil. If granules are incorporated in the soil during band or T-band applications or after broadcast applications, it is assumed that only 15% of the applied granules remain available to wildlife. Following in-furrow applications, it is assumed that only 1% of the granules are available on the soil surface.

EECs for pesticides applied in granular form and as seed treatments are calculated based on potential ingestion rates of avian or mammalian species (e.g., 10-30% body weight/day). This provides an estimate of maximum exposure that may occur as a result of granule or seed treatment spills, which commonly occur at end rows during application and planting. The availability of granules and seed treatments to terrestrial vertebrates is also considered by calculating the loading per unit area ($LD_{50}/ft^2$) for comparison to USEPA LOCs (USEPA 1998). The T-REX version 1.2.3 (USEPA 2005b) contains a submodel which automates Kanaga exposure calculations for granular pesticides and treated seed.

The following formulas are used to calculate EECs depending upon the type of granular pesticide application:

For in-furrow applications, assume a typical value of 1% granules, bait, or seed remain unincorporated.

$$mg\ a.i./ft.^2 = [(lbs.\ product/acre)(\%\ a.i.)(453{,}580\ mg/lbs)(1\%\ exposed))] / \{[(43{,}560\ ft.^2/acre)/(row\ spacing\ (ft.))] / (row\ spacing\ (ft.)\}$$

*or*

$$mg\ a.i./ft^2 = [(lbs\ product/1000\ ft.\ row)(\%\ a.i.)(1000\ ft\ row)(453{,}580\ mg/lb.)(1\%\ exposed)$$

$$EEC = [(mg\ a.i./ft.^2)(\%\ of\ pesticide\ biologically\ available)]$$

For incorporated banded treatments, assume that 15% of granules, bait, seeds are unincorporated.

$$mg\ a.i./ft.^2 = [(lbs.\ product/1000\ row\ ft.)(\%\ a.i.)(453{,}580\ mg/lb.)(1\text{-}\%\ incorporated)] / (1{,}000\ ft.)(band\ width\ (ft.))$$

$$EEC = [(mg\ a.i./ft.^2)(\%\ of\ pesticide\ biologically\ available)]$$

For broadcast treatment without incorporation, assume 100% of granules, bait, seeds are unincorporated.

$$mg\ a.i./ft.^2 = [(lbs.\ product/acre)(\%\ a.i.)(453{,}590\ mg/lb.)] / (43{,}560\ ft.^2/acre)$$

$$EEC = [(mg\ a.i./ft.^2)(\%\ of\ pesticide\ biologically\ available)]$$

Note:

- *% of pesticide biologically available = 100% without species specific ingestion rates*

- *Conversion for calculating mg a.i./ft.$^2$ using ounces: 453,580 mg/lb. /16 = 28,349 mg/oz.*

The following equation is used to calculate a RQ based on the EEC calculated by one of these equations. The EEC is divided by the surrogate $LD_{50}$ toxicological endpoint multiplied by the body weight (Table 3) of the surrogate.

$$RQ = EEC / [LD_{50} (mg/kg) * body\ weight\ (kg)]$$

As with other risk assessments, a RQ>LOC is presumed an unacceptable ecological risk. A RQ<LOC is considered an acceptable risk with only minor, temporary, or localized effects to species.

**<u>Aquatic Exposure</u>**. Exposures to aquatic habitats (e.g., wetlands, meadows, ephemeral pools, water delivery ditches) are evaluated separately for ground-based pesticide treatments. The primary exposure pathway for aquatic organisms from any ground-based treatments likely would be particle drift during the pesticide application. However, different exposure scenarios must be considered as a result of contrasting application equipment and techniques. In addition, the type of pesticides used to control pests as part of facilities maintenance (e.g., roadsides, parking lots, trails) may vary from those used to manage habitats on the refuge. Further, pesticide applications may be done <25 feet from the high water mark of aquatic habitats for habitat management treatments; whereas, no-spray buffers (≥25 feet) would be used for facilities maintenance treatments.

For the worst-case exposure scenario to non-target aquatic habitats EECs (Table 4) are derived from Urban and Cook (1986) that assumes an intentional overspray to an entire, non-target water body (1-foot depth) from a treatment <25 feet from the high water mark using the maximum application rate (acid basis). However, use of BMPs for applying pesticides (see Section 5.0) would likely minimize/eliminate potential drift to non-target aquatic habitats during actual treatments. An unacceptable (acute or chronic) risk to fish and wildlife with the simulated 100% overspray (RQ>LOC) would likely result in a proposed pesticide being disapproved or the pesticide proposal being approved at a lower application rate to minimize/eliminate unacceptable risk to aquatic organisms (RQ=LOC).

Field drift studies conducted by the Spray Drift Task Force, which is a joint project of several agricultural chemical businesses, were used to develop a generic spray drift database. From this database, the AgDRIFT computer model was created to satisfy USEPA pesticide registration spray drift data requirements and as a scientific basis to evaluate off-target movement of pesticides from particle drift and assess potential effects of exposure to wildlife. Several versions of the computer model have been developed (i.e., v2.01 through v2.10). The Spray Drift Task Force AgDRIFT® model version 2.01 (AgDRIFT 2001, SDTF 2003) would be used to derive EECs resulting from drift of pesticides to refuge aquatic resources from ground-based pesticide applications >25 feet from the high water mark. The Spray Drift Task Force AgDRIFT model is publicly available at http://www.agdrift.com. At this website, click "AgDRIFT 2.0" and then click "Download Now" and follow the instructions to obtain the computer model.

| Table 4<br>Estimated Environmental Concentrations<br>of Pesticides in Aquatic Habitats (1 foot depth)<br>Immediately after Direct Application | |
|---|---|
| **Lbs/acre** | **EEC (ppb)** |
| 0.10 | 36.7 |
| 0.20 | 73.5 |
| 0.25 | 91.9 |
| 0.30 | 110.2 |
| 0.40 | 147.0 |
| 0.50 | 183.7 |
| 0.75 | 275.6 |
| 1.00 | 367.5 |
| 1.25 | 459.7 |
| 1.50 | 551.6 |
| 1.75 | 643.5 |
| 2.00 | 735.7 |
| 2.25 | 827.6 |
| 2.50 | 919.4 |
| 3.00 | 1103.5 |
| 4.00 | 1471.4 |
| 5.00 | 1839 |
| 6.00 | 2207 |
| 7.00 | 2575 |
| 8.00 | 2943 |
| 9.00 | 3311 |
| 10.00 | 3678 |

Source: (Urban and Cook 1986)

The AgDRIFT model is composed of submodels called tiers. Tier I Ground submodel is used to assess ground-based applications of pesticides. Tier outputs (EECs) are calculated with AgDRIFT using the following input variables: maximum application rate (acid basis), low boom (20 inches), fine to medium droplet size, EPA-defined wetland, and a ≥25-foot distance (buffer) from treated area to water.

**Use of Information on the Effects of Specific IPM Practices**

Where the scope of a NEPA document prepared by another Federal agency is relevant to the evaluation of the effects of pesticide uses on refuge lands, that document may, in accordance with 43 CRF 46.120(d), be incorporated by reference into Service NEPA documents that address the impacts of pesticides on Refuge resources. As such, is may be appropriate to incorporate through reference ecological risk assessments prepared by the U.S. Forest Service (http://www.fs.fed.us/r6/invasiveplant-eis/Risk-Assessments/Herbicides-Analyzed-InvPlant-EIS.htm) and Bureau of Land Management (http://www.blm.gov/wo/st/en/prog/more/veg_eis.html). These risk assessments and the associated documentation are available in total with the administrative record for the Final

Environmental Impact Statement entitled *Pacific Northwest Region Invasive Plant Program – Preventing and Managing Invasive Plants* (U.S. Forest Service 2005) and *Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic EIS (PEIS)* (Bureau of Land Management 2007).

As a basis for completing "Chemical Profiles" for approving or disapproving refuge PUPs, ecological risk assessments for the following herbicide and adjuvant uses prepared by the U.S. Forest Service are incorporated by reference:

- 2,4-D
- Chlorosulfuron
- Clopyralid
- Dicamba
- Glyphosate
- Imazapic
- Imazapyr
- Metsulfuron methyl
- Picloram
- Sethoxydim
- Sulfometuron methyl
- Triclopyr
- Nonylphenol polyethylate (NPE) based surfactants

As a basis for completing "Chemical Profiles" for approving or disapproving refuge PUPs, ecological risk assessments for the following herbicides and pesticide degradates and adjuvants, prepared by the Bureau of Land Management, are incorporated by reference:

- Bromacil
- Chlorsulfuron
- Diflufenzopyr
- Diquat
- Diuron
- Fluridone
- Imazapic
- Overdrive (diflufenzopyr and dicamba)
- Sulfometuron methyl
- Tebuthiuron
- Pesticide degradates and adjuvants (Appendix D)

**Assumptions for Ecological Risk Assessments**

There are a number of assumptions involved with the ecological risk assessment process for terrestrial and aquatic organisms associated with utilization of the USEPA (2004) process. These assumptions may be risk neutral or may lead to an overestimation or underestimation of risk from pesticide exposure depending upon site-specific conditions. The following describes these assumptions, their application to the conditions typically encountered, and whether or not they may lead to recommendations that are risk neutral, underestimate, or overestimate ecological risk from potential pesticide exposure.

1. Indirect effects would not be evaluated by ecological risk assessments. These effects include the mechanisms of indirect exposure to pesticides: consuming prey items (fish, birds, or small mammals), reductions in the availability of prey items, and disturbance associated with pesticide application activities.

2. Exposure to a pesticide product can be assessed based upon the active ingredient; however, exposure to a chemical mixture (pesticide formulation) may result in effects that are similar or substantially different compared to only the active ingredient. Non-target organisms may be exposed directly to the pesticide formulation or only various constituents of the formulation as they dissipate and partition in the environment. If toxicological information for both the active ingredient and formulated product are available, then data representing the greatest potential toxicity would be selected for use in the risk assessment process (USEPA 2004). This conservative approach may lead to an overestimation of risk characterization from pesticide exposure.

3. Because toxicity tests with listed or candidate species or closely related species are not available, data for surrogate species would most often be used for risk assessments. Specifically, bobwhite quail and mallard duck are the most frequently used surrogates for evaluating potential toxicity to federally listed avian species. Bluegill sunfish, rainbow trout, and fathead minnow are the most common surrogates for evaluating toxicity for freshwater fishes. Sheep's head minnow can be an appropriate surrogate marine species for coastal environments. Rats and mice are the most common surrogates for evaluating toxicity for mammals. Interspecies sensitivity is a major source of uncertainty in pesticide assessments. As a result of this uncertainty, data is selected for the most sensitive species tested within a taxonomic group (birds, fish, and mammals) assuming the quality of the data is acceptable. If additional toxicity data for more species of organisms in a particular group are available, the selected data will not be limited to the species previously listed as common surrogates.

4. The Kanaga nomogram outputs maximum EEC values that may be used to calculate an average daily concentration over a specified interval of time, which is referred to as a time-weighted-average (TWA). The maximum EEC would be selected as the exposure input for both acute and chronic risk assessments in the screening-level evaluations. The initial or maximum EEC derived from the Kanaga nomogram represents the maximum expected instantaneous or acute exposure to a pesticide. Acute toxicity endpoints are determined using a single exposure to a known pesticide concentration typically for 48 to 96 hours. This value is assumed to represent ecological risk from acute exposure to a pesticide.

5. An organism's response to chronic pesticide exposure may result from either the concentration of the pesticide, length of exposure, or some combination of both factors. Standardized tests for chronic toxicity typically involve exposing an organism to several different pesticide concentrations for a specified length of time (days, weeks, months, years or generations). However, when a test is limited to a single length of time, the time response data is usually not available for inclusion into risk assessments, and without time response data, it is difficult to determine the concentration that elicited a toxicological response.

6. Using maximum EECs for chronic risk estimates may result in an overestimate of risk, particularly for compounds that dissipate rapidly. Conversely, using TWAs for chronic risk estimates may underestimate risk if it is the concentration rather than the duration of exposure that is primarily responsible for the observed adverse effect. The maximum EEC is used for chronic risk assessments although it may result in an overestimate of risk. TWAs may be used for chronic risk assessments, but they will be applied judiciously considering the potential for an underestimate or overestimate of risk. For example, the number of days exposure exceeds the LOC may influence the suitability of a pesticide use.

The greater the number of days the EEC exceeds the LOC translates into greater the ecological risk. This is a qualitative assessment and is subject to reviewer's expertise in ecological risk assessment and tolerance for risk.

7. The length of time used to calculate the TWA can have a substantial effect on the exposure estimates and there is no standard method for determining the appropriate duration for this estimate. The T-REX model assumes a 21-week exposure period, which is equivalent to avian reproductive studies designed to establish a steady-state concentration for bioaccumulative compounds. However, this does not necessarily define the true exposure duration needed to elicit a toxicological response. Pesticides, which do not bioaccumulate, may achieve a steady-state concentration earlier than 21 weeks. The duration of time for calculating TWAs will require justification and it will not exceed the duration of exposure in the chronic toxicity test (approximately 70 days for the standard avian reproduction study). An alternative to using the duration of the chronic toxicity study is to base the TWA on the application interval. In this case, increasing the application interval would suppress both the estimated peak pesticide concentration and the TWA. Another alternative to using TWAs would be to consider the number of days that a chemical is predicted to exceed the LOC.

8. Pesticide dissipation is assumed to be first-order in the absence of data suggesting alternative dissipation patterns such as bi-phasic. Field dissipation data would generally be the most pertinent for assessing exposure in terrestrial species that forage on vegetation. However, this data is often not available and it can be misleading particularly if the compound is prone to "wash-off". Soil half-life is the most common degradation data available. Dissipation or degradation data that would reflect the environmental conditions typical of refuge lands would be utilized, if available.

9. For species found in the water column, it is assumed that the greatest bioavailable fraction of the pesticide active ingredient in surface waters is freely dissolved in the water column.

10. Actual habitat requirements for any particular terrestrial species are not considered, and it is assumed that species exclusively and permanently occupy the treated area, or adjacent areas receiving pesticide at rates commensurate with the treatment rate. This assumption produces a maximum estimate of exposure for risk characterization and will likely lead to an overestimation of exposure for species that do not permanently and exclusively occupy the treated area (USEPA 2004).

11. Exposure through incidental ingestion of pesticide contaminated soil is not considered in the USEPA risk assessment protocols. Research suggests <15% of the diet can consist of incidentally ingested soil depending upon species and feeding strategy (Beyer et al. 1994). An assessment of pesticide concentrations in soil compared to food item categories in the Kanaga nomogram indicates incidental soil ingestion will not likely increase dietary exposure to pesticides. Inclusion of soil into the diet would effectively reduce the overall dietary concentration compared to the present assumption that the entire diet consists of a contaminated food source (Fletcher et al. 1994). An exception to this may be soil-applied pesticides in which exposure from incidental ingestion of soil may increase. Potential for pesticide exposure under this assumption may be underestimated for soil-applied pesticides and overestimated for foliar-applied pesticides. The concentration of a pesticide in soil would likely be less than predicted on food items.

12. Exposure through inhalation of pesticides is not considered in the USEPA risk assessment protocols. Such exposure may occur through three potential sources: spray material in droplet form at the time of application, vapor phase with the pesticide volatilizing from treated surfaces, and airborne particulates (soil, vegetative matter, and pesticide dusts). The USEPA (1990) reported exposure from inhaling spray droplets at the time of application is not an appreciable route of exposure for birds. According to research on mallards and bobwhite quail, respirable particle size (particles reaching the lung) in birds is limited to maximum diameter of 2 to 5 microns. The spray droplet spectra covering the majority of pesticide application scenarios indicate that less than 1% of the applied material is within the respirable particle size. This route of exposure is further limited because the permissible spray drop size distribution for ground pesticide applications is restricted to ASAE medium or coarser drop size distribution.

13. Inhalation of a pesticide in the vapor phase may be another source of exposure for some pesticides under certain conditions. This mechanism of exposure to pesticides occurs post application and would pertain to those pesticides with a high vapor pressure. The USEPA is currently evaluating protocols for modeling inhalation exposure from pesticides including near-field and near-ground air concentrations based upon equilibrium and kinetics-based models. Risk characterization for exposure with this mechanism is unavailable.

14. The effect from exposure to dusts contaminated with a pesticide cannot be assessed generically, as partitioning issues related to application site, soils, and chemical properties of the applied pesticides render the exposure potential from this route highly situation specific.

15. Dermal exposure may occur through three potential sources: direct application of spray to terrestrial wildlife in the treated area or within the drift footprint; incidental contact with contaminated vegetation; or contact with contaminated water or soil. Interception of spray and incidental contact with treated substrates may pose risk to avian wildlife (Driver et al. 1991); however, research related to wildlife dermal contact with pesticides is extremely limited. Dermal toxicity values are common for some mammals used as human surrogates, particularly rats and mice. The USEPA is currently evaluating protocols for modeling dermal exposure. Risk characterization may be underestimated for this route of exposure, particularly with high risk pesticides such as some organophosphates or carbamate insecticides, which act by a similar mechanism to organophosphate pesticides. If protocols are established by the USEPA for assessing dermal exposure to pesticides, they will be considered for incorporation into pesticide assessment protocols.

16. Exposure to a pesticide may occur from consuming surface water, dew, or other water on treated surfaces. Water soluble pesticides have the potential to dissolve in surface runoff and puddles in a treated area may contain pesticide residues. Similarly, pesticides with lower organic carbon partitioning characteristics and higher solubility in water have a greater potential to dissolve in dew and other water associated with plant surfaces. Estimating the extent to which such pesticide loadings to drinking water occurs is complex and would depend upon the partitioning characteristics of the active ingredient, as well as the soils types and meteorology of the treatment area. In addition, the use of various water sources by wildlife is highly species-specific. Currently, risk characterization for this exposure mechanism is not available. The USEPA is actively developing protocols to quantify drinking water exposures from puddles and dew. If and when such protocols are

formally established by the USEPA, these protocols will be incorporated into pesticide risk assessment protocols.

17. Risk assessments are based upon the assumption that the entire treatment area will be subject to pesticide application at the rates specified on the label. In most cases however, there is potential for uneven application of pesticides through such plausible incidents as changes in calibration of application equipment, spillage, and localized releases at specific areas in or near the treated field that are associated with mixing and handling, application equipment, and applicator skill. Inappropriate use of pesticides and the occurrence of spills represent a potential underestimate of risk; however, this is generally a minor factor for risk characterization. All pesticide applicators are required to be certified by the state in which they apply pesticides. Certification training, which requires yearly updates, includes the safe storage, transport, handling, and mixing of pesticides, appropriate equipment calibration, and proper application.

18. The USEPA relies on Fletcher (1994) for setting the assumed pesticide residues in wildlife dietary items. The USEPA (2004) "believes that these residue assumptions reflect a realistic upper-bound residue estimate, although the degree to which this assumption reflects a specific percentile estimate is difficult to quantify." Fletcher's (1994) research suggests that the pesticide active ingredient residue assumptions used by the USEPA represent a 95$^{th}$ percentile estimate. However, research conducted by Pfleeger et al. (1996) indicates USEPA residue assumptions for short grass was not exceeded. Baehr and Habig (2000) compared USEPA residue assumptions with distributions of measured pesticide residues for the USEPA's Uptake, Translocation, Accumulation, and Biotransformation (UTAB) database. Overall residue selection level will tend to overestimate risk characterization. This is particularly evident when wildlife individuals are likely to have selected a variety of food items acquired from multiple locations. Some food items may be contaminated with pesticide residues whereas others are not contaminated. However, it is important to recognize differences in species feeding behavior. Some species may consume whole above-ground plant material, while others will preferentially select different plant structures. Species may also preferentially select a specific food item despite the presence of multiple food items. Without species specific knowledge regarding foraging behavior, characterizing ecological risk other than in general terms is not possible.

19. Acute and chronic risk assessments rely on comparisons of wildlife dietary residues with $LC_{50}$ or "no observed effect concentration" (NOEC) values expressed as concentrations of pesticides in laboratory feed. These comparisons assume that ingestion of food items in the field occurs at rates commensurate with those in the laboratory. Although the screening assessment process adjusts dry-weight estimates of food intake to reflect the increased mass in fresh-weight wildlife food intake estimates, it does not allow for gross energy and assimilative efficiency differences between wildlife food items and laboratory feed. Differences in assimilative efficiency between laboratory and wild diets suggest that current screening assessment methods are not accounting for a potentially important aspect of food requirements.

20. It is assumed that aquatic species exclusively and permanently occupy the water body being assessed. Actual habitat requirements of aquatic species are not considered. With the possible exception of scenarios where pesticides are directly applied to water, it is assumed that no habitat use considerations specific for any species would place the organisms in closer proximity to pesticide use sites. This assumption produces a maximum estimate of exposure or risk characterization. It would likely be realistic for many aquatic

species that may be found in aquatic habitats within or in close proximity to treated terrestrial habitats. However, the spatial distribution of wildlife is usually not random because wildlife distributions are often related to habitat requirements of the species. Clumped distributions of wildlife may result in an underestimation or overestimation of risk depending upon where the initial pesticide concentration occurs relative to the species or species habitat.

21. For species found in the water column, it is assumed that the greatest bioavailable fraction of the pesticide active ingredient in surface waters is freely dissolved in the water column. Additional chemical exposure from materials associated with suspended solids or food items is not considered, because partitioning onto sediments is considered minimal. Adsorption and bioconcentration occurs at lower levels for many newer pesticides compared with older more persistent bioaccumulative compounds. For pesticides with RQs close to listed species' LOC, the potential for additional exposure from these routes may be a limitation of risk assessments, because potential pesticide exposure or risk may be underestimated.

22. Mass transport losses of pesticide from a water body (except for losses by volatilization, degradation, and sediment partitioning) are not considered in ecological risk assessments. The water body would be assumed to capture all pesticide active ingredients entering as runoff, drift, and adsorbed to eroded soil particles. It would also be assumed that the pesticide active ingredient is not lost from the water body by overtopping or flow-through, nor is its concentration reduced by dilution. In total, these assumptions would lead to a near maximum possible water-borne concentration. However, this assumption would not account for the potential to concentrate pesticide through evaporative loss. This limitation may have the greatest impact on water bodies with high surface-to-volume ratios such as ephemeral wetlands, where evaporative losses are accentuated and applied pesticides have low rates of degradation and volatilization.

23. For acute risk assessments, there would be no averaging time for exposure. An instantaneous peak concentration would be assumed, where instantaneous exposure is sufficient in duration to elicit acute effects comparable to those observed over more protracted exposure periods (typically 48 to 96 hours) tested in the laboratory. In the absence of data regarding time-to-toxic event, analyses and latent responses to instantaneous exposure, risk would likely be overestimated.

24. For chronic exposure risk assessments, the averaging times considered for exposure are commensurate with the duration of invertebrate life-cycle or fish-early life stage tests (e.g., 21-28 days and 56-60 days, respectively). Response profiles (time to effect and latency of effect) to pesticides likely vary widely with mode of action and species and should be evaluated on a case-by-case basis as available data allow. Nevertheless, because the USEPA relies on chronic exposure toxicity endpoints based on a finding of no observed effect, the potential for any latent toxicity effects or averaging time assumptions to alter the results of an acceptable chronic risk assessment prediction is limited. The extent to which duration of exposure from water-borne concentrations overestimate or underestimate actual exposure depends on several factors, including: localized meteorological conditions; runoff characteristics of the watershed (e.g., soils, topography); hydrological characteristics of receiving waters; environmental fate of the pesticide active ingredient; and the method of pesticide application. It should also be understood that chronic effects studies are performed using a method that holds water concentration in a steady state. This method is not likely to reflect conditions associated with pesticide

runoff. Pesticide concentrations in the field increase and decrease in surface water on a cycle influenced by rainfall, pesticide use patterns, and degradation rates. As a result of the dependency of this assumption on several undefined variables, risk associated with chronic exposure may in some situations underestimate risk and overestimate risk in others.

Several other assumptions can affect non-target species that are not considered in the risk assessment process. These include possible additive or synergistic effects from applying two or more pesticides or additives in a single application, co-location of pesticides in the environment, cumulative effects from pesticides with the same mode of action, effects of multiple stressors (e.g., combination of pesticide exposure, adverse abiotic and biotic factors), and behavioral changes induced by exposure to a pesticide. These factors may exist at some level contributing to adverse affects to non-target species, but they are usually characterized in the published literature in only a general manner limiting their value in the risk assessment process. As this type of information becomes available, it would be included, either quantitatively or qualitatively, in this risk assessment process.

USEPA is required by the Food Quality Protection Act to assess the cumulative risks of pesticides that share common mechanisms of toxicity, or act the same within an organism. Currently, USEPA has identified four groups of pesticides that have a common mechanism of toxicity requiring cumulative risk assessments. These four groups are: the organophosphate insecticides, N-methyl carbamate insecticides, triazine herbicides, and chloroacetanilide herbicides.

### 7.3 Pesticide Mixtures and Degradates

Pesticide products are usually a formulation of several components generally categorized as active ingredients and inert or other ingredients. The term active ingredient is defined by FIFRA as preventing, destroying, repelling, or mitigating the effects of a pest, or it is a plant regulator, defoliant, desiccant, or nitrogen stabilizer. In accordance with FIFRA, the active ingredient(s) must be identified by name(s) on the pesticide label along with its relative composition expressed in percentage(s) by weight. In contrast, inert ingredient(s) are not intended to affect a target pest. Their role in the pesticide formulation is to act as a solvent (keep the active ingredient is a liquid phase), an emulsifying or suspending agent (keep the active ingredient from separating out of solution), or a carrier such as clay in which the active ingredient is impregnated on the clay particle in dry formulations. For example, if isopropyl alcohol would be used as a solvent in a pesticide formulation, it would be considered an inert ingredient. FIFRA only requires that inert ingredients be identified if they pose a hazard to man or the environment. Inert ingredients that are not classified as hazardous are not required to be identified. The only other requirement is to state on the product label the percentage by weight of all inert ingredients.

The USEPA (September 1997) issued Pesticide Regulation Notice 97-6 which encouraged manufacturers, formulators, producers, and registrants of pesticide products to voluntarily substitute the term “other ingredients” for “inert ingredients” in the ingredient statement. This change recognized that all components in a pesticide formulation potentially could elicit or contribute to an adverse effect on non-target organisms and, therefore, are not necessarily inert. Whether referred to as “inerts” or “other ingredients,” these constituents within a pesticide product have the potential to affect species or environmental quality. The USEPA categorizes regulated inert ingredients as follows (http://www.epa.gov/opprd001/inerts/index.html):

- List 1 – Inert Ingredients of Toxicological Concern
- List 2 – Potentially Toxic Inert Ingredients
- List 3 – Inerts of Unknown Toxicity
- List 4 – Inerts of Minimal Toxicity

Several of the List 4 compounds are naturally-occurring earthen materials (e.g., clay materials, simple salts) that would not elicit toxicological response at applied concentrations. However, some of the inerts (particularly the List 3 compounds and unlisted compounds) may have moderate to high potential toxicity to aquatic species based on MSDSs or published data.

Comprehensively assessing potential effects to non-target fish, wildlife, plants, and/or their habitats from pesticide use is a complex task. It would be preferable to assess the cumulative effects from exposure to the active ingredient, its degradates, and inert ingredients, as well as other active ingredients in the spray mixture. However, it would only be feasible to conduct deterministic risk assessments for each component in the spray mixture individually. Limited scientific information is available regarding ecological effects (additive or synergistic) from chemical mixtures that typically rely upon broadly encompassing assumptions. For example, the U.S. Forest Service (2005) found that mixtures of pesticides used in land (forest) management were not likely to cause additive or synergistic effects to non-target species based upon a review of scientific literature regarding toxicological effects and interactions of agricultural chemicals (ATSDR 2004). Moreover, information on inert ingredients, adjuvants, and degradates is often limited by the availability of and access to reliable toxicological data for these constituents.

Toxicological information regarding "other ingredients" may be available from sources, including:

- TOMES (a proprietary toxicological database including USEPA's IRIS, the Hazardous Substance Data Bank, the Registry of Toxic Effects of Chemical Substances [RTECS]);
- USEPA's ECOTOX database, which includes AQUIRE (a database containing scientific papers published on the toxic effects of chemicals to aquatic organisms);
- TOXLINE (a literature searching tool);
- Material Safety Data Sheets (MSDSs) from pesticide suppliers; and
- Sources such as the Farm Chemicals Handbook.

Because there is a lack of specific inert toxicological data, inert(s) in a pesticide may cause adverse ecological effects. However, inert ingredients typically represent only a small percentage of the pesticide spray mixture, and it would be assumed that negligible effects would be expected to result from inert ingredient(s).

Although the potential effects of degradates should be considered when selecting a pesticide, it is beyond the scope of this assessment process to consider all possible breakdown chemicals of the various product formulations containing an active ingredient. Degradates may be more or less mobile and more or less hazardous in the environment than their parent pesticides (Battaglin et al. 2003). Differences in environmental behavior (e.g., mobility) and toxicity between parent pesticides and degradates would make assessing potential degradate effects extremely difficult. For example, a less toxic and more mobile, bioaccumulative, or persistent degradate may have potentially greater effects on species and/or degrade environmental quality. The lack of data on the toxicity of degradates for many pesticides would represent a source of uncertainty for assessing risk.

USEPA-approved labels specify whether a product can be mixed with one or more pesticides. Without product-specific toxicological data, it would not possible to quantify the potential effects of these mixtures. In addition, a quantitative analysis could only be conducted if reliable scientific information allowed a determination of whether the joint action of a mixture would be additive, synergistic, or antagonistic. Such information would not likely exist unless the mode of action would be common among the chemicals and receptors. Moreover, the composition of and exposure to mixtures would be highly site- and/or time-specific and, therefore, it would be nearly impossible to assess potential effects to species and environmental quality.

To minimize or eliminate potential negative effects associated with applying two or more pesticides as a mixture, the use would be conducted in accordance with the labeling requirements. Labels for two or more pesticides applied as a mixture should be completely reviewed, where products with the least potential for negative effects would be selected for use on the refuge. This is especially relevant when a mixture would be applied in a manner that may already have the potential for an effect(s) associated with an individual pesticide (e.g., runoff to ponds in sandy watersheds). Use of a tank mix under these conditions would increase the level of uncertainty in terms of risk to species or potential to degrade environmental quality.

Adjuvants generally function to enhance or prolong the activity of pesticide. For terrestrial herbicides, adjuvants aid in the absorption into plant tissue. Adjuvant is a broad term that generally applies to surfactants, selected oils, anti-foaming agents, buffering compounds, drift control agents, compatibility agents, stickers, and spreaders. Adjuvants are not under the same registration requirements as pesticides and the USEPA does not register or approve the labeling of spray adjuvants. Individual pesticide labels identify types of adjuvants approved for use with it. In general, adjuvants compose a relatively small portion of the volume of pesticides applied. Selection of adjuvants with limited toxicity and low volumes would be recommended to reduce the potential for the adjuvant to influence the toxicity of the pesticide.

### 7.4 Determining Effects to Soil and Water Quality

The approval process for pesticide use considers the potential to degrade water quality on and off refuge lands. After application, pesticide mobilization can be characterized by one or more of the following (Kerle et al. 1996):

- Attach (sorb) to soil, vegetation, or other surfaces and remain at or near the treated area;
- Attach to soil and move off-site through erosion from runoff or wind; and/or
- Dissolve in water subjected to runoff or leaching.

As an initial screening tool, selected chemical characteristics and rating criteria for a pesticide can be evaluated to assess the potential for the product to enter ground and/or surface waters. These would include the following: persistence, sorption coefficient ($K_{oc}$), Groundwater Ubiquity Score (GUS), and solubility. Persistence, which is expressed as half-life ($t_{½}$), represents the length of time required for 50% of the deposited pesticide to degrade (completely or partially). Persistence in the soil can be categorized as the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days (Kerle et al. 1996). Half-life data is usually available for aquatic and terrestrial environments.

Another measure of pesticide persistence is dissipation time ($DT_{50}$). This represents the time required for 50% of the deposited pesticide to degrade and move from a treated site; whereas, half-life describes the rate for degradation only. Similar to half-life, units of dissipation time are usually expressed in days. Field or foliar dissipation time is the preferred data for use to estimate pesticide concentrations in the environment; however, soil half-life is the most common persistence data cited in published literature. If field or foliar dissipation data is not available, soil half-life data may be used. The average or representative half-life value of the most important degradation mechanism will be selected for quantitative analysis for both terrestrial and aquatic environments.

Mobility of a pesticide is a function of how strongly it is adsorbed to soil particles and organic matter, its solubility in water, and its persistence in the environment. Pesticides strongly adsorbed to soil particles, relatively insoluble in water, and not environmentally persistent would be less likely to move across the soil surface into surface waters or to leach through the soil profile and contaminate groundwater. Conversely, pesticides that are not strongly adsorbed to soil particles, are highly water soluble, and are persistent in the environment would have greater potential to move from the application site (off-site movement). The degree of pesticide adsorption to soil particles and organic matter (Kerle et al. 1996) is expressed as the soil adsorption coefficient ($K_{oc}$). The soil adsorption coefficient is measured as micrograms of pesticide per gram of soil (μg/g) that can range from near zero to the thousands. Pesticides with higher $K_{oc}$ values are strongly sorbed to soil and, therefore, would be less subject to movement.

The Groundwater Ubiquity Score (GUS) is a quantitative screening tool to estimate a pesticide's potential to move in the environment. It utilizes soil persistence and adsorption coefficients in the following formula: $GUS = \log_{10}(t_{½}) \times [4 - \log_{10}(K_{oc})]$. The potential pesticide movement rating would be based upon its GUS value. Pesticides with a GUS <0.1 would considered to have an extremely low potential to move toward groundwater. Values of 1.0-2.0 would be low, 2.0-3.0 would be moderate, 3.0-4.0 would be high, and >4.0 would have a very high potential to move toward groundwater.

Water solubility describes the amount of pesticide dissolving in a specific quantity of water, where it is usually measured as milligrams of pesticide dissolved per liter of water (mg/l) or parts per million (ppm). Solubility is useful as a comparative measure because pesticides with higher values are more likely to move by runoff or leaching. For example, pesticides with solubility <0.1 ppm are virtually insoluble in water, 100-1000 ppm are moderately soluble, and >10,000 ppm highly soluble (U.S. Geological Survey 2000). As pesticide solubility increases, there is greater potential for off-site movement.

GUS, water solubility, $t_{½}$, and $K_{oc}$ values are available for selected pesticides from the OSU Extension Pesticide Properties Database at http://npic.orst.edu/ppdmove.htm. Many of the values in this database were derived from the SCS/ARS/CES Pesticide Properties Database for Environmental Decision Making (Wauchope et al. 1992).

Soil properties influence the fate of pesticides in the environment. The following six properties are most likely to affect pesticide degradation and the potential for pesticides to move off-site by leaching (vertical movement through the soil) or runoff (lateral movement across the soil surface).

> Permeability. This is the rate at which water moves vertically through the soil. It is affected by soil texture and structure. Coarse textured soils (e.g., high sand content) have a larger pore size and are generally more permeable than fine textured soils (i.e., high clay content). The potential for pesticides to move vertically down through the soil profile is greater the more permeable the soils are within the treatment area. Soil permeability rates (inches/hour) are usually available in county soil survey reports. In the case of the Seal Beach NWR, the majority of the soils on site consist of stratified clay and sand deposits that are poorly drained (USDA 1978).

Soil Texture. Soil texture is defined by the relative percentage of sand, silt, and clay present in the soil. In general, greater clay content would lower the likelihood and rate at which water would move through the soil profile. Clay also serves to adsorb (bind) pesticides to soil particles. Soils with high clay content would adsorb more pesticide than soils with relatively low clay content. In contrast, sandy soils with coarser texture and lower water holding capacity would have a greater potential for water to leach through them.

Soil Structure. Soil structure describes soil aggregation. Soils with a well developed soil structure have looser, more aggregated, structure that would be less likely to be compacted. Both characteristics would allow for less restricted flow of water through the soil profile resulting in greater infiltration.

Organic Matter Content. This is the single most important factor affecting pesticide adsorption in soils. Many pesticides are adsorbed to organic matter, reducing their rate of downward movement through the soil profile. Also, soils high in organic matter tend to hold more water, which may make less water available for leaching.

Soil Moisture Content. Soil moisture content affects how the velocity at which water moves through the soil. If soils are already wet or saturated before rainfall or irrigation, excess moisture would runoff rather than infiltrate into the soil profile. Soil moisture also influences microbial and chemical activity in soil, which effects pesticide degradation.

Soil pH. Soil pH influences the chemical reactions that occur in the soil. This in turn determines whether or not a pesticide will degrade, as well as the rate of degradation, and, in some instances, the types of degradation products that are produced.

Based upon the aforementioned properties, soils most vulnerable to groundwater contamination are sandy soils with low organic matter. In contrast, the least vulnerable soils are well-drained, clayey soils with high organic matter. Consequently, pesticides with the lowest potential for movement in conjunction with appropriate BMPs will be used in an IPM framework to treat pests while minimizing effects to non-target biota and protecting environmental quality.

Along with soil properties, the potential for a pesticide to affect water quality through runoff and leaching would also be affected by site-specific environmental and abiotic conditions including rainfall, water table conditions, and topography (Huddleston 1996). Water is necessary to separate pesticides from soil. This can occur in two basic ways: 1) pesticides that are soluble would move easily with runoff water, and 2) pesticide-laden soil particles could be dislodged and transported from the application site in runoff. The concentration of pesticides in the surface runoff would be greatest for the first runoff event following treatment. The rainfall intensity and route of water infiltration into the soil, to a large extent, determine pesticide concentrations in surface runoff. The timing of the rainfall after application would also have an influence on the total pesticide concentrations in surface runoff. Rainfall interacts with pesticides at a shallow soil depth (¼ to ½ inch), which is called the mixing zone (Baker and Miller 1999). The pesticide/water mixture in the mixing zone would tend to leach down into the soil or runoff depending upon how quickly the soil surface becomes saturated and how rapidly water can infiltrate into the soil. Leaching would decrease the amount of pesticide available near the soil surface (mixing zone) reducing total runoff during the initial rainfall event following application, as well as subsequent rainfall events.

Terrain slope would also affect the potential for surface runoff and the intensity of the runoff. Steeper slopes would have greater potential for runoff following a rainfall event. In contrast, soils that are relatively flat would have little potential for runoff, except during intense rainfall events. In addition, soils in lower areas would be more susceptible to leaching as a result of receiving excessive water from surrounding higher elevations.

Depth to groundwater is also an important factor affecting the potential for pesticides to leach into groundwater. If the distance from the soil surface to the top of the water table is shallow, pesticides would be more likely to influence groundwater quality. Soil survey reports, available for individual counties, provide data regarding the water table depths. In some situations, a hard pan may exist above the water table, preventing the pesticide from leaching into the groundwater.

### 7.5 Determining Effects to Air Quality

Pesticides may 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. The extent to which a pesticide may volatilize is influenced by temperature, sorption, soil moisture, and the pesticide's solubility. Vapor pressure is often expressed in mm Hg. To make these numbers easier to compare, vapor pressure may be expressed in exponent form ($I \times 10^{-7}$), where "I" represents a vapor pressure index. In general, pesticides with $I<10$ would have a low potential to volatilize; whereas, pesticides with $I>1{,}000$ would have a high potential to volatilize (Oregon State University 1996). Vapor pressure values for pesticides are usually available in the pesticide product MSDS or the USDA Agricultural Research Service (ARS) pesticide database.

### 7.6 Preparing a Chemical Profile

The following instructions will be used by Service personnel to complete Chemical Profiles for pesticides. Specifically, profiles will be prepared for pesticide active ingredients (e.g., glyphosate, oryzalin) that would be contained in one or more trade name products, registered and labeled with USEPA. A blank Chemical Profile form is provided as Attachment A. All fields under each category (e.g., Toxicological Endpoints, Environmental Fate) on the Chemical Profile must be filled in. If no information is available for a specific field, then "No data is available in references" would be recorded in the profile. Available scientific information would be used to complete Chemical Profiles. Each entry of scientific information would be shown with applicable references.

Completed Chemical Profiles will provide a structured decision making process utilizing quantitative assessment/screening tools with threshold values, where appropriate, that would be used to evaluate potential biological and other environmental effects to refuge resources. For ecological risk assessments presented in these profiles, the "worst-case scenario" would be evaluated to determine whether a pesticide could be approved for use considering the maximum single application rate specified on pesticide labels for Refuge habitat management and facilities maintenance. Where the "worst-case scenario" is likely to result in only minor, temporary, and localized effects to listed and non-listed species (when appropriate BMPs [see Section 5.0] are implemented), the proposed pesticide's use would have a scientific basis for approval under any application rate specified on the label that is at or below rates evaluated in a Chemical Profile. In some cases, the Chemical Profile will include a lower application rate than the maximum labeled rate in order to protect refuge resources. As necessary, Chemical Profiles will be periodically updated to include new scientific information or include a new pesticide proposed for use on the Refuge through the PUPs process that possesses the same active ingredient described in the Chemical Profile.

Currently, three Chemical Profiles have been prepared for the Seal Beach NWR: one for the active ingredient glyphosate; one for the active ingredient oryzalin; and one for the active ingredient imazapyr (Attachments B-1, B-2, and B-3). These Chemical Profiles address the active ingredients used in Aquamaster, Glyphosate Pro 4, Surflan A S, and Habitat, all of which have been approved for use on the Refuge through the PUPs process.

The Chemical Profile will clearly identify threshold values in order to prevent or minimize potential biological and environmental effects. Comparison of these threshold values provides an explicit scientific basis to approve or disapprove PUPs for habitat management and facilities maintenance on the Seal Beach NWR. In general, PUPs will be approved for pesticides with Chemical Profiles where there would be no exceedances of threshold values. However, BMPs are identified for some screening tools that would minimize and/or eliminate potential effects (exceedance of the threshold value) as a basis for approving PUPs.

The following information will be recorded for each Chemical Profile that is completed or updated.

**General Information**

**Date**. Service personnel will record the date when the Chemical Profile is completed or updated. Chemical Profiles (e.g., currently approved pesticide use patterns) will be periodically reviewed and updated, as necessary. The most recent review date will be recorded on a profile to document when it was last updated.

**Trade Name(s)**. Service personnel will accurately and completely record the trade name(s) from the pesticide label, which includes a suffix that describes the formulation (e.g., WP, DG, EC, L, SP, I, II or 64). The suffix often distinguishes a specific product among several pesticides with the same active ingredient. Service personnel will record a trade name for each pesticide product with the same active ingredient.

**Common Chemical Name(s)**. Service personnel will record the common name(s) listed on the pesticide label or MSDS for an active ingredient. The common name of a pesticide is listed as the active ingredient on the title page of the product label immediately following the trade name, and on the MSDS, Section 2: Composition/Information on Ingredients. A Chemical Profile is completed for each active ingredient.

**Pesticide Type**. Service personnel will record the type of pesticide for an active ingredient as one of the following: herbicide, dessicant, fungicide, fumigant, growth regulator, insecticide, pisicide, or rodenticide.

**EPA Registration Number(s)**. This number (EPA Reg. No.) appears on the title page of the label and MSDS, Section 1: Chemical Product and Company Description. It is not the EPA Establishment Number that is usually located near it. Service personnel will record the EPA Reg. No. for each trade name product with an active ingredient based upon PUPs.

**Pesticide Class.** Service personnel will list the general chemical class for the pesticide (active ingredient). For example, malathion is an organophosphate, and carbaryl is a carbamate.

**CAS (Chemical Abstract Service) Number**. Service personnel will record this number, which is often located in the second section (Composition/Information on Ingredients) of the MSDS, in the Chemical Profile. The MSDS table listing components usually contains this number immediately prior to or following the % composition.

**Other Ingredients**. From the most recent MSDS for the proposed pesticide product(s), Service personnel will include any chemicals in the pesticide formulation not listed as an active ingredient that are described as toxic or hazardous, or regulated under the Superfund Amendments and Reauthorization Act (SARA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Toxic Substances Control Act (TSCA), OSHA, State Right-to-Know, or other listed authorities. These are usually found in MSDS sections titled "Hazardous Identifications," "Exposure Control/Personal Protection," and "Regulatory Information". If concentrations of other ingredients are available for any compounds identified as toxic or hazardous, then Service personnel will record this information in the Chemical Profile by trade name. MSDS(s) may be obtained from the manufacturer, manufacturer's website or from an online database maintained by Crop Data Management Systems, Inc.

**Toxicological Endpoints**

Toxicological endpoint data is collected for acute and chronic tests with mammals, birds, and fish. This data will be recorded in the Chemical Profiles as available in the scientific literature. If no data are found for a particular taxonomic group, then "No data available is references" will be recorded as the data entry. Throughout the Chemical Profile, references (including toxicological endpoint data) will be cited using parentheses (#) following the recorded data.

**Mammalian $LD_{50}$**. For test species in the scientific literature, Service personnel will record available data for oral lethal dose ($LD_{50}$) in mg/kg-bw (body weight) or ppm-bw. The most common test species in scientific literature are the rat and mouse. The lowest $LD_{50}$ value found for a rat will be used as a toxicological endpoint for dose-based RQ calculations to assess acute risk to mammals (see Table 1 in Section 7.2).

**Mammalian $LC_{50}$**. For test species in the scientific literature, Service personnel will record available data for dietary lethal concentration ($LC_{50}$) as reported (e.g., mg/kg-diet or ppm-diet). The most common test species in scientific literature are the rat and mouse. The lowest $LC_{50}$ value found for a rat will be used as a toxicological endpoint for diet-based RQ calculations to assess acute risk (see Table 1 in Section 7.2).

**Mammalian Reproduction**. For test species listed in the scientific literature, Service personnel will record the test results (e.g., Lowest Observed Effect Concentration [LOEC], Lowest Observed Effect Level [LOEL], No Observed Adverse Effect Level [NOAEL], No Observed Adverse Effect Concentration [NOAEC]) in mg/kg-bw or mg/kg-diet for reproductive test procedure(s) (e.g., generational studies [preferred], fertility, new born weight). The most common test species available in scientific literature are rats and mice. The lowest NOEC, NOAEC, NOEL, or NOAEL test results found for a rat will be used as a toxicological endpoint for RQ calculations to assess chronic risk (see Table 1 in Section 7.2).

**Avian $LD_{50}$**. For test species available in the scientific literature, Service personnel will record values for oral lethal dose ($LD_{50}$) in mg/kg-bw or ppm-bw. The most common test species available in scientific literature are the bobwhite quail and mallard. The lowest $LD_{50}$ value found for an avian species will be used as a toxicological endpoint for dose-based RQ calculations to assess acute risk (see Table 1 in Section 7.2).

**Avian $LC_{50}$**. For test species available in the scientific literature, Service personnel will record values for dietary lethal concentration ($LC_{50}$) as reported (e.g., mg/kg-diet or ppm-diet). The most common test species available in scientific literature are the bobwhite quail and mallard. The lowest $LC_{50}$ value found for an avian species will be used as a toxicological endpoint for dietary-based RQ calculations to assess acute risk (see Table 1 in Section 7.2).

**Avian Reproduction**. For test species available in the scientific literature, Service personnel will record test results (e.g., LOEC, LOEL, NOAEC, NOAEL) in mg/kg-bw or mg/kg-diet consumed for reproductive test procedure(s) (e.g., early life cycle, reproductive). The most common test species available in scientific literature are the bobwhite quail and mallard. The lowest NOEC, NOAEC, NOEL, or NOAEL test results found for an avian species will be used as a toxicological endpoint for RQ calculations to assess chronic risk (see Table 1 in Section 7.2).

**Fish $LC_{50}$**. For test freshwater or marine species listed in the scientific literature, Service personnel will record a $LC_{50}$ in ppm or mg/L. The most common test species available in the scientific literature are the bluegill, rainbow trout, and fathead minnow (marine). Test results for many game species may also be available. The lowest $LC_{50}$ value found for a freshwater fish species will be used as a toxicological endpoint for RQ calculations to assess acute risk (see Table 1 in Section 7.2).

**Fish Early Life Stage (ELS)/Life Cycle**. For test freshwater or marine species available in the scientific literature, Service personnel will record test results (e.g., LOEC, NOAEL, NOAEC, LOAEC) in ppm for test procedure(s) (e.g., early life cycle, life cycle). The most common test species available in the scientific literature are bluegill, rainbow trout, and fathead minnow. Test results for other game species may also be available. The lowest test value found for a fish species (preferably freshwater) will be used as a toxicological endpoint for RQ calculations to assess chronic risk (see Table 1 in Section 7.2).

**Other**. For test invertebrate, as well as non-vascular and vascular plant species, available in the scientific literature, Service personnel will record $LC_{50,}$ $LD_{50,}$ LOEC, LOEL, NOAEC, NOAEL, or $EC_{50}$ (environmental concentration) values in ppm or mg/L.
The most common test invertebrate species available in scientific literature are the honey bee and the water flea (*Daphnia magna*). Green algae (*Selenastrum capricornutum*) and pondweed (*Lemna minor*) are frequently available test species for aquatic non-vascular and vascular plants, respectively.

#### Ecological Incident Reports

After a site has been treated with pesticide(s), wildlife may be exposed to these chemical(s). When exposure is high relative to the toxicity of the pesticides, wildlife may be killed or visibly harmed (incapacitated). Such events are called ecological incidents. The USEPA maintains a database (Ecological Incident Information System) of ecological incidents. This database stores information extracted from incident reports submitted by various Federal and State agencies and non-government organizations. Information provided in an incident report includes date and location of the incident, type and magnitude of affects observed in various species, type(s) of pesticides known or suspected of contributing to the incident, and results of any chemical residue and cholinesterase activity analyses conducted during the investigation.

**Ecological Incident Reports**. Incident reports can play an important role in evaluating the effects of pesticides by supplementing quantitative risk assessments. All incident reports pertaining to the active ingredient addressed in a Chemical Profile and the associated information related to the reported incident will be recorded. If no reports are available this, too, will be noted.

**Environmental Fate**

**Water Solubility.** Service personnel will record values for water solubility ($S_w$), which describes the amount of pesticide that dissolves in a known quantity of water. $S_w$ is expressed as mg/L (ppm). Pesticide $S_w$ values would be categorized as one of the following: insoluble <0.1 ppm, moderately soluble = 100 to 1000 ppm, highly soluble >10,000 ppm (US Geological Survey 2000). As pesticide $S_w$ increases, there is a greater potential for water quality to be degraded through runoff and leaching. $S_w$ will be used to evaluate potential for bioaccumulation in aquatic species (see Octanol-Water Partition Coefficient ($K_{ow}$).

**Soil Mobility**. Service personnel will record available values for soil adsorption coefficient ($K_{oc}$ [μg/g]), which provides a measure of a chemical's mobility and leaching potential in soil. $K_{oc}$ values are directly proportional to organic content, clay content, and surface area of the soil. $K_{oc}$ data for a pesticide may be available for a variety of soil types (e.g., clay, loam, sand). $K_{oc}$ values will be used in evaluating the potential to degrade groundwater by leaching (see Potential to Move to Groundwater).

**Soil Persistence**. Service personnel will record values for soil half-life ($t_{1/2}$), which represents the length of time (days) required for 50% of the deposited pesticide to degrade (completely or partially) in the soil. Based upon the $t_{1/2}$ value, soil persistence would be categorized as one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days (Kerle et. al. 1996). Along with $K_{oc}$, soil $t_{1/2}$ values will be used in evaluating the potential to degrade groundwater by leaching (see Potential to Move to Groundwater).

The following threshold has been established for approving PUPs:

> Where soil $t_{1/2}$ is $\leq$100 days, a PUP will be approved without additional BMPs to protect water quality.
>
> Where soil $t_{1/2}$ is>100 days, a PUP will only be approved with additional BMPs implemented specifically to protect water quality.

When BMPs are required to protect water quality, one or more of the following measures will be included in the Specific Best Management Practices (BMPs) section of the Chemical Profile and will be implemented during the application of the specific pesticide to minimize potential surface runoff and leaching that can degrade water quality:

- Do not exceed one application per site per year.
- Do not use on coarse-textured soils where the groundwater table is <10 feet and average annual precipitation >12 inches.
- Do not use on steep slopes if substantial rainfall is expected within 24 hours or the ground is already saturated.

**Soil Dissipation**. Dissipation time ($DT_{50}$) represents the time required for 50% of the deposited pesticide to degrade and move from a treated site; whereas, soil $t_{½}$ describes the rate for degradation only. As for $t_{½}$, units of dissipation time are usually expressed in days. Field dissipation time will be the preferred data for use to estimate pesticide concentrations in the environment, because it is based upon field studies as compared to soil $t_{½}$, which is derived in a laboratory. However, soil $t_{½}$ is the most common persistence data available in the published literature. If field dissipation data is not available, soil $t_{½}$ data will be used in a Chemical Profile. The average or representative half-life value of the most important degradation mechanism will be selected for quantitative analysis for both terrestrial and aquatic environments. Along with $K_{oc}$, soil $DT_{50}$ values (preferred over soil $t_{½}$) will be used in evaluating the potential to degrade groundwater by leaching (see Potential to Move to Groundwater), if available.

Based upon the $DT_{50}$ value, environmental persistence in the soil will also be categorized as one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days.

The following threshold has been established for approving PUPs:

> Where soil $DT_{50}$ is ≤100 days, a PUP will be approved without additional BMPs to protect water quality.
>
> Where soil $DT_{50}$ is >100 days, a PUP will only be approved with additional BMPs implemented specifically to protect water quality.

When BMPs are required to protect water quality, one or more of the following measures will be included in the Specific Best Management Practices section of the Chemical Profile and will be implemented during the application of the specific pesticide to minimize potential surface runoff and leaching that can degrade water quality:

- Do not exceed one application per site per year.
- Do not use on coarse-textured soils where the ground water table is <10 feet and average annual precipitation >12 inches.
- Do not use on steep slopes if substantial rainfall is expected within 24 hours or the ground is already saturated.

**Aquatic Persistence.** Service personnel will record values for aquatic $t_{½}$, which represents the length of time required for 50% of the deposited pesticide to degrade (completely or partially) in water. Based upon the $t_{½}$ value, aquatic persistence would be categorized as one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days (Kerle et al. 1996).

The following threshold has been established for approving PUPs:

> Where aquatic $t_{½}$ is ≤100 days, a PUP will be approved without additional BMPs to protect water quality.
>
> Where aquatic $t_{½}$ is >100 days, a PUP will only be approved with additional BMPs implemented specifically to protect water quality.

When BMPs are required to protect water quality, one or more of the following measures will be included in the Specific Best Management Practices section of the Chemical Profile and will be implemented during the application of the specific pesticide to minimize potential surface runoff and leaching that can degrade water quality:

- Do not exceed one application per site per year.
- Do not use on coarse-textured soils where the ground water table is <10 feet and average annual precipitation >12 inches.
- Do not use on steep slopes if substantial rainfall is expected within 24 hours or the ground is already saturated.

**Aquatic Dissipation**. Dissipation time ($DT_{50}$) represents the time required for 50% of the deposited pesticide to degrade or move (dissipate); whereas, aquatic $t_{½}$ describes the rate for degradation only. As for $t_{½}$, units of dissipation time are usually expressed in days. Based upon the $DT_{50}$ value, environmental persistence in aquatic habitats also would be categorized as one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days.

The following threshold has been established for approving PUPs:

> Where aquatic $DT_{50}$ is ≤100 days, a PUP will be approved without additional BMPs to protect water quality.
>
> Where aquatic $DT_{50}$ is >100 days, a PUP will only be approved with additional BMPs implemented specifically to protect water quality.

When BMPs are required to protect water quality, one or more of the following measures will be included in the Specific Best Management Practices section of the Chemical Profile and will be implemented during the application of the specific pesticide to minimize potential surface runoff and leaching that can degrade water quality:

- Do not exceed one application per site per year.
- Do not use on coarse-textured soils where the ground water table is <10 feet and average annual precipitation >12 inches.
- Do not use on steep slopes if substantial rainfall is expected within 24 hours or the ground is already saturated.

**Potential to Move to Groundwater**. The Groundwater Ubiquity Score (GUS) = $\log_{10}$(soil $t_{½}$) x [4 – $\log_{10}(K_{oc})$]. If a $DT_{50}$ value is available, it will be used rather than a $t_{½}$ value to calculate a GUS score. Based upon the GUS value, the potential to move toward groundwater will be recorded as one of the following categories: extremely low potential<1.0, low - 1.0 to 2.0, moderate - 2.0 to 3.0, high - 3.0 to 4.0, or very high>4.0.

The following threshold has been established for approving PUPs:

> Where GUS is ≤4.0, a PUP will be approved without additional BMPs to protect water quality.
>
> Where GUS is>4.0, a PUP will only be approved with additional BMPs implemented specifically to protect water quality.

When BMPs are required to protect water quality, one or more of the following measures will be included in the Specific Best Management Practices section of the Chemical Profile and will be implemented during the application of the specific pesticide to minimize potential surface runoff and leaching that can degrade water quality:

- Do not exceed one application per site per year.
- Do not use on coarse-textured soils where the ground water table is <10 feet and average annual precipitation >12 inches.
- Do not use on steep slopes if substantial rainfall is expected within 24 hours or the ground is already saturated.

**Volatilization**. Pesticides may volatilize (evaporate) from soil and plant surfaces and move off-target into the atmosphere. In general, pesticides with I<10 would have low potential to volatilize; whereas, pesticides with I >1,000 would have a high potential to volatilize (Oregon State University 1996). Vapor pressure values for pesticides are usually available in the pesticide product MSDS or the USDA Agricultural Research Service (ARS) pesticide database (see References provided at the end of Section 7.6).

The following threshold has been established for approving PUPs:

> Where I is ≤1000, a PUP will be approved without additional BMPs to minimize drift and protect air quality.
>
> Where I is >1000, a PUP will only be approved with additional BMPs implemented specifically to minimize drift and protect air quality.

When BMPs are required to protect air quality, one or more of the following measures will be included in the Specific Best Management Practices section of the Chemical Profile and will be implemented during the application of the specific pesticide to reduce volatilization and drift:

- Do not treat when wind velocities are <2 or >10 mph with existing or potential inversion conditions.
- Apply the largest-diameter droplets possible for spray treatments.
- Avoid spraying when air temperatures >85°F.
- Use the lowest spray height possible above target canopy.
- Where identified on the pesticide label, soil incorporate the pesticide as soon as possible during or after application.

**Octanol-Water Partition Coefficient ($K_{ow}$)**. The octanol-water partition coefficient ($K_{ow}$) is the concentration of a pesticide in octanol and water at equilibrium at a specific temperature. Because octanol is an organic solvent, it is considered a surrogate for natural organic matter. Therefore, $K_{ow}$ will be used to assess the potential for a pesticide to bioaccumulate in tissues of aquatic species (e.g., fish). If $K_{ow}$ >1000 or $S_w$<1 mg/L and soil $t_{½}$>30 days, then there is a high potential for a pesticide to bioaccumulate in aquatic species such as fish (U.S. Geological Survey 2000).

'The following threshold has been established for approving PUPs:

> If there is not a high potential for a pesticide to bioaccumulate in aquatic species, then the PUP would be approved.
>
> If there is a high potential to bioaccumulate in aquatic species ($K_{ow}$>1000 or $S_w$<1 mg/L and soil $t_{½}$>30 days), then the PUP would not approved, except under unusual circumstances where approval would only be granted by the Washington Office.

**Bioaccumulation/Bioconcentration**. This is the physiological process whereby pesticide concentrations in tissue would increase in biota because they are taken and stored at a faster rate than they are metabolized or excreted. The potential for bioaccumulation will be evaluated through bioaccumulation factors (BAFs) or bioconcentration factors (BCFs). Based upon BAF or BCF values, the potential to bioaccumulate will be recorded as one of the following: low – 0 to 300, moderate – 300 to 1000, or high >1000 (Calabrese and Baldwin 1993).

The following threshold has been established for approving PUPs:

> If BAF or BCF is ≤1000, then a PUP would be approved without additional BMPs.
>
> If BAF or BCF is >1000, then a PUP would not approved, except under unusual circumstances where approval would only be granted by the Washington Office.

**Worst-Case Ecological Risk Assessment**

**Max Application Rates (acid equivalent)**. Service personnel will record the highest application rate of an active ingredient (ae basis) for habitat management and facilities maintenance treatments in this data field of a Chemical Profile. These rates can be found in Table CP.1 of Attachment A under the column heading "Max Product Rate – Single Application (lbs/acre – AI on acid equiv basis)." This table is to be filled out prior to completing the Chemical Profile to provide the basic information needed to complete the Chemical Profile. The information included on this table can be found on the product labels for trade name products identified in PUPs. If these data are not available in pesticide labels, then write "NS" for "not specified on label" in this table.

**EECs**. EECs represent potential exposure of fish and wildlife (birds and mammals) to a pesticide applied on the Refuge. EECs would be derived by Service personnel using an USEPA screening-level approach (USEPA 2004). For each max application rate (see description under Max Application Rates [acid equivalent]), Service personnel will record two EEC values in a Chemical Profile; these will represent the worst-case terrestrial and aquatic exposures for habitat management and facilities maintenance treatments. For terrestrial and aquatic EEC calculations, see description for data entry under Presumption of Unacceptable Risk/Risk Quotients, which is the next field for a Chemical Profile.

**Presumption of Unacceptable Risk/Risk Quotients**. Service personnel will calculate and record acute and chronic risk quotients (RQs) for birds, mammals, and fish using the provided tabular formats for habitat management and/or facilities maintenance treatments. RQs recorded in a Chemical Profile will represent the worst-case assessment for ecological risk. See Section 7.2 for discussion regarding the calculations of RQs.
For aquatic assessments associated with habitat management treatments, RQ calculations will be based upon selected acute and chronic toxicological endpoints for fish and the EEC

will be derived from Urban and Cook (1986) assuming 100% overspray to an entire 1-foot deep water body using the max application rate (ae basis).

For aquatic assessments associated with facilities maintenance treatments, RQ calculations will be calculated by Service personnel based upon selected acute and chronic toxicological endpoints for fish and an EEC will be derived from the aquatic assessment in AgDRIFT® model version 2.01 under Tier I ground-based application with the following input variables: max application rate (acid basis), low boom (20 inches), fine to medium/coarse droplet size, 20 swaths, EPA-defined wetland, and 25-foot distance (buffer) from treated area to water. See the section entitled "Aquatic Exposure" for more details regarding the calculation of EECs for aquatic habitats for habitat management and facilities maintenance treatments.

For terrestrial avian and mammalian assessments, RQ calculations will be calculated by Service personnel based upon dietary exposure, where the "short grass" food item category will represent the worst-case scenario. For terrestrial spray applications associated with habitat management and facilities maintenance treatments, exposure (EECs and RQs) will be determined using the Kanaga nomogram method through the USEPA's Terrestrial Residue Exposure model (T-REX) version 1.2.3. T-REX input variables will include the following: max application rate (acid basis) and pesticide half-life (days) in soil to estimate the initial, maximum pesticide residue concentration on food items for terrestrial vertebrate species in short (<20 cm tall) grass.

For granular pesticide formulations and pesticide-treated seed with a unique route of exposure for terrestrial avian and mammalian wildlife, see the section entitled "Terrestrial Exposure" for the procedure that would be used to calculate RQs.

All calculated RQs in both tables would be compared with LOCs established by USEPA (see Table 2 in Section 7.2). If a calculated RQ exceeds an established LOC value (in brackets inside the table), then there would be a potential for an acute or chronic effect (unacceptable risk) to federally listed (T&E) species and non-listed species. See Section 7.2 for detailed descriptions of acute and chronic RQ calculations and comparison to LOCs to assess risk.

The following threshold has been established for approving PUPs:

> If RQs is ≤LOCs, then a PUP would be approved without additional BMPs.
>
> If RQs is >LOCs, then a PUP would only be approved with additional BMPs implemented specifically to minimize exposure (ecological risk) to bird, mammal, and/or fish species.

When BMPs are required to reduce the potential risk to listed or non-listed species, one or more of the following measures will be included in the Specific Best Management Practices section of the Chemical Profile:

- The application rate will be lowered and/or fewer number of applications will be conducted so RQs≤LOCs.
- For aquatic assessments (fish) associated with facilities maintenance, the buffer distance will be increased beyond 25 feet so RQs≤LOCs.

**Justification for Use**. Service personnel will describe the reason(s) for using the pesticide to control specific pests or groups of pests. In most cases, the pesticide label provides the appropriate information regarding control of pests, which can be included in the section.

**Specific Best Management Practices (BMPs)**. Service personnel will record specific BMPs necessary to minimize or eliminate potential effects to non-target species and/or to minimize or eliminate degradation of environmental quality related to drift, surface runoff, or leaching. These BMPs will be based upon scientific information documented in previous data fields of a Chemical Profile. Where necessary and feasible, these specific practices will be included in PUPs as a basis for approval.

If there are no specific BMPs that are appropriate, Service personnel will describe why the potential effects to refuge resources and/or degradation of environmental quality is outweighed by the overall resource benefit(s) from the proposed pesticide use in the BMP section of the PUP. See Section 4.0 of this document for a complete list of BMPs associated with mixing and applying pesticides appropriate for all PUPs with ground-based treatments that would be additive to any necessary, chemical-specific BMPs.

**References.** Service personnel will record scientific resources used to provide data/information for a Chemical Profile. Use the number sequence to uniquely reference data in a chemical profile.

The following online data resources are readily available for toxicological endpoint and environmental fate data for pesticides:

1. California Product/Label Database. Department of Pesticide Regulation, California Environmental Protection Agency. (http://www.cdpr.ca.gov/docs/label/labelque.htm#regprods)

2. ECOTOX database. Office of Pesticide Programs, U.S. Environmental Protection Agency, Washington, DC. (http://cfpub.epa.gov/ecotox/)

3. Extension Toxicology Network (EXTOXNET) Pesticide Information Profiles. Cooperative effort of University of California-Davis, Oregon State University, Michigan State University, Cornell University and University of Idaho through Oregon State University, Corvallis, Oregon. (http://extoxnet.orst.edu/pips/ghindex.html)

4. Human health and ecological risk assessments. Pesticide Management and Coordination, Forest Health Protection, U.S. Department of Agriculture, U.S. Forest Service. (http://www.fs.fed.us/foresthealth/pesticide/risk.shtml)

5. Pesticide Chemical Fact Sheets. Clemson University Pesticide Information Center. (http://www.clemson.edu/extension/pest_ed/safety_ed_prog/label_msds/factshee.html)

6. Pesticide Fact Sheets. National Pesticide Information Center. (http://npic.orst.edu/npicfact.htm)

7. Pesticide and Policy, Environmental Database. U.S. Environmental Protection Agency, Washington, DC. (http://www.epa.gov/opp00001/science/efed_databasesdescription.htm).

8. Pesticide product labels and material safety data sheets. Crop Data Management Systems, Inc. (CDMS) (http://www.cdms.net/pfa/LUpdateMsg.asp) or multiple websites maintained by agrichemical companies.

9. Registered Pesticide Products (Oregon database). Oregon Department of Agriculture. (http://oregon.gov/ODA/PEST/registration_index.shtml)

10. Regulatory notes. Pest Management Regulatory Agency, Health Canada, Ontario, Canada. (http://www.hc-sc.gc.ca/pmra-arla/)

11. Reptile and Amphibian Toxicology Literature. Canadian Wildlife Service, Environment Canada, Ontario, Canada. (http://publications.gc.ca/collections/Collection/CW69-5-357E.pdf)

12. Fact Sheet on New Active Ingredients. U.S. Environmental Protection Agency, Washington, DC. (http://www.epa.gov/opprd001/factsheets/)

13. Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas. The Invasive Species Initiative. The Nature Conservancy. (http://tnsweeds.ucdavis.edu/handbook.html)

14. Wildlife Contaminants Online. U.S. Geological Survey, Department of Interior, Washington, D.C. (http://www.pwrc.usgs.gov/contaminants-online/)

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## Attachment A - Blank Chemical Profile Form

| | | | |
|---|---|---|---|
| **Date:** | | | |
| **Trade Name(s):** | | **Common Chemical Name(s):** | |
| **Pesticide Type:** | | **EPA Registration Number:** | |
| **Pesticide Class:** | | **CAS Number:** | |
| **Other Ingredients:** | | | |

**Toxicological Endpoints**

| | |
|---|---|
| **Mammalian $LD_{50}$:** | |
| **Mammalian $LC_{50}$:** | |
| **Mammalian Reproduction:** | |
| **Avian $LD_{50}$:** | |
| **Avian $LC_{50}$:** | |
| **Avian Reproduction:** | |
| **Fish $LC_{50}$:** | |
| **Fish ELS/Life Cycle:** | |
| **Other:** | |

**Ecological Incident Reports**

| |
|---|
| |

**Environmental Fate**

| | |
|---|---|
| **Water solubility ($S_w$):** | |
| **Soil Mobility ($K_{oc}$):** | |
| **Soil Persistence ($t_{½}$):** | |
| **Soil Dissipation ($DT_{50}$):** | |
| **Aquatic Persistence ($t_{½}$):** | |
| **Aquatic Dissipation ($DT_{50}$):** | |
| **Potential to Move to Groundwater (GUS score):** | |
| **Volatilization (mm Hg):** | |
| **Octanol-Water Partition Coefficient ($K_{ow}$):** | |
| **Bioaccumulation/Biocentration:** | **BAF:**<br>**BCF:** |

**Worst Case Ecological Risk Assessment**

| | |
|---|---|
| **Max Application Rate (ai lbs/acre – ae basis)** | **Habitat Management:**<br>**Croplands/Facilities Maintenance:** |
| **EECs** | **Terrestrial (Habitat Management):**<br>**Terrestrial (Croplands/Facilities Maintenance):**<br>**Aquatic (Habitat Management):**<br>**Aquatic (Croplands/Facilities Maintenance):** |

Habitat Management Treatments:

| Presumption of Unacceptable Risk | | Risk Quotient (RQ) | |
|---|---|---|---|
| | | Listed (T&E) Species | Nonlisted Species |
| Acute | Birds | [0.1] | [0.5] |
| | Mammals | [0.1] | [0.5] |
| | Fish | [0.05] | [0.5] |
| Chronic | Birds | [1] | [1] |
| | Mammals | [1] | [1] |
| | Fish | [1] | [1] |

Cropland/Facilities Maintenance Treatments:

| Presumption of Unacceptable Risk | | Risk Quotient (RQ) | |
|---|---|---|---|
| | | Listed (T&E) Species | Nonlisted Species |
| Acute | Birds | [0.1] | [0.5] |
| | Mammals | [0.1] | [0.5] |
| | Fish | [0.05] | [0.5] |
| Chronic | Birds | [1] | [1] |
| | Mammals | [1] | [1] |
| | Fish | [1] | [1] |

| | |
|---|---|
| **Justification for Use:** | |
| **Specific Best Management Practices (BMPs):** | |
| **References:** | |

## Attachment A (continued)

| Table CP.1<br>(Accompanies the Chemical Profile)<br>Pesticide Name | | | | | | |
|---|---|---|---|---|---|---|
| **Trade Name[a]** | **Treatment Type[b]** | **Max Product Rate – Single Application (lbs/acre or gal/acre)** | **Max Product Rate -Single Application (lbs/acre - AI on acid equiv basis)** | **Max Number of Applications Per Season** | **Max Product Rate Per Season (lbs/acre/season or gal/acre/season)** | **Minimum Time Between Applications (Days)** |
| | | | | | | |

[a] From each label for a pesticide identified in pesticide use proposals (PUPs), Service personnel would record application information associated with possible/known uses on Service lands.

[b] Treatment type: H – habitat management or CF – cropland/facilities maintenance. If a pesticide is labeled for both types of treatments (uses), then record separate data for H and CF applications.

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# Attachment B - Completed Chemical Profiles for the Seal Beach NWR

**B-1 Aquamaster, AquaNeat, and Rodeo Chemical Profile (Glyphosate)**

**B-2 Oryzalin Chemical Profile**

**B-3 Imazapyr Formulations Chemical Profile**

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## B-1 Aquamaster, AquaNeat, and Rodeo Chemical Profile (Glyphosate)

| | | | |
|---|---|---|---|
| **Date:** | 9/21/11 | | |
| **Trade Name(s):** | Aquamaster<br>AquaNeat<br>Rodeo | **Common Chemical Name(s):** | glyphosate |
| **Pesticide Type:** | Herbicide<br>Group 9 | **EPA Registration Number:** | 9468-33<br>524-343<br>62719-324 |
| **Pesticide Class:** | EPSP synthase inhibitor | **CAS Number:** | 1071-83-6 |
| **Other Ingredients:** | **Aquamaster:** 46.2% water (1a). **AquaNeat:** Other ingredients (46.2%) not listed and no regulatory advisories listed in MSDS (1b). **Rodeo:** Other ingredients (46.2%) not listed and no regulatory advisories listed in MSDS (1c). | | |

**Toxicological Endpoints**

| | |
|---|---|
| **Mammalian $LD_{50}$:** | **Tech:** Oral, Rat: =5600 mg/kg (2); >5000 mg/kg (8); >4320 mg/kg (5). Mice: >10,000 mg/kg (2); =1760 mg/kg (12). Rabbit: >10,000 mg/kg (2). Goat: >10,000 mg/kg (2). **Aquamaster:** Oral: Rat, >5000 mg/kg (1,6); Mouse, >5000 mg/kg (1a). **Rodeo:** Oral, Rat, >5000 mg/kg (6). |
| **Mammalian $LC_{50}$:** | No information in references. |
| **Mammalian Reproduction:** | **Tech:** Rat: 3-generation NOEL >=30mg/kg/day (diet); focal tubular dilation only effect and considered spurious rather than glyphosate-related effect by EPA as it was not observed in 2-generation study using higher doses (5); 2-generation NOEL=30000 ppm (6), =1500 mg/kg/day (5). **Aquamaster :** Oral, Rat: 3-generation NOAEL >30 mg/kg (1a). |
| **Avian $LD_{50}$:** | **Tech:** Bobwhite: >3851 mg/kg (3,7,9), >2000 mg/kg (5,9). Chicken: >2500 mg/kg (7). **Aquamaster:** Bobwhite >3851 mg/kg (1a,6). **Rodeo:** Bobwhite >2000 mg/kg (6). |
| **Avian $LC_{50}$:** | **Tech:** Bobwhite: >4640 ppm (3,4,5,7,9); >4500 ppm (3); >5200 ppm (9). Mallard: >4640 ppm (3,5,7,9); >4500 ppm (3); >5200 ppm (9). **Aquamaster:** Bobwhite: >4640 ppm (1,6). Mallard: >4640 ppm (1a,6). |
| **Avian Reproduction:** | **Tech:** Bobwhite: (17 wk) LOEL>1000 ppm (3,5), NOEL >1000 ppm (3,5,7); Mallard: (1 gen) LOEL >30 ppm, NOEL >30 ppm (3,5); Mallard: (17 wk) LOEL >1000 ppm (3,5), NOEL >1000 ppm (3,5,7). **Aquamaster:** Bobwhite: (17 wk) NOEC >1000mg/kg (1a,6). Mallard: 16-wk NOEC >1000 mg/kg (1a). |
| **Fish $LC_{50}$:** | **Tech:** 96 hr: Bluegill: =120 ppm (3,5), NOEL = 100 ppm (3); =140 ppm (3,5); =120 ppm (4,5); <24 ppm (5); =2.4 – 240 ppm (8); =5.8-34 ppm (7); =20.7 ppm (11). Channel catfish: =130 ppm (3,5); =3.3 – 130 ppm (8); =39 ppm (7); =10.3 ppm (11). Fathead minnow: =97 ppm (3,5); =84.9 ppm (5); =2.3-97 ppm (8). Rainbow: =86 ppm (3,4,5), NOEL = 42 ppm (3); =140 ppm (3,5); =1.4-240 ppm (8); =8.2-26 ppm (7); =59.2 ppm (11); =38 ppm (12). Carp: =3.1-620 ppm (8); =19.0 ppm (7). Coho: =1.3-210 ppm (8); =22 ppm (7). Fathead minnow: =2.3-97 ppm (8); =23 ppm (7); =84.9 ppm (5); =97 ppm (5); 26.9 ppm (11). Brown |

| | |
|---|---|
| | trout: =4.5-5.4 ppm (8); =5.4 ppm (11). **Aquamaster:** Bluegill: >1000 ppm (1a,5,6). Rainbow: >1000 ppm (1a,5,6). **Rodeo:** Rainbow: =60 ppm (1c); =1100 ppm (6); $TL_{50}$ >1000 ppm (6). Carp: $TL_{50}$>10,000 ppm (6). Bluegill: $TL_{50}$ >1000 ppm (6). |
| **Fish ELS/Life Cycle:** | **Tech:** Rainbow: chronic 21-day NOEC =25 ppm (12). Fathead minnow: (ErlyLf), LOEL > 25.7 ppm (5), NOEL > 25.7 ppm (3,5). |
| **Other:** | **Tech:** 48 hr $EC_{50}$: *Daphnia:* = 780 ppm (3,5), NOEL = 560 ppm (3); =13-37 ppm (7); =5.3 – 96 ppm (8); =40 ppm (12). ErlyLf (21 da), =96 ppm (3,5), NOEL = 50 ppm (3,5); chronic 21-day NOEC =30 ppm (12). Duckweed: =21.5 ppm (5); $EC_{50}$ biomass =12 ppm (12). Green algae: =12.5 ppm (5). American toad: $LC_{50}$=2.52 ppm (8); LOEC=5.0 ppm (8), NOEC=1.0 ppm (8). Bullfrog: $LC_{50}$=2.07 ppm (8); LOEC=5.0 ppm (8), NOEC=1.0 ppm (8). Leopard frog: $LC_{50}$=2.46 ppm (8); LOEC=5.0 ppm (8), NOEC=1.0 ppm (8). Earthworm: acute 14-day LC50 >480 mg/kg (12); chronic 14-day NOEC >28.8 mg/kg (12). Honeybee: oral $LD_{50}$ =100 ug/bee (12). **Aquamaster:** *Daphnia*: $LC_{50}$ =930 ppm (1a,6). **Rodeo:** *Daphnia*, $LC_{50}$=218 ppm (6). |

**Ecological Incident Reports**

| |
|---|
| No reports in references. |

**Environmental Fate**

| | |
|---|---|
| **Water solubility ($S_w$):** | =900,000 ppm (4); =12,000 ppm (2); =10,500 mg/l (12). |
| **Soil Mobility ($K_{oc}$):** | Tech: =884-60,000 ml/g (1a); =21,699 ml/g (12). |
| **Soil Persistence ($t_{½}$):** | Soil photolysis = stable (5). Aerobic soil metabolism ½ life =2.1 days (5); =12 days (12). Degraded primarily by microbial activity (4). |
| **Soil Dissipation ($DT_{50}$):** | =2-174 days (1a), average =47 days (4). Field dissipation ½ life (vegetation) =10.4 to 26.6 days (4). |
| **Aquatic Persistence ($t_{½}$):** | Hydrolysis = stable @ pH 3, 6 & 9 (5,12). Aqueous photolysis = stable @ pH 5, 7 & 9 (5); =69 days @ pH 7 (12). Anaerobic aquatic metabolism ½ life = 8.1 days (7). |
| **Aquatic Dissipation ($DT_{50}$):** | Aquatic field dissipation = 7.5-120 days (5). Water-sediment $DT_{50}$ =87 days (12). Water phase only $DT_{50}$ =2.5 days (12). |
| **Potential to Move to Groundwater (GUS score):** | =-0.36 (12). |
| **Volatilization (mm Hg):** | $=9.83\times10^{-08}$ (12). |
| **Octanol-Water Partition Coefficient ($K_{ow}$):** | $=6.31\times10^{-4}$ (12). |
| **Bioaccumulation/Biocentration:** | **BAF:** Low – calculated (12)<br>**BCF:** =0.5 (low potential) (12) |

**Worst Case Ecological Risk Assessment**

| | |
|---|---|
| **Max Application Rate (ai lbs/acre – ae basis)** | **Habitat Management:** 2 lbs. a.e./acre<br>**Croplands/Facilities Maintenance:** 2 lbs. a.e./acre |
| **EECs** | **Terrestrial (Habitat Management):** 480 ppm<br>**Terrestrial (Croplands/Facilities Maintenance):** 480 ppm<br>**Aquatic (Habitat Management):** 0.736 ppm<br>**Aquatic (Croplands/Facilities Maintenance):** 0.00671 ppm |

Habitat Management Treatments:

| **Presumption of Unacceptable Risk** | | **Risk Quotient (RQ)** | |
|---|---|---|---|
| | | **Listed (T&E) Species** | **Nonlisted Species** |
| Acute | Birds | =0.11 [0.1] | =0.11 [0.5] |
| | Mammals | =0.05 [0.1] | =0.05 [0.5] |
| | Fish | =0.01 [0.05] | =0.01 [0.5] |
| Chronic | Birds | =0.48 [1] | =0.48 [1] |
| | Mammals | =0.02 [1] | =0.02 [1] |
| | Fish | =0.03 [1] | =0.03 [1] |

Cropland/Facilities Maintenance Treatments:

| **Presumption of Unacceptable Risk** | | **Risk Quotient (RQ)** | |
|---|---|---|---|
| | | **Listed (T&E) Species** | **Nonlisted Species** |
| Acute | Birds | =0.11 [0.1] | =0.11 [0.5] |
| | Mammals | =0.05 [0.1] | =0.05 [0.5] |
| | Fish | <0.01 [0.05] | <0.01 [0.5] |
| Chronic | Birds | =0.48 [1] | =0.48 [1] |
| | Mammals | =0.02 [1] | =0.02 [1] |
| | Fish | <0.01 [1] | <0.01 [1] |

| | |
|---|---|
| **Justification for Use:** | Efficacious non-selective annual, biannual and perennial broadleaf and grass weed control. |
| **Specific Best Management Practices (BMPs):** | Use surfactants classified as slight acute toxicity or practically non-toxic (>10 ppm) to aquatic organisms. Practically non-toxic and slight acute toxicity surfactants include LI-700, AgriDex, Activate Plus, Big Sur 90, Sil Energy, Dyne-Amic, Freeway, Cygnet Plus, Sun-Wet, Hasten Modified Vegetable Oil, Kinetic or Class Act Next Generation. |
| **References:** | [1a] ___. 2001. Aquamaster MSDS. Monsanto Co., 800 N. Lindbergh Blvd. St. Louis, MO. 8 pp.<br>[1b] ___. 2001. AquaNeat MSDS. Monsanto Co., 800 N. Lindbergh Blvd. St. Louis, MO. 8 pp.<br>[1c] ___. 2000. Rodeo MSDS. Dow AgroSciences, 9330 Zionsville Road, Indianapolis, IN. 3 pp.<br>[2] ___. 1996. Glyphosate. Extension toxicology network (EXTOXNET) Pesticide information profiles. Oregon State University, Corvallis, OR. 4 pp.<br>[3] ___. 2000. USEPA one-liner database.<br>[4] Tu, et. al. 2001. Glyphosate. Weed control methods handbook. The Nature Conservancy. 10 pp. |

[5] Special Review and Reregistration Division. 1993. Reregistration eligibility decision – glyphosate. Office of Pesticide Programs, U.S. Environmental Protection Agency, Washington, D.C. 75 pp.
[6] ____. 1999. Glyphosate – human health and ecological risk assessment final report. Prepared for USDA-Forest Service by Syracuse Environmental Research Associates, Inc. Fayetteville, NY to USDA-APHIS, Biotechnology, Biologics and Environmental Protection, Environmental Analysis and Documentation, Riverdale, MD. __ pp.
[7] _____. 2001. FAO specifications and evaluations for plant protection products – Glyphosate. Food and Agriculture Organization, United Nations, New York, NY. 33 pp.
[8] Office of Pesticide Programs. 2000. ECOTOX: aquatic report. Pesticide Ecotoxicity Database, Environmental Fate and Effects Division, U.S. Environmental Protection Agency, Washington, D.C.
[9] Office of Pesticide Programs. 2000. ECOTOX: terrestrial report. Pesticide Ecotoxicity Database, Environmental Fate and Effects Division, U.S. Environmental Protection Agency, Washington, D.C.
[10] Office of Pesticide Programs. 2000. Active ingredient fate studies: glyphosate. Pesticide Fate Database, Environmental Fate and Effects Division, U.S. Environmental Protection Agency, Washington, D.C.
[11] Kegley, et. al. 2000-09. PAN pesticide database. Pesticide Action Network, San Francisco, CA.
[12] _____. 2009. Pesticide properties database. Agricultural & Environmental Research Unit, Science and Technology Research Institute, University of Hertfordshire, Hatfield, UK.

| Table CP.1 - Pesticide Name<br>Active Ingredient = glyphosate | | | | | | |
|---|---|---|---|---|---|---|
| Trade Name[a] | Treatment Type[b, c] | Max Product Rate – Single Application (lbs/acre or gal/acre) | Max Product Rate – Single Application (lbs/acre – AI on acid equiv basis) | Max Number of Applications Per Season | Max Product Rate Per Season (lbs/acre/season or gal/acre/season) | Minimum Time Between Applications (Days) |
| Aquamaster | H | 0.5 gal/acre | 2.0 | 1 | 0.5 gal/acre/year | 0 |
| AquaNeat | H | 0.5 gal/acre | 2.0 | 1 | 0.5 gal/acre/year | 0 |
| Rodeo | H | 0.5 gal/acre | 2.0 | 1 | 0.5 gal/acre/year | 0 |

[a]From each label for a pesticide identified in pesticide use proposals (PUPs), Service personnel would record application information associated with possible/known uses on Service lands.

[b]Treatment type: H – habitat management or CF – cropland/facilities maintenance. If a pesticide is labeled for both types of treatments (uses), then record separate data for H and CF applications.

[c]Treatment type is for ecological risk assessment purposes only. The product label will determine whether or not the treatment type is permissible under Section 3 of the Federal Insecticide, Fungicide and Rodenticide Act.

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## B-2 Oryzalin Chemical Profile

| | | | |
|---|---|---|---|
| **Date:** | 6/8/11 | | |
| **Trade Name(s):** | Surflan AS<br>Surflan WDG | **Common Chemical Name(s):** | oryzalin |
| **Pesticide Type:** | Herbicide/Grp 3 | **EPA Registration Number:** | 70506-44<br>70506-50 |
| **Pesticide Class:** | dinitroaniline | **CAS Number:** | 19044-88-3 |
| **Other Ingredients:** | **Surflan AS:** <40% by wt. glycerin, <40% by wt. propylene glycol (1).<br>**Surflan WDG:** 15% by wt. kaolin (2). | | |

**Toxicological Endpoints**

| | |
|---|---|
| **Mammalian $LD_{50}$:** | Rats: >5000 mg/kg (1,2,3,7). Mice: >5000 mg/kg (3). Dog: >1000 mg/kg (3). Chicken: >1000 mg/kg (3). |
| **Mammalian $LC_{50}$:** | Dietary NOEL >300 ppm (7). |
| **Mammalian Reproduction:** | No adverse effects on reproduction in a three-generation study fed dietary concentrations up to 112.5 mg/kg/day (3,9). |
| **Avian $LD_{50}$:** | Bobwhite: =1046 mg/kg (1,2); >500 mg/kg (3); =506.7 mg/kg (4,9). Mallard: >500 mg/kg (3); =427 mg/kg (7). Chicken: =1000 mg/kg (3). |
| **Avian $LC_{50}$:** | Bobwhite: >5000 ppm (3,4,9,10). Mallard: >5000 ppm (3,4,9,10). |
| **Avian Reproduction:** | Bobwhite: LOEL =1000 ppm (10), NOEL =1000 (10). Mallard: LOEL =1000 ppm (10), NOEL =1000 ppm (9,10). |
| **Fish $LC_{50}$:** | Bluegill: =2.88 ppm (3,5,8,9,10). Rainbow trout: =2.86 ppm (7); =3.26 ppm (3,5,9,10); =3.355 ppm (8); =3.45 ppm (5,10). Goldfish: =1.4 ppm (3). |
| **Fish ELS/Life Cycle:** | Rainbow trout: 21-day chronic NOEC =0.46 ppm (7,9,10). Fathead minnow: MATC =0.22 ppm (9); LOEL =0.43 ppm (10), NOEL =0.22 ppm (10). |
| **Other:** | Water flea: $EC_{50}$ =1.5 ppm (5,10); =1.02 ppm (7); =1.4 ppm (9); 21-day chronic NOEC =0.36 ppm (7). Aquatic sowbug: =0.4 ppm (5); =0.7 ppm (8). Scud: =0.19 ppm (5); =0.495 ppm (8). Red Swamp crayfish: =400-10,000 ppm (5). Midge: 28-day chronic NOEC =1.0 ppm (7). Honeybee: oral >100 ug (1,2); =>11ug (3,9,10); =32 ug/bee (7). Blue-green algae: $EC_{50}$ =0.0181 ppm (7); =0.024 ppm (8,10). Green algae: =0.042 ppm (8,9,10). Duckweed: $EC_{50}$ =0.0154 ppm (5,7,8,9,10). Earthworm: $LC_{50}$ >500 mg/kg (7). |

**Ecological Incident Reports**

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|---|
| No reports in references. |

**Environmental Fate**

| | |
|---|---|
| **Water solubility ($S_w$):** | =1.13 mg/L (7); =3.0 mg/L (8). |
| **Soil Mobility ($K_{oc}$):** | =949 ml/g (7); =807 ml/g (8). |
| **Soil Persistence ($t_{½}$):** | =20 days (3). Soil photolysis =0.933 days (6,9). Aerobic soil metabolism =63 days (6,8,9). Anaerobic soil metabolism =10 days (6,8,9). |
| **Soil Dissipation ($DT_{50}$):** | =20-120 days (3). Aerobic soil degradation =20 days (7). Field dissipation =68 days in sand soil FL (9); biphasic degradation in silty clay loam soil in MI |

| | |
|---|---|
| | 77 days and 146 days, and in loam soil in CA 58 days and 138 days (9). |
| **Aquatic Persistence ($t_{½}$):** | Hydrolysis =Stable @ pH 5-9 (6,9); =28 days (8) =stable (7). Aquatic photolysis =0.0958 days @ pH 5 (6); =0.21 days @ pH 5 (9); =0.08 days (7). |
| **Aquatic Dissipation ($DT_{50}$):** | Water-sediment =32.7 days (7); water phase only =5.9 days (7). |
| **Potential to Move to Groundwater (GUS score):** | =1.33 |
| **Volatilization (mm Hg):** | $=7.5x10^{-07}$ mm Hg (7). |
| **Octanol-Water Partition Coefficient ($K_{ow}$):** | Kow $=5.37x10^{-3}$ (7). |
| **Bioaccumulation/Biocentration:** | **BAF:** Low (7).<br>**BCF:** Edible tissue =37.5; viscera =122; whole body =75.8 (6), =66.1 (7). Bluegill =32.2 edible tissue; =105.7 viscera; =66.1 whole fish (9), >75% depuration within 24 hrs. |

**Worst Case Ecological Risk Assessment**

| | |
|---|---|
| **Max Application Rate (ai lbs/acre – ae basis)** | **Habitat Management:** 2.0 lbs. a.i./acre<br>**Croplands/Facilities Maintenance:** 2.0 lbs. a.i./acre |
| **EECs** | **Terrestrial (Habitat Management):** 480 ppm<br>**Terrestrial (Croplands/Facilities Maintenance):** 480 ppm<br>**Aquatic (Habitat Management):** 0.552 ppm<br>**Aquatic (Croplands/Facilities Maintenance):** 0.00503 ppm |

Habitat Management Treatments:

| **Presumption of Unacceptable Risk** | | **Risk Quotient (RQ)** | |
|---|---|---|---|
| | | **Listed (T&E) Species** | **Nonlisted Species** |
| Acute | Birds | =0.10 [0.1] | =0.10 [0.5] |
| | Mammals | =0.04 [0.1] | =0.04 [0.5] |
| | Fish | =0.39 [0.05] | =0.39 [0.5] |
| Chronic | Birds | =0.48 [1] | =0.48 [1] |
| | Mammals | =0.21 [1] | =0.21 [1] |
| | Fish | =1.20 [1] | =1.20 [1] |

Cropland/Facilities Maintenance Treatments:

| **Presumption of Unacceptable Risk** | | **Risk Quotient (RQ)** | |
|---|---|---|---|
| | | **Listed (T&E) Species** | **Nonlisted Species** |
| Acute | Birds | =0.10 [0.1] | =0.10 [0.5] |
| | Mammals | =0.04 [0.1] | =0.04 [0.5] |
| | Fish | <0.01 [0.05] | <0.01 [0.5] |
| Chronic | Birds | =0.48 [1] | =0.48 [1] |
| | Mammals | =0.21 [1] | =0.21 [1] |
| | Fish | =0.01 [1] | =0.01 [1] |

| | |
|---|---|
| **Justification for Use:** | |
| **Specific Best Management Practices (BMPs):** | 1 application @ 1.5 lbs. a.i./acre/year.<br>Maintain a minimum 25-foot buffer zone between all upland treatment site(s) and the high water mark of the nearest surface water resource(s).<br>Do not apply oryzalin to sites upslope to surface water resources with >10$^{o}$ slope. |
| **References:** | [1]_____. 2005 & 2009, respectively. Surflan AS specimen label & MSDS. United Phosphorus, Inc., King of Prussia, PA. 12 and 8 pp., respectively.<br>[2]_____. 2006 & 2009, respectively. Surflan WDG specimen label & MSDS. United Phosphorus, Inc., King of Prussia, PA. 6 & 8 pp., respectively.<br>[3]_____. 1996. EXTOXNET – Pesticide Information Profile, Oryzalin. Web database maintained by Oregon State Univ., Corvallis, OR.<br>[4]Office of Pesticide Programs. 2000. ECOTOX: terrestrial report, pesticide ecotoxicity database. Environmental Fate and Effects Division, USEPA, Washington, D.C.<br>[5]Office of Pesticide Programs. 2000. ECOTOX: aquatic report, pesticide ecotoxicity database. Environmental Fate and Effects Division, USEPA, Washington, D.C.<br>[6]Office of Pesticide Programs. 2000. Pesticide fate database: active Ingredient fate studies. Environmental Fate and Effects Division, USEPA, Washington, D.C.<br>[7]_____. 2009. Pesticide properties database. Agricultural & Environmental Research Unit, Science and Technology Research Institute, University of Hertfordshire, Hatfield, UK.<br>[8]____. 2000. Pesticide database – oryzalin. Pesticide Action Network, San Francisco, CA.<br>[9]Special Review and Reregistration Division. 1994. Reregistration eligibility decision (RED) – oryzalin EPA 738-R-94-016. Office of Prevention, Pesticides and Toxic Substances, U.S. EPA, Washington, D.C. 223 pp.<br>[10]_____. 2000. U.S. EPA one-liner database. Office of Pesticide Programs, U.S. Environmental Protection Agency, Washington, D.C. |

**Table CP.1**
**Pesticide Name**
**Active Ingredient = oryzalin**

| Trade Name[a] | Treatment Type[b] | Max Product Rate – Single Application (lbs/acre or gal/acre) | Max Product Rate – Single Application (lbs/acre – AI on acid equiv basis) | Max Number of Applications Per Season | Max Product Rate Per Season (lbs/acre/season or gal/acre/season) | Minimum Time Between Applications (Days) |
|---|---|---|---|---|---|---|
| Surflan AS | H | 0.5 gal/acre | 2.0 | 1 | 0.5 gal/acre | 0 |
| Surflan WDG | H | 2.35 lbs/acre | 2.0 | 1 | 2.35 lbs/acre | 0 |

[a]From each label for a pesticide identified in pesticide use proposals (PUPs), Service personnel would record application information associated with possible/known uses on Service lands.

[b]Treatment type: H – habitat management or CF – cropland/facilities maintenance. If a pesticide is labeled for both types of treatments (uses), then record separate data for H and CF applications.

[c]Treatment type is for ecological risk assessment purposes only. The product label will determine whether or not the treatment type is permissible under Section 3 of the Federal Insecticide, Fungicide and Rodenticide Act.

## B-3 Imazapyr Formulations Chemical Profile

| | | | |
|---|---|---|---|
| **Date:** | 6/13/11 | | |
| **Trade Name(s):** | Habitat, Arsenal, Stalker, Ecomazapyr 2 SL | **Common Chemical Name(s):** | imazapyr |
| **Pesticide Type:** | Herbicide Group 9 | **EPA Registration Number:** | 241-426, 241-346, 241-398, 74477-6 |
| **Pesticide Class:** | imidazolinone | **CAS Number:** | 81510-83-0 |
| **Other Ingredients:** | **Habitat:** 71.3% proprietary ingredients (1a). **Arsenal:** 71.3% proprietary ingredients (1b). **Stalker:** 72.4% proprietary ingredients (1c). **Ecomazapyr 2 SL:** 72.2% proprietary ingredients (1d). | | |

**Toxicological Endpoints**

| | |
|---|---|
| **Mammalian $LD_{50}$:** | **Amine Salt:** Rat, oral: >5000 mg/kg (combined sexes) (1a,5,6); >2,000 mg/kg (7). |
| **Mammalian $LC_{50}$:** | Rat, dietary: **Acid:** NOEL=10,000 ppm (7). |
| **Mammalian Reproduction:** | Chronic studies in three mammalian species (dogs, rats, and mice) and several reproduction studies in two mammalian species (rats and rabbits) indicate that imazapyr is not likely to be associated with adverse effects at relatively high dose levels (6). |
| **Avian $LD_{50}$:** | **Acid:** Bobwhite: >2150 mg/kg (2,5,6,8), NOEL=2150 mg/kg (2). Mallard: >2150 mg/kg (2,5,6,7,8), NOEL>2150 mg/kg (2). |
| **Avian $LC_{50}$:** | **Acid:** Bobwhite: >5000 ppm (2,6,8), NOEL>5000 ppm (2). Mallard: >5000 ppm (2,6,8), >5000 ppm (2). **Amine Salt:** Bobwhite: >5000 ppm (2), NOEL=5000 ppm (2). |
| **Avian Reproduction:** | **Acid:** ErlyLf: Bobwhite: LOEL<2000 ppm (2), NOEL=1000 ppm (2); NOEC=2000 ppm (6). Mallard: LOEL>1890 ppm, NOEL=1890 ppm (2); NOEC=2000 ppm (6). |
| **Fish $LC_{50}$:** | **Acid:** Bluegill: >100 ppm (2,5,6,9), NOEL=100 ppm (2); =100 ppm (3); 1000 ppm (3,6); =180 ppm (6); =24 ppm (9); =75 ppm (9). Rainbow: >100 ppm (2,5,6,7,9), NOEL=100 ppm (2); =100 ppm (3); =110 ppm (6); =6.7 ppm (9). Channel catfish: >100 ppm (2,5,6), NOEL=100 ppm (2); =100 ppm (3). **Amine Salt:** Bluegill: >1000 ppm (2), NOEL=1000 ppm (2). |
| **Fish ELS/Life Cycle:** | **Acid:** Rainbow: LOEC=92 ppm (2), NOEC=43.1 ppm (2), investigators reported nearly significant results, but discount the significance of the results due to a lack of correlation to test concentration and lack of corresponding reductions in wet and dry weights (6). Fathead minnow: LOEC>120 ppm (6), NOEC=120 ppm (6); LOEC>118 ppm (6), NOEC>118 ppm (6). |
| **Other:** | **Acid:** *Daphnia*: $EC_{50}$>100 ppm (2,5,6,9), =100 ppm (3,7); LOEC=350 ppm (6), NOEC=180 ppm (6). ErlyLf: LOEC>97.1 (2,6), NOEC>97.1 ppm (2,6). Green algae: $EC_{50}$=71 ppm (2,3,6,9). Bluegreen alage: $EC_{50}$=12.2 ppm (2,3); =11.7 ppm (6). Duckweed: $EC_{50}$=0.024 ppm (2,3,6,7). Honeybee: =25 ug/bee (7). Earthworms: =133 mg/kg (7). **Amine Salt:** *Daphnia*: $EC_{50}$=750 ppm (2,3), NOEL=560 ppm (2); =6.6 ppm (3). |

**Ecological Incident Reports**

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| USEPA EIIS has records of 12 incidents related to the use of imazapyr. Four incidents involved aquatic resources including fish kills. One report agricultural runoff to a pond resulting in a possible fish kill from imazapyr, but could not definitively determine mortalities were directly related to Imazapyr exposure. Two other reports involved a mixture of herbicides, one of which was imzapyr. Because a mixture was involved it could not be definitively determined the mortalities were due to Imazapyr exposure. A fourth report involved a goldfish kill from suspected runoff following aerial application of Imazapyr. |

**Environmental Fate**

| | |
|---|---|
| **Water solubility ($S_w$):** | **Acid:** =15,000 ppm (4); =9740 ppm (7). **Amine salt:** 650,000 ppm (4). |
| **Soil Mobility ($K_{oc}$):** | **Acid:** Koc =125 ml/g (7). Adsorption to soil particles is generally weak, but can vary depending on soil properties. Adsorption is reversible, and desorption occurs readily. Because the chemical form is determined by pH, the adsorption capacity of imazapyr changes with soil pH. A decline in pH below 5 increases adsorption to soil particles. Above pH 5, imazapyr becomes ionized, increasing its negative charge, and limiting its ability to bind with soils. (5) |
| **Soil Persistence ($t_{½}$):** | **Acid:** Microbial degradation is the primary mechanism in the soil. Average soil ½ life =69 to 155 days (5). Aerobic soil ½ life =4.5 days (4); =11 days (7). Aerobic and anaerobic soil degradation = stable (10). |
| **Soil Dissipation ($DT_{50}$):** | **Acid:** Field dissipation ½ life = 90 days (4). **Amine salt:** Field dissipation ½ life =90 days (4). |
| **Aquatic Persistence ($t_{½}$):** | **Acid:** Aqueous photolysis ½ life =2 days (5); =3 to 5 days (10). Hydrolysis =stable (10). Aerobic and anaerobic aquatic metabolism =stable (10). |
| **Aquatic Dissipation ($DT_{50}$):** | No data in references. |
| **Potential to Move to Groundwater (GUS score):** | =1.98 (7). |
| **Volatilization (mm Hg):** | $=9.75\times10^{-8}$ (7). |
| **Octanol-Water Partition Coefficient ($K_{ow}$):** | Log Kow=0.11 (7). |
| **Bioaccumulation/Biocentration:** | **BAF:** Low – calculated (7).<br>**BCF:** =2.54 (7). |

**Worst Case Ecological Risk Assessment**

| | |
|---|---|
| **Max Application Rate (ai lbs/acre – ae basis)** | **Habitat Management:** 1.5 lbs. a.e./acre<br>**Croplands/Facilities Maintenance:** 1.5 lbs. a.e./acre |
| **EECs** | **Terrestrial (Habitat Management):** 360 ppm<br>**Terrestrial (Croplands/Facilities Maintenance):** 360 ppm<br>**Aquatic (Habitat Management):** 0.552 ppm<br>**Aquatic (Croplands/Facilities Maintenance):** 0.00503 ppm |

Habitat Management Treatments:

| Presumption of Unacceptable Risk | | Risk Quotient (RQ) | |
|---|---|---|---|
| | | Listed (T&E) Species | Nonlisted Species |
| Acute | Birds | =0.07 [0.1] | =0.07 [0.5] |
| | Mammals | =0.04 [0.1] | =0.04 [0.5] |
| | Fish | <0.01 [0.05] | <0.01 [0.5] |
| Chronic | Birds | =0.07 [1] | =0.07 [1] |
| | Mammals | =0.04 [1] | =0.04 [1] |
| | Fish | <0.01 [1] | <0.01 [1] |

Cropland/Facilities Maintenance Treatments:

| Presumption of Unacceptable Risk | | Risk Quotient (RQ) | |
|---|---|---|---|
| | | Listed (T&E) Species | Nonlisted Species |
| Acute | Birds | =0.07 [0.1] | =0.07 [0.5] |
| | Mammals | =0.04 [0.1] | 0.04 [0.5] |
| | Fish | <0.01 [0.05] | <0.01 [0.5] |
| Chronic | Birds | =0.07 [1] | =0.07 [1] |
| | Mammals | =0.04 [1] | =0.04 [1] |
| | Fish | <0.01 [1] | <0.01 [1] |

| | |
|---|---|
| **Justification for Use:** | Reduced risk herbicide active ingredient that may be used in upland, riparian and aquatic habitats. |
| **Specific Best Management Practices (BMPs):** | Habitat may be applied within 25 feet of surface water resources. Stalker may be applied to upland sites greater than 25 feet from surface water resources. |
| **References:** | [1a]_____. 2004 & 2010, respectively. Habitat specimen label & MSDS. BASF Corp., Agricultural Products Group, Research Triangle Park. 13 & 8 pp., respectively.<br>[1b]_____. 2008 & 2010, respectively. Arsenal specimen label & MSDS. BASF Corp., Agricultural Products Group, Research Triangle Park. 18 & 8 pp., respectively.<br>[1c]_____. 2008 & 2010, respectively. Stalker specimen label & MSDS. BASF Corp., Agricultural Products Group, Research Triangle Park. 9 & 8 pp., respectively.<br>[1d]_____. 2008. Ecomazapyr 2 SL specimen label & MSDS. Alligare, LLC, Opelika, AL. 7 & 4 pp., respectively.<br>[2]_____. 2000. USEPA one-liner database.<br>[3]_____. 2000. Pesticide database. Pesticide Action Network, San Francisco, CA.<br>[4]_____. 1995. ARS pesticide properties database. USDA-ARS, Washington, D.C.<br>[5]Tu, et al. 2001. Imazapyr. Weed Control Handbook, The Nature Conservancy. 7 pp.<br>[6]Syracuse Environmental Research Associates, Inc. 2004. Imazapyr – human health and ecological risk assessment – final report. Prepared for USDA, Forest Service (GSA Contract No. GS-10F-0082F), Washington, D.C. 149 pp.<br>[7]_____. 2009. Pesticide properties database. Agricultural & |

Environmental Research Unit, Science and Technology Research Institute, University of Hertfordshire, Hatfield, UK.
[8]Office of Pesticide Programs. 2000. ECOTOX: terrestrial report. Pesticide Ecotoxicity Database, Environmental Fate and Effects Division, USEPA, Washington, D.C.
[9]Office of Pesticide Programs. 2000. ECOTOX: aquatic report. Pesticide Ecotoxicity Database, Environmental Fate and Effects Division, USEPA, Washington, D.C.
[10]_____. 2006. Reregistration eligibility decision (RED) document for imazapyr, List C, Case Number 3078. Office of Pesticide Programs, Prevention, Pesticides and Toxic Substances, USEPA, Washington, D.C. 100 pp.

**Table CP.1**
**Pesticide Name**
**Active Ingredient = imazapyr**

| Trade Name[a] | Treatment Type[b,c] | Max Product Rate – Single Application (lbs/acre or gal/acre) | Max Product Rate -Single Application (lbs/acre - AI on acid equiv basis) | Max Number of Applications Per Season | Max Product Rate Per Season (lbs/acre/season or gal/acre/season) | Minimum Time Between Applications (Days) |
|---|---|---|---|---|---|---|
| Habitat, | H | 0.75 gal/acre | 1.5 lbs a.e./acre | 1 | 1.5 lbs a.e./acre/season | 0 |
| Arsenal, | H | 0.75 gal/acre | 1.5 lbs a.e./acre | 1 | 1.5 lbs a.e./acre/season | 0 |
| Stalker, | H | 0.75 gal/acre | 1.5 lbs a.e./acre | 1 | 1.5 lbs a.e./acre/season | 0 |
| Ecomazapyr 2 SL | H | 0.75 gal/acre | 1.5 lbs a.e./acre | 1 | 1.5 lbs a.e./acre/season | 0 |

[a] From each label for a pesticide identified in pesticide use proposals (PUPs), Service personnel would record application information associated with possible/known uses on Service lands.

[b] Treatment type: H – habitat management or CF – cropland/facilities maintenance. If a pesticide is labeled for both types of treatments (uses), then record separate data for H and CF applications.

[c] Treatment type is for ecological risk assessment purposes only. The product label will determine whether or not the treatment type is permissible under Section 3 of the Federal Insecticide, Fungicide and Rodenticide Act.

# *Appendix H*

# *Federal and State Ambient Air Quality Standards*

# Ambient Air Quality Standards

| Pollutant | Averaging Time | California Standards [1] | | Federal Standards [2] | | |
|---|---|---|---|---|---|---|
| | | Concentration [3] | Method [4] | Primary [3,5] | Secondary [3,6] | Method [7] |
| Ozone ($O_3$) | 1 Hour | 0.09 ppm (180 µg/m$^3$) | Ultraviolet Photometry | — | Same as Primary Standard | Ultraviolet Photometry |
| | 8 Hour | 0.070 ppm (137 µg/m$^3$) | | 0.075 ppm (147 µg/m$^3$) | | |
| Respirable Particulate Matter (PM10) | 24 Hour | 50 µg/m$^3$ | Gravimetric or Beta Attenuation | 150 µg/m$^3$ | Same as Primary Standard | Inertial Separation and Gravimetric Analysis |
| | Annual Arithmetic Mean | 20 µg/m$^3$ | | — | | |
| Fine Particulate Matter (PM2.5) | 24 Hour | No Separate State Standard | | 35 µg/m$^3$ | Same as Primary Standard | Inertial Separation and Gravimetric Analysis |
| | Annual Arithmetic Mean | 12 µg/m$^3$ | Gravimetric or Beta Attenuation | 15.0 µg/m$^3$ | | |
| Carbon Monoxide (CO) | 8 Hour | 9.0 ppm (10mg/m$^3$) | Non-Dispersive Infrared Photometry (NDIR) | 9 ppm (10 mg/m$^3$) | None | Non-Dispersive Infrared Photometry (NDIR) |
| | 1 Hour | 20 ppm (23 mg/m$^3$) | | 35 ppm (40 mg/m$^3$) | | |
| | 8 Hour (Lake Tahoe) | 6 ppm (7 mg/m$^3$) | | — | — | — |
| Nitrogen Dioxide ($NO_2$) | Annual Arithmetic Mean | 0.030 ppm (57 µg/m3) | Gas Phase Chemiluminescence | 53 ppb (100 µg/m$^3$) (see footnote 8) | Same as Primary Standard | Gas Phase Chemiluminescence |
| | 1 Hour | 0.18 ppm (339 µg/m$^3$) | | 100 ppb (188 µg/m$^3$) (see footnote 8) | None | |
| Sulfur Dioxide ($SO_2$) | 24 Hour | 0.04 ppm (105 µg/m$^3$) | Ultraviolet Fluorescence | — | — | Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)[9] |
| | 3 Hour | — | | — | 0.5 ppm (1300 µg/m$^3$) (see footnote 9) | |
| | 1 Hour | 0.25 ppm (655 µg/m$^3$) | | 75 ppb (196 µg/m$^3$) (see footnote 9) | — | |
| Lead[10] | 30 Day Average | 1.5 µg/m$^3$ | Atomic Absorption | — | — | — |
| | Calendar Quarter | — | | 1.5 µg/m$^3$ | Same as Primary Standard | High Volume Sampler and Atomic Absorption |
| | Rolling 3-Month Average[11] | — | | 0.15 µg/m$^3$ | | |
| Visibility Reducing Particles | 8 Hour | Extinction coefficient of 0.23 per kilometer — visibility of ten miles or more (0.07 — 30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent. Method: Beta Attenuation and Transmittance through Filter Tape. | | No Federal Standards | | |
| Sulfates | 24 Hour | 25 µg/m$^3$ | Ion Chromatography | | | |
| Hydrogen Sulfide | 1 Hour | 0.03 ppm (42 µg/m$^3$) | Ultraviolet Fluorescence | | | |
| Vinyl Chloride[10] | 24 Hour | 0.01 ppm (26 µg/m$^3$) | Gas Chromatography | | | |

**See footnotes on next page …**

1. California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, suspended particulate matter—PM10, PM2.5, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2. National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact U.S. EPA for further clarification and current federal policies.

3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4. Any equivalent procedure which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

7. Reference method as described by the EPA. An “equivalent method” of measurement may be used but must have a “consistent relationship to the reference method” and must be approved by the EPA.

8. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010). Note that the EPA standards are in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national standards to the California standards the units can be converted from ppb to ppm. In this case, the national standards of 53 ppb and 100 ppb are identical to 0.053 ppm and 0.100 ppm, respectively.

9. On June 2, 2010, the U.S. EPA established a new 1-hour $SO_2$ standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. EPA also proposed a new automated Federal Reference Method (FRM) using ultraviolet technology, but will retain the older pararosaniline methods until the new FRM have adequately permeated State monitoring networks. The EPA also revoked both the existing 24-hour $SO_2$ standard of 0.14 ppm and the annual primary $SO_2$ standard of 0.030 ppm, effective August 23, 2010. The secondary $SO_2$ standard was not revised at that time; however, the secondary standard is undergoing a separate review by EPA. Note that the new standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the new primary national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

10. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

11. National lead standard, rolling 3-month average: final rule signed October 15, 2008.

# *Appendix I*

# *Fire Management Plan Exemption*

United States Department of the Interior
Fish and Wildlife Service
San Diego National Wildlife Refuge Complex
2722-D Loker Avenue West
Carlsbad, California 92008

**Memorandum** December 4, 2002

To: Acting Manager, California and Nevada Operations, Region 1, U.S. Fish and Wildlife Service, Sacramento, California

From: San Diego National Wildlife Refuge Complex, Carlsbad, California

Subject: Request for Fire Management Plan Exemption, Seal Beach National Wildlife Refuge

**Seal Beach National Wildlife Refuge**
**Request for Fire Management Plan Exemption**

When approved, this document will exempt Seal Beach National Wildlife Refuge from developing a Fire Management Plan. U.S. Fish and Wildlife Service policy requires that all refuges with burnable vegetation develop a Fire Management Plan (620 DM 1). The Project Leader/Refuge Manager believes that this refuge contains no burnable vegetation, or essentially no burnable vegetation due to fuels conditions that will prevent ignition and fire spread. Therefore, a Fire Management Plan for this refuge is not required.

**Justification:**
We believe that the Seal Beach NWR should be exempt from the requirement to write a Fire Management Plan for the following reasons:

- Virtual lack of burnable vegetation
- Lack of ignition sources
- No reason or plans to do prescribed burning
- A long history of having no wild fires
- Refuge incorporated into Naval Weapons Station Fire Management Program

The Seal Beach NWR consists of a salt water marsh located in the Anaheim Bay estuary along the southern California bight, approximately 3 miles south of the City of Long Beach. About 745 acres of the Refuge's 923 acres are subject to regular, unobstructed tidal influences, creating a salt marsh environs that includes about 560 acres of salt marsh vegetation, 60 acres of mud flats regularly exposed at lower tides, and 115 acres of tidal channels and open water. The remaining 178 acres are mostly distributed over the Refuge as narrow swaths of vegetation and bare ground located immediately adjacent to the wetlands, above the mean high tide elevation. The narrowness and isolation of upland areas and marine-influenced weather have resulted in limited vegetative growth, mostly dominated by grasses and sparse annual forbs. The upland vegetation community along the edges of the salt marsh appear to be limited to the salt-laden clayey soil. Common plants found in these strips often include elements from the salt marsh, particularly pickleweed (*Salicornia virginica* and *S. subterminalis*) and the higher marsh grasses, along with *Bassia hyssopifolia*, *Gasoul nodiflorum*, *Gasoul crystallinum*, and Australian saltbush (*Atriplex semibaccata*). Further from the Refuge edge, regular perturbation of the land by discing and mowing has led to the proliferation of weedy introduced plants along the road edges, including tumbleweed (*Salsola iberica*), mustards (*Brassica* spp.), and, most abundant in terms of total cover and distribution, annual grasses. The grasses include ripgutgrass (*Bromus diandrus*), foxtail chess (*Bromus rubens*), soft chess (*Bromus mollis*), barleys (*Hordeum* spp.), fescues (*Festuca* spp.), and wild oats (*Avena* spp.). Additional species of regular occurrence include telegraph weed (*Heterotheca grandiflora*), sow-thistle (*Sonchus oleraceous*), sweet-clovers (*Melilotus indicus* and *M. albus*), filaree (*Erodium cicutarium*), wild radish (*Raphanus sativus*), milk thistle (*Silybum marianum*), pigweed (*Chenopodium album*), curly dock (*Rumex crispus*), and London-rocket (*Sysymbrium irio*). A small number of native species, other than the salt marsh elements, are conspicuous for their local abundance, stature, or color. These natives include mulefat (*Baccharis emoyri*), lupin (*Lupinus* spp.), and fiddleneck (*Amsinkia intermedia*).

Fuels are non-continuous due to paved and dirt roads; temperatures are relatively low with an average daily temperature of 65 degrees F., and the Refuge is frequently bathed in fog throughout the year. Average annual rainfall is about 12 inches mostly occurring in the November to April time frame. Along the coast this period is characterized by fog and low clouds. Vegetation growth occurs primarily during this season, and during this time the annual plant growth on the upland strips is substantial, but too moist to be burnable. During the summer, fog and low clouds are a regular morning phenomenon, often persisting until mid-afternoon, and contribute to keeping the air temperature mild in summer. In May through July, the annual plants dry up with the lack of rainfall. This is the time when fuels would be most flammable; however, the prevailing weather conditions cause the fine and noncontinuous fuels to be very moist. The warmest, driest period of the year occurs August through early November when occasional strong, dry, gusty wind storms known locally as Santa Ana winds come from the inland deserts and are a regular autumn phenomenon. By this time most of the fuels have been mown as part of fuel control program on the Naval Weapons Station Seal Beach and blown away.

The Refuge is co-located on the 5000-acre Naval Weapons Station Seal Beach. The U.S. Fish and Wildlife Service administers the Refuge as a "management overlay." The Navy facility is responsible for storing and handling ordnance for the U.S. Navy's Pacific Fleet. Both structural and wildland fire management is administer by a civilian fire department which is located on the base. Fire prevention is a dominant safety concern on the Station. All ordnance storage and handling activity occurs on the eastern 4/5 of the Station; the western 1/5 is used for administrative and other miscellaneous functions. A major road separates the two portions of the Station. In order to reduce fire hazards to the minimum, the Navy administers agricultural leases covering much of the ordnance/handling areas. These leases result in maintaining the open space lands on the Station in some stage of cultivation, significantly reducing fuels potential. The Station's Fire Department is strategically located on the Station, operates two 10,000 gallon tankers, and is manned 24 hours a day, 7 days a week. The Department conducts routine monthly fire prevention inspections, confines smoking to limited specified locations (off Refuge), maintains a water grid system of hydrants covering the entire base, and allows no open flames or "hot work" ( eg. Bar-B-Q, welding) without prior inspections and permit. Ruderal vegetation along road sides, including on the Refuge, is cut by a contractor at regular intervals.

Public access to the Refuge is substantially curtailed by the Navy, limited to the last Saturday of each month and a few additional "clean-up" days during the year. There is virtually no trespass, so there is little chance of a human-ignited fire. There is no reason nor plans to conduct any prescribed fire.

Prepared: G. Mendel Stewart — 12/5/02

G. Mendel Stewart, Project Leader — Date
~~San Diego NWR Complex~~

Concurred: Pam Ensley — 1/6/03

Pam Ensley, Regional Fire Management Coordinator — Date
Pacific Region, U.S. Fish and Wildlife Service

Approved: for Dan Walsworth Acting CNO Mgr — 1/15/03

Steve Thompson, Manager — Date
California and Nevada Operations
Pacific Region, U.S. Fish and Wildlife Service

# *Appendix J*

# *Wilderness Inventory*

# *Wilderness Inventory- Seal Beach NWR*

## Introduction

A National Wilderness Preservation System composed of federally owned areas designated by Congress as "wilderness areas" has been created as a result of the passage of the Wilderness Act of 1964 (16 USC 1131-1136, 78 Stat. 890). The purpose of this act is "to secure for the American people of present and future generations the benefits of an enduring resource of wilderness." Areas designated as wilderness are to be administered "for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness." No Federal lands are to be designated as "wilderness areas" except as provided for in the Act.

Consistent with the intent of the Wilderness Act, wilderness reviews are a required element of Comprehensive Conservation Plans and are conducted in accordance with the refuge planning process outlined in Section 602 FW 1 and 3 of the Service Manual, including public involvement and National Environmental Policy Act (NEPA) compliance. The three phases of the wilderness review are: 1) inventory, 2) study, and 3) recommendation.

If, through the inventory process, a determination is made that a refuge or area on a refuge meets the criteria for wilderness, the area, referred to as a wilderness study area (WSA), is further evaluated as part of the study phase. In the study phase, all values (e.g., ecological, recreational, cultural, economic, symbolic), resources (e.g., wildlife, water, vegetation, minerals, soils), public uses, and refuge management activities within the area are analyzed. This analysis also includes an evaluation of whether the WSA can be effectively managed to preserve its wilderness character. These elements are analyzed through the refuge planning process to determine the most appropriate management direction for the WSA.

The recommendation phase consists of forwarding or reporting recommendations for wilderness designation from the Director through the Secretary of the Interior and the President to Congress in a wilderness study report.

If the inventory does not identify any areas that meet the WSA criteria, these findings are documented in the administrative record for the CCP, fulfilling the planning requirement for a wilderness review. We inventoried the lands and waters within the Seal Beach National Wildlife Refuge (NWR or Refuge) and found no areas that meet the eligibility criteria for a WSA as defined by the Wilderness Act. This appendix summarizes the wilderness inventory for the Seal Beach NWR.

## Inventory Criteria

The wilderness inventory is a broad look at the planning area to identify wilderness study areas. WSAs are roadless areas that meet the minimum criteria for wilderness identified in Section 2(c) of the Wilderness Act.

> *"A wilderness, in contrast with those areas where man and his works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions, and which: (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological or other features of scientific, educational, scenic, or historical value."*

A WSA must be a roadless area or island, meet the size criteria, appear natural, and provide outstanding opportunities for solitude or primitive recreation. The process for identification of roadless areas and islands in the Seal Beach NWR and application of the wilderness criteria are described in the following sections.

### Identification of Roadless Areas and Roadless Islands

Identification of roadless areas and roadless islands required gathering and evaluating land status maps, land use and road inventory data, and aerial photographs for the Seal Beach NWR. "Roadless" refers to the absence of improved roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use.

### Evaluation of the Size Criteria

Roadless areas or roadless islands meet the size criteria if any one of the following standards applies:

- An area with over 5,000 contiguous acres. State and private lands are not included in making this acreage determination.
- A roadless island of any size. A roadless island is defined as an area surrounded by permanent waters or that is markedly distinguished from the surrounding lands by topographical or ecological features.
- An area of less than 5,000 contiguous Federal acres that is of sufficient size as to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management.
- An area of less than 5,000 contiguous Federal acres that is contiguous with a designated wilderness, recommended wilderness, or area under wilderness review by another Federal wilderness managing agency such as the Forest Service, National Park Service, or Bureau of Land Management.

### Evaluation of the Naturalness Criteria

In addition to being roadless, a WSA must meet the naturalness criteria. Section 2(c) defines wilderness as an area that "... generally appears to have been affected primarily by the forces of nature with the imprint of man's work substantially unnoticeable." The area must appear natural to the average visitor rather than "pristine." The presence of historic landscape conditions is not required. An area may include some human impacts, provided they are substantially unnoticeable in the unit as a whole. Significant human-caused hazards, such as the presence of unexploded ordnance from military activity, and the physical impacts of refuge management facilities and activities are also considered in evaluation of the naturalness criteria. An area may not be considered unnatural in appearance solely on the basis of the "sights and sounds" of human impacts and activities outside the boundary of the unit.

**Evaluation of Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation**
In addition to meeting the size and naturalness criteria, a WSA must provide outstanding opportunities for solitude or primitive recreation. The area does not have to possess outstanding opportunities for both solitude and primitive and unconfined recreation and does not need to have outstanding opportunities on every acre. Further, an area does not have to be open to public use and access to qualify under this criteria; Congress has designated a number of wilderness areas in the Refuge System that are closed to public access to protect resource values.

Opportunities for solitude refer to the ability of a visitor to be alone and secluded from other visitors in the area. Primitive and unconfined recreation means non-motorized, dispersed outdoor recreation activities that are compatible and do not require developed facilities or mechanical transport. These primitive recreation activities may provide opportunities to experience challenge and risk, self-reliance, and adventure.

These two "opportunity elements" are not well defined by the Wilderness Act but, in most cases, can be expected to occur together. However, an outstanding opportunity for solitude may be present in an area offering only limited primitive recreation potential. Conversely, an area may be so attractive for recreation use that experiencing solitude is not an option.

**Evaluation of Supplemental Values**
Supplemental values are defined by the Wilderness Act as "...ecological, geological, or other features of scientific, educational, scenic, or historic value." These values are not required for wilderness, but their presence should be documented.

## Inventory Findings

As documented here, the lands and waters within the Seal Beach NWR do not meet the criteria for a WSA.

**Roadless Areas and Roadless Islands**
The majority of the Seal Beach NWR is owned by the U.S. Navy. The water areas not owned by the Navy are designated as public tidelands held in trust for the people of California by the California State Lands Commission and are leased to the Service for management as a national wildlife refuge. Several paved and unpaved roads extend through the Refuge and are used by both the Refuge and the Navy. The lands and waters within the Refuge do not meet the criteria for roadless areas.

**Size Criteria**
The Seal Beach NWR consists of approximately 965 acres of land and water, which does not meet the size criteria for wilderness. No islands are included within the Seal Beach NWR.

**Naturalness Criteria**
The marsh complex within the Seal Beach NWR represents historic, natural coastal wetland habitat. However, other portion of the Refuge, including Forrestal Pond, Case Road Pond, 7th Street Pond, and Perimeter Pond, support subtidal habitats that were constructed as mitigation

for wetland impacts at the Port of Long Beach. These restored wetlands are maintained through a system of culverts and constructed tidal channels and do not represent the historic natural conditions of the area. In addition, evidence of past military and oil development are present in various locations throughout the Refuge.

**Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation**
The Seal Beach NWR is located on a Naval Weapons Station, with a small weapons range located just off the Refuge to the northeast. Pacific Coast Highway borders the southwestern edge of the Refuge, and military aircraft from Los Alamitos Army Airfield, located to the northeast of the Refuge, often fly over the site. Although the Refuge can provide opportunities for escape from the urban environment, the sights and sounds of urbanization are often apparent within the Refuge boundary.

**Supplemental Values**
The Seal Beach NWR protects what remains of the historic, natural coastal wetlands of Anaheim Bay, and these areas of the Refuge provide significant scenic value and provide significant ecological benefits to wildlife.

## Conclusions

The lands and waters included within the Seal Beach NWR do not meet the minimum criteria for wilderness as identified in Section 2(c) of the Wilderness Act. No further analysis related to wilderness issues is therefore required.