U.S. Fish & Wildlife Service

# Willapa National Wildlife Refuge

*Comprehensive Conservation Plan*

Volume 1

# *A Vision of Conservation*

Within this beautiful coastal and bay setting, incoming tides mix with nutrient laden freshwaters to create one of the most pristine and productive estuarine environments along the Pacific coastline.

The distinctive habitats found within the Refuge include coastal dunes, salt marshes, mudflats, open water with eelgrass beds, grasslands, and old growth western red cedar forest.

Visitors explore and enjoy a variety of wildlife from Roosevelt elk and the Pacific giant salamanders on Long Island to flocks of birds containing tens of thousands of shorebirds along the beach at Leadbetter Point.

Refuge management activities focus on protecting and restoring historic habitat conditions: second growth forests to healthy old growth forests, managed manmade freshwater wetlands to historic salt marsh habitat, threatened and endangered species to healthy sustained wildlife populations.

Success with these management activities is attained through partnerships with the Shoalwater Bay Tribe, local, state, and federal agencies, local organizations, communities, and individuals.

Community stewardship for these natural resources helps to sustain the healthy naturally functioning ecosystems of the Willapa Bay region for current and future generations to enjoy.

*Comprehensive Conservation Plans provide long-term guidance for management decisions and set forth goals, objectives, and strategies needed to accomplish refuge purposes and identify the U.S. Fish and Wildlife Service's best estimates of future needs. These plans detail program planning levels that are sometimes substantially above current budget allocations, and as such, are primarily used for strategic planning and program prioritization purposes. The plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.*

*Dunlin and sanderlings*
© Rudy Schuver

# Willapa National Wildlife Refuge
## Final Comprehensive Conservation Plan

**Prepared by:**

U.S. Fish and Wildlife Service
Willapa National Wildlife Refuge Complex
3888 SR 101
Ilwaco, Washington 98624

September 2011

Approved: Robyn Thorson
Regional Director, Region 1
Portland, Oregon

SEP 29 2011
Date

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**U.S. Fish and Wildlife Service**
**Willapa National Wildlife Refuge**
**Comprehensive Conservation Plan and Environmental Impact Statement**
**Approval Submission**

In accordance with the National Wildlife Refuge System Administration Act, as amended, the U.S. Fish and Wildlife Service completed a Comprehensive Conservation Plan and Environmental Impact Statement (CCP/EIS) for Willapa National Wildlife Refuge (Refuge). The purpose of this CCP is to specify a management direction for the Refuge for the next 15 years. The goals, objectives, and strategies for improving the Refuge's conditions—including the types of habitat we will provide, partnership opportunities, and management actions needed to achieve desired future conditions—are described in the CCP/EIS. The Service's preferred alternative for managing the Refuge and the effects on the human environment are described in this CCP/EIS.

This CCP/EIS is submitted for the Regional Director's approval by:

C Stenvall — 9/28/11
Charlie Stenvall, Project Leader — Date
Willapa National Wildlife Refuge Complex

Concur: _____ 9/28/11
Refuge Supervisor — Date

Concur: Robert. West — 9-28-11
Regional Chief — Date
National Wildlife Refuge System

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**U.S. Department of the Interior, Fish and Wildlife Service**

# Record of Decision
**for the**
# Willapa National Wildlife Refuge
**Final Comprehensive Conservation Plan and Environmental Impact Statement**
Pacific County, Washington

**September 2011**

Through this Record of Decision (ROD), we, the U.S. Fish and Wildlife Service (Service), select the Comprehensive Conservation Plan (CCP) for the Willapa National Wildlife Refuge (Refuge). This ROD includes brief summaries of our public involvement process, the alternatives we considered, and our rationale for selecting Alternative 2, as described in the Final CCP and Environmental Impact Statement (EIS). The CCP will provide guidance for managing and conserving the Refuge's natural resources and public use activities over the next 15 years.

## Alternatives Considered

In the Draft CCP/EIS, the Service evaluated three alternatives for the Refuge, including a no-action alternative (Alternative 1) as required by the Council on Environmental Quality's regulations (40 CFR 1500-1508). Based upon public input on the Draft CCP/EIS, we modified our preferred alternative, and the changes are reflected in the final document.

*Alternative 1.* Under Alternative 1, we would maintain current Refuge management programs and where feasible, restore forest, wetland, and beach dune habitats, and improve habitats for Federal and State-listed threatened and endangered species. We would continue to implement the forest management plan with our partners. Existing public uses—hunting, fishing, wildlife observation, photography, interpretation, environmental education, and camping—would continue. Lands within the Refuge's Presidential Proclamation Boundary would remain closed to waterfowl hunting.

*Alternative 2.* Under Alternative 2, current wildlife and habitat management would continue and a number of habitat improvements would occur. We would restore the intensively managed pastures and impoundments to historic estuarine conditions, increasing open water, intertidal flats, and salt marsh habitat by 621 acres. On the Leadbetter Point Unit, we would control avian and mammalian predators as necessary, to help meet western snowy plover recovery goals. On the Riekkola Unit, 93 acres of short-grass fields would be managed as foraging habitat for Canada geese, elk, and other grassland-dependent wildlife. Grassland restoration on 33 acres would include establishing the early-blue violet host plant which would serve the future reintroduction of the endangered Oregon silverspot butterfly. We would continue to implement our forest management plan, and maintain managed freshwater wetlands on the Tarlatt Unit. We would expand the approved Refuge boundary by 6,809 acres in the Nemah, Naselle, South Bay, and East Hills areas, and divest the Shoalwater and Wheaton Units (941 acres) from the Refuge.

Improvements to the wildlife-dependent public use program would include developing an interpretive trail and observation deck along the South Bay that ties into our proposed Tarlatt Unit visitor/administrative facility. After estuarine restoration is completed, the waterfowl hunting area would expand to include 5,570 acres. An additional 100 acres and three blinds (including one barrier

free blind) would be available for goose hunting, and two blinds (including one barrier free blind) would be added for waterfowl hunting. Walk-in hunters could access the blinds on a first-come, first-served basis. We would develop a year-round cartop boat launch, parking area, and 0.6-mile Porter Point Trail to access the South Bay. A special permit elk hunt on the Leadbetter Point Unit, and elk and deer hunting in the South Bay and East Hills Unit during State hunting seasons, are also proposed.

*Alternative 3.* Under Alternative 3, the Lewis and Porter Point Units' intensively managed pastures and impoundments would be restored to historic estuarine conditions, maintaining approximately 878 acres of open water habitat and 4,178 acres of intertidal flats, and increasing salt marsh habitat by 429 acres. On the Leadbetter Point Unit, we would control avian predators as necessary, to help meet western snowy plover recovery goals. We would restore grassland habitat and establish the early-blue violet host plant on 33 acres, to serve the reintroduction of the endangered Oregon silverspot butterfly. We would continue to implement our forest management plan, and maintain managed freshwater wetlands on the Riekkola and Tarlatt Units. We would expand the approved Refuge boundary by 4,901 acres in the South Bay and East Hills areas, and divest the Shoalwater and Wheaton Units from the Refuge.

Improvements to the wildlife-dependent public use program would include developing an interpretive trail and observation deck along the South Bay that ties into our proposed Tarlatt Unit visitor/administrative facility. After estuarine restoration is completed, the waterfowl hunting area would expand to include approximately 5,440 acres. We would provide seven blinds for walk-in goose hunting through a lottery system, a permit-only elk hunt on Leadbetter Point Unit, and elk and deer hunting in the South Bay Unit during State seasons.

**Environmentally Preferable Alternative**

An alternative considered to be environmentally preferable, generally causes the least damage to the biological and physical environment, and best protects, preserves and enhances natural resources. For this CCP/EIS, Alternative 2, our preferred alternative, is also the environmentally preferable alternative. Under Alternative 2, current wildlife and habitat management activities will continue, and we will implement habitat improvement projects for a variety of wildlife species and provide opportunities for the public to learn about and enjoy the Refuge's resources through wildlife-dependent public uses. Under Alternative 2 we would:

*Wildlife and Habitat Management*

- Restore the intensively managed pastures and impoundments to historic estuarine conditions, increasing open water, intertidal flats, and salt marsh habitat by 621 acres, thereby benefitting salmonids, shorebirds, a host of aquatic species, and other wildlife.
- Manage 93 acres of short-grass fields on the Riekkola Unit as foraging habitat for Canada geese, elk, and other grassland dependent wildlife.
- Restore grasslands, including establishing the early-blue violet host plant on 33 acres, which would serve reintroduction of the endangered Oregon silverspot butterfly.
- Continue to implement our Forest Management Plan with our partners, by protecting 557 acres of late-successional Sitka spruce forest and 6,180 acres of second-growth Sitka spruce forest to improve ecological function and forest health.
- Maintain and protect 1,581 acres of coastal dune habitat on the Leadbetter Point Unit and restore 220 acres.

- Maintain and protect 17 acres of seasonal managed freshwater wetlands on the Tarlatt Unit, 27 miles of riverine habitat, and 545 acres of naturally occurring permanent and semi-permanent freshwater wetlands which are important for a variety of wildlife species.
- Control avian and mammalian predators on the Leadbetter Point Unit, only as necessary to help meet western snowy plover recovery goals.

*Refuge Boundary Expansion*

- Expand the Refuge acquisition boundary by 6,809 acres in the Nemah, Naselle, South Bay, and East Hills areas contributing to the ecosystem's protection and health.
- Divest the Shoalwater and Wheaton Units (941 acres) from the Refuge to focus on priority Refuge programs.

*Administrative/Maintenance and Visitor Facility*

- Develop the proposed administrative/maintenance and visitor facility on the Tarlatt Unit, which would improve visitor services, help conserve crucial wildlife habitat, improve staff productivity, consolidate maintenance facilities, serve as an interpretive area, and eliminate increasing operations and maintenance costs for the old facilities.

*Wildlife-dependent Public Uses*

- Develop an interpretive trail and observation deck along the South Bay (concurrent with estuarine restoration) that ties into our proposed Tarlatt Unit administrative/maintenance and visitor facility.
- Develop a cartop boat launch, parking area, and 0.6-mile Porter Point Trail to access the South Bay for year-round public use opportunities.
- Expand the waterfowl hunting area to include 5,570 acres, after estuarine restoration is completed.
- Provide an additional 100 acres and three blinds (including one barrier free blind) for goose hunting, and two blinds (including one barrier free blind) for waterfowl hunting. Walk-in hunters could access the blinds on a first-come, first-serve basis. These blinds would also be open to all refuge visitors during the nonhunting season.
- Provide a special permit elk hunt on the Leadbetter Point Unit, and elk and deer hunting in the South Bay and East Hills Units during state seasons.

**Public Involvement**

We initiated the public scoping phase of the planning process in March 2008, by announcing our intention to develop a CCP/EIS in the Federal Register and Planning Update 1. We also explained the planning process and requested scoping comments in Planning Update 1, and announced public meetings. All planning updates were mailed to an extensive list of addressees and posted on the Refuge's website. We also held public open house meetings in March 2008 to obtain comments.

In August 2008, we provided summaries of public comments and a draft vision statement in Planning Update 2. In July 2009, we requested comments on our preliminary alternatives in Planning Update 3. On January 21, 2011, we released the Draft CCP/EIS, with a summary in Planning Update 4, for a 45-day public comment period announced in the Federal Register. We extended the comment period

to 60-days, in response to public requests, and participated in a public hearing sponsored by the local congressional representative.

Numerous national, state, and local organizations; agencies; neighboring landowners; and interested citizens were involved in the review process. All substantive issues raised in public comments have been addressed, either through revisions to the Final CCP/EIS or through our response to comments in Appendix E of the Final CCP/EIS. Most guidelines and actions in Alternative 2 of the Final CCP/EIS remain consistent with those presented in the Draft CCP/EIS, with a few changes. The Final CCP/EIS was released to the public on August 12, 2011, through a Federal Register notice and press release, our Web site, and Planning Update 5.

**Responses to Comments Received On the Final CCP/EIS**

We received comment letters on the Final CCP/EIS from seven commenters. The comments did not raise new issues; therefore, our analysis and preferred alternative remained unchanged.

**Decision**

The Service has selected Alternative 2 for implementation, as described in the Final CCP/EIS. Alternative 2 is the most effective alternative for addressing the key issues identified during the planning process and will best achieve the purposes and goals for the Refuge, as well as the goals of the National Wildlife Refuge System (Refuge System). Implementation of the CCP will occur over the next 15 years. Some actions will require additional funding and will be implemented as funding becomes available.

**Factors Considered in Making the Decision**

In reaching this decision, the Service reviewed and considered the following.

- Impacts identified in Chapter 6 of the Draft and Final CCP/EIS.
- Relevant issues, concerns, and opportunities presented by agencies, organizations, and individuals throughout the CCP process, including comments on the Draft and Final CCP/EIS.
- Other relevant factors, including the purposes for which the Refuge was established and statutory and regulatory guidance.

Alternative 2 was modified from the Draft CCP/EIS and selected for implementation for the following reasons:

- Alternative 2, with acreage changes from the draft, provides the greatest amount of estuarine restoration of the three alternatives, and restores the intensively managed freshwater impoundments to historic estuarine conditions. A large portion of estuarine habitat has been lost to diking, channelization, dredging, and filling. Restoration of this amount of estuarine habitat will result in a 30 percent increase in intertidal emergent (salt marsh) habitat in Willapa Bay. This action will be an important contribution to providing salmonid rearing habitat and will benefit a variety of migratory birds, including waterfowl, shorebirds, seabirds, and wading birds.
- Alternative 2 provides the greatest amount of Refuge expansion and the highest potential to improve protection of the south Willapa Bay ecosystem. Areas identified within the

expanded boundary would provide us with opportunities to conduct wildlife-dependent public uses, and provide fish and wildlife habitat for a variety of migratory birds, threatened and endangered species, and salmonids. The expanded boundary will help us improve and protect habitat quality and connectivity, water quality, forest ecosystem function, and wildlife corridors throughout the south Willapa Bay ecoregion. This alternative best responds to the increasing threat of development, habitat fragmentation, forest fragmentation, and other human pressures in the surrounding areas.

- Through Alternative 2, we will assist in the recovery of the threatened western snowy plover by maintaining and enhancing existing breeding and wintering habitat, preventing sources of disturbance at nesting sites, enforcing regulations designed to protect areas used by nesting plovers, and preventing excessive predation through an integrated predator management strategy. Of the six Washington locations identified in the plover's Federal recovery plan as breeding areas, only two are currently occupied; the largest is located at the Refuge's Leadbetter Point Unit.
- Through Alternative 2, we will work with partners to establish and maintain suitable habitat for future reintroduction of the Oregon silverspot butterfly (currently extirpated in the State) while supporting a variety of other grassland dependent wildlife species.
- Alternative 2 was changed from the Draft CCP/EIS to provide and manage short-grass field habitat adequate for Canada geese and Roosevelt elk, while minimizing the potential for depredation on private lands.
- Alternative 2 provides an achievable balance of various opportunities for all six wildlife-dependent priority public uses (hunting, fishing, wildlife observation and photography, environmental education, and interpretation), while providing sufficient protection and sanctuary habitat areas for fish and wildlife.
- Alternative 2 provides for an integrated waterfowl hunting program and was modified from the Draft CCP to provide walk-in access to waterfowl hunting blinds. It also provides hunting in the expanded open water area, which will be concurrent with estuarine restoration. Other modifications from the Draft CCP include boat access to the South Bay Units by a cartop boat ramp at Dohman Creek, and a 0.6 mile trail from the parking area that will provide year-round access to Porter Point. The big game hunting program will be expanded, providing opportunities to hunt elk and deer, including a special permitted elk hunt on the Leadbetter Point Unit.
- Through Alternative 2 we will greatly enhance the quality of the environmental education and interpretation programs and will increase the number of students and visitors currently served by the program, with the construction and location of the proposed administrative/maintenance and visitor facility and the addition of an education specialist.
- Alternative 2 will strengthen our fish, wildlife, habitat, and public use monitoring efforts. It is the best alternative to ensure that the Refuge can make the greatest contribution to fish, wildlife, and habitat needs within the south Willapa Bay watershed and Willapa Bay ecosystem.

**Measures to Minimize Environmental Harm**

Public concerns, potential impacts, and measures or stipulations to mitigate those impacts are addressed in the Final CCP/EIS. All practicable measures to avoid or minimize environmental harm that could result from implementation of Alternative 2 have been identified and incorporated into the Final CCP/EIS, Chapters 2 and 6, and Appendix C. The stipulations identified in the Compatibility Determinations in Appendix C, ensure that public and other uses are compatible with the National

Wildlife Refuge System mission and the Refuge purposes. These stipulations and other mitigation measures identified in the preferred alternative in Chapter 2, are adopted by the Service in this Record of Decision and will be followed or enforced by Refuge staff members, partners, and volunteers.

**Findings Required by Other Laws and Executive Orders**

The proposed action complies with all Federal laws and Executive Orders related to the CCP planning process. A Compliance Statement has been prepared which explains how the selected alternative complies with the requirements of the National Wildlife Refuge System Administration Act, as amended (16 U.S.C. 688dd-688ee); NEPA (42 U.S.C. 4321 et seq.); the Endangered Species Act (16 U.S.C. 1531-1544, 87 Stat. 884); the National Historic Preservation Act (16 U.S.C. 470-470b, 470c-470n); Wilderness Preservation Act of 1964; Executive Order 11988, Floodplain Management; Executive Order 11990, Protection of Wetlands; Executive Order 12372, Intergovernmental Review; Executive Order 13186, Protection of Migratory Birds; and Executive Order 12898, Environmental Justice.

**For Further Information**

Interested and affected parties are being notified of our decision. Questions about the CCP/EIS may be directed to Charlie Stenvall, Project Leader, Willapa National Wildlife Refuge Complex, 3888 SR 101 Ilwaco, Washington 98624, phone number (360) 484-3482, fax number (360) 484-3109, and e-mail Charlie_Stenvall@fws.gov. This ROD and supporting references are available for public review at the Willapa National Wildlife Refuge, 3888 SR 101, Ilwaco, Washington 98624, and on our Web site: http://www.fws.gov/willapa/.

Noreen Thorson

Regional Director, Region 1
Portland, Oregon

SEP 29 2011

Date

**Supporting References**

U.S. Fish and Wildlife Service. August 2011. Willapa National Wildlife Final Comprehensive Conservation Plan and Environmental Impact Statement.

U.S. Fish and Wildlife Service. January 2011. Willapa National Wildlife Draft Comprehensive Conservation Plan and Environmental Impact Statement.

# Executive Summary

The Willapa National Wildlife Refuge (Refuge) is located on Willapa Bay along the southern Washington coastline. The Refuge was established in 1937 to protect migrating and wintering populations of brant, waterfowl, shorebirds, and other migratory birds, and for other conservation purposes. It encompasses over 16,000 acres of tidelands, temperate rainforest, ocean beaches, sand dunes, rivers, and small streams. The Refuge also preserves several rare remnants of old-growth coastal cedar forest, habitat for spawning wild salmon, hundreds of thousands of migrating shorebirds, and threatened and endangered species such as the western snowy plover and marbled murrelet. The U.S. Fish and Wildlife Service (Service) manages the Refuge as part of the National Wildlife Refuge System (Refuge System).

This comprehensive conservation plan (CCP) was developed in accordance with the National Wildlife Refuge System Improvement Act of 1997 and National Environmental Policy Act. The Service began the process of developing a CCP for the Refuge in 2008. The Service held two public meetings for the CCP in March 2008: one in South Bend, Washington, and one in Ilwaco, Washington. We solicited comments on the Draft CCP/EIS for Willapa NWR for a 45-day period starting on January 21, 2011. In response to requests for additional time, we extended the comment period a full 60 days, ending March 21, 2011. We attended one public hearing on March 13, 2011. For additional information see the Summary of Public Involvement in Appendix E.

We describe the direction for future management of the Refuge and analyze its potential effects on the biological, cultural, recreational, and economic environment in Chapters 3-5. We identified the management direction because it will best achieve benchmarks and allow for public uses as defined by the National Wildlife Refuge System Administration Act as amended.

**Changes Made to the Final CCP.** Appendix E contains a summary of all comments that were received in response to the Draft CCP/EIS during the 60-day public comment. The Service has modified the CCP based upon these comments. Table E-2 in Appendix E shows the major changes between the Draft and Final CCP. For additional information see Chapter 2 and Maps 2-4 in this CCP.

We received many comments regarding the dike removal and restoration of 749 acres of historical estuarine habitats (open water, intertidal flats, and salt marsh). The final management direction has been modified to restore only 621 acres, and the Service will only restore a portion of the short-grass fields at the Riekkola Unit to estuarine habitat.

Many comments emphasized the importance of the short-grass field (pasture) habitat at the Riekkola Unit for the dusky Canada goose and elk, and how habitat changes with the proposed tidal restoration would be detrimental to those species and would cause depredation to private property owners. The management direction includes 93 acres of short-grass fields on the Riekkola Unit that will be managed for Canada geese and Roosevelt elk.

We also received several comments regarding impacts of estuarine restoration on private property. The management direction has been modified based upon these concerns. This modification eliminates the need for raising County Road (67th Place), a designated tsunami evacuation route for Pacific County, and eliminates impacts to private landowners' freshwater wetlands.

A number of comments expressed concern regarding changes to waterfowl hunting opportunities. The management direction has been modified to include three blinds for goose hunting (including one barrier-free blind) and the addition of two blinds for waterfowl hunting (including one barrier-free blind) on the Riekkola Unit. Walk-in access to these blinds will occur according to State hunting regulations.

Suggestions and issues were raised about refuge access, the car-top boat launch, trails, and parking. The management direction has been modified to provide additional wildlife-dependent recreation opportunities, and the parking area, car-top boat launch, and new trail to Porter Point will be open year-round to all refuge visitors. The blinds will be open only to hunters during the hunting season; however, during the non-hunting season, these blinds may be used by any refuge visitor.

**Selected Management Direction.** After considering the public comments we received, we have modified the management direction. It was selected for implementation for the Refuge because it will best achieve refuge purposes and fulfill the Service's mission. It is consistent with the principles of sound wildlife management and will facilitate priority public uses that are compatible with the purposes of the Refuge. It is based on a land management approach that protects and enhances natural resources, habitats, and landscapes, while allowing for recreational public uses.

Under the management direction, current wildlife and habitat management programs will be maintained. In addition, the intensively managed pastures and impoundments will be restored to historical estuarine conditions, creating approximately 621 acres of open water, intertidal flats, and salt marsh habitats. We will continue to implement the forest management plan with our partners. On the Leadbetter Point Unit, a predator management program will be implemented as necessary, to control avian and mammalian predators and help meet western snowy plover recovery goals. There will be 93 acres of short-grass fields that will be managed for foraging habitat for Canada geese, elk, and other grassland-dependent wildlife. Grassland restoration on 15-33 acres will include establishing the early blue violet, a host plant that will serve the future reintroduction of the endangered Oregon silverspot butterfly. Managed freshwater wetlands will remain on the Tarlatt Unit. An expanded approved refuge boundary will include 6,803 acres located in the Nemah and Naselle areas, South Bay, and the East Hills. The Shoalwater and Wheaton Units will be divested from the Refuge.

Improvements to the wildlife-dependent public use program will include a new interpretive trail and wildlife observation deck along the South Bay. The new trail will tie into our Tarlatt Unit visitor/administrative/maintenance facility. The area where waterfowl hunting is conducted in accordance with the state's season will expand to include approximately 5,670 acres after the estuarine restoration is completed. In addition, three blinds for goose hunting and two blinds for waterfowl hunting will provide walk-in hunter access via a first-come, first-serve system. A car-top boat launch will be developed to access the South Bay. An expanded special-permit elk hunt is planned for the Leadbetter Point Unit. Elk and deer hunting will be expanded and conducted in South Bay Units in accordance with State seasons.

We encourage you to review the Final CCP. The CCP will provide guidance and direction for managing the Refuge for 15 years.

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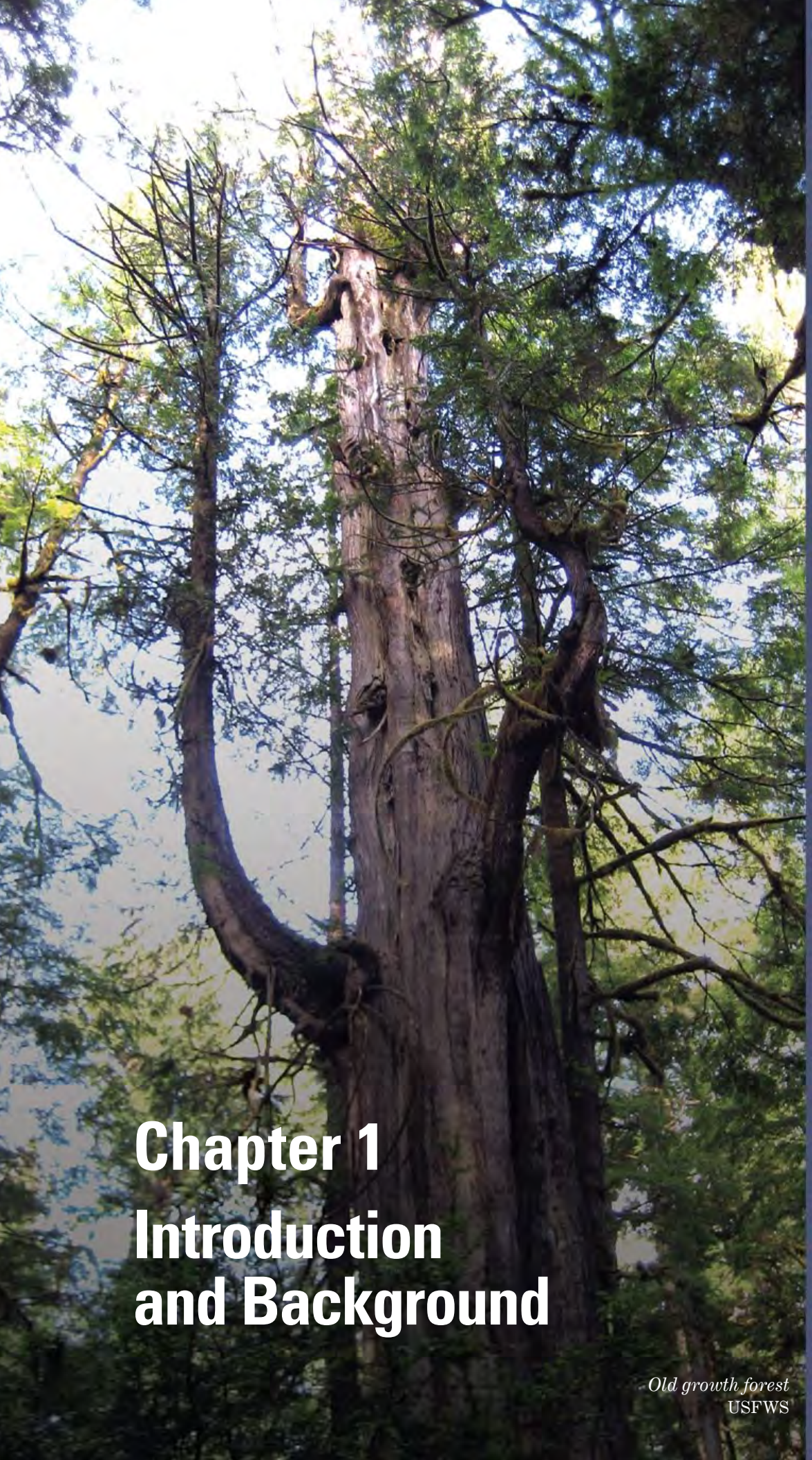


# Chapter 1
# Introduction and Background

*Old growth forest*
USFWS

# Chapter 1. Introduction and Background

## 1.1 Introduction

The Willapa National Wildlife Refuge (Refuge or NWR) is located on Willapa Bay along the southern Washington coastline (Map 1). The Refuge was established in early 1937 by President Franklin Roosevelt in order to preserve and manage the important habitats and wildlife of Willapa Bay. The Refuge currently manages over 16,000 acres including sand dunes, sand beaches, intertidal mudflats, saltwater and freshwater marshes, grassland, open water, and forested lands.

The Refuge's wetland habitats support wintering populations of waterfowl such as black brant, trumpeter swans, Canada geese, scaup, canvasback, bufflehead, scoters, and American wigeon. The Refuge also hosts some of the largest concentrations of shorebirds on the Pacific Coast during their spring and fall migrations. These large concentrations of migrating shorebirds and the habitats that support them are now recognized as globally significant. The western snowy plover, listed as threatened under the Endangered Species Act (ESA), nests along the refuge beaches. Marbled murrelet, black bear, black-tailed deer, Roosevelt elk, bats, bobcats, and grouse can be found in the forests and upland habitats. The cool, wet climate of the Willapa Hills makes the area a "hotspot" of amphibian diversity; habitats on the Refuge support up to 13 of the 24 native amphibians that occur in Washington. Coastal rivers and streams on the Refuge provide habitat for western brook lamprey; western pearlshell mussels; chum, coho, and Chinook salmon; steelhead; and sea-run cutthroat trout.

## 1.2 Proposed Action

The U.S. Fish and Wildlife Service (USFWS or the Service) is proposing to adopt and implement a comprehensive conservation plan (CCP) for the Willapa National Wildlife Refuge. This CCP will set forth management guidance for the Refuge for the next 15 years as required by the National Wildlife Refuge System (NWRS or the Refuge System) Administration Act of 1966, as amended (16 U.S. Code [U.S.C.] 688dd-688ee).

A CCP is required by the Refuge Administration Act to address "1) the purposes of the refuge; 2) the fish, wildlife and plant populations, their habitats, and the archaeological and cultural values found on the refuge; 3) significant problems that may adversely affect wildlife populations and habitats and ways to correct or mitigate those problems; 4) areas suitable for administrative sites or visitor facilities; and 5) opportunities for fish and wildlife-dependent recreation."

The Service has developed and analyzed the future refuge management direction. It addresses the major issues and relevant mandates identified in the CCP process and is consistent with the principles of sound fish and wildlife management.

The Service selected the management direction because it represents the best balanced approach for achieving the Refuge purposes, vision, and goals; contributing to the NWRS mission; and addressing relevant issues and mandates consistent with sound principles of fish and wildlife management. The management direction was modified between the draft and final documents based upon comments received from the public, other agencies, and organizations. For details on the specific components and actions making up the management direction, see Chapter 2.

## 1.3 Purpose and Need for the Comprehensive Conservation Plan

The purpose of the CCP is to provide the Service, the Refuge System, our partners, and the public with a long-term (15-year) management plan. This plan will integrate the goals, objectives, and strategies (refuge management actions) set forth in this document. An approved CCP will ensure that the Service manages the Refuge to achieve the refuge purposes, vision, goals, and objectives to help fulfill the mission of the Refuge System. This CCP:

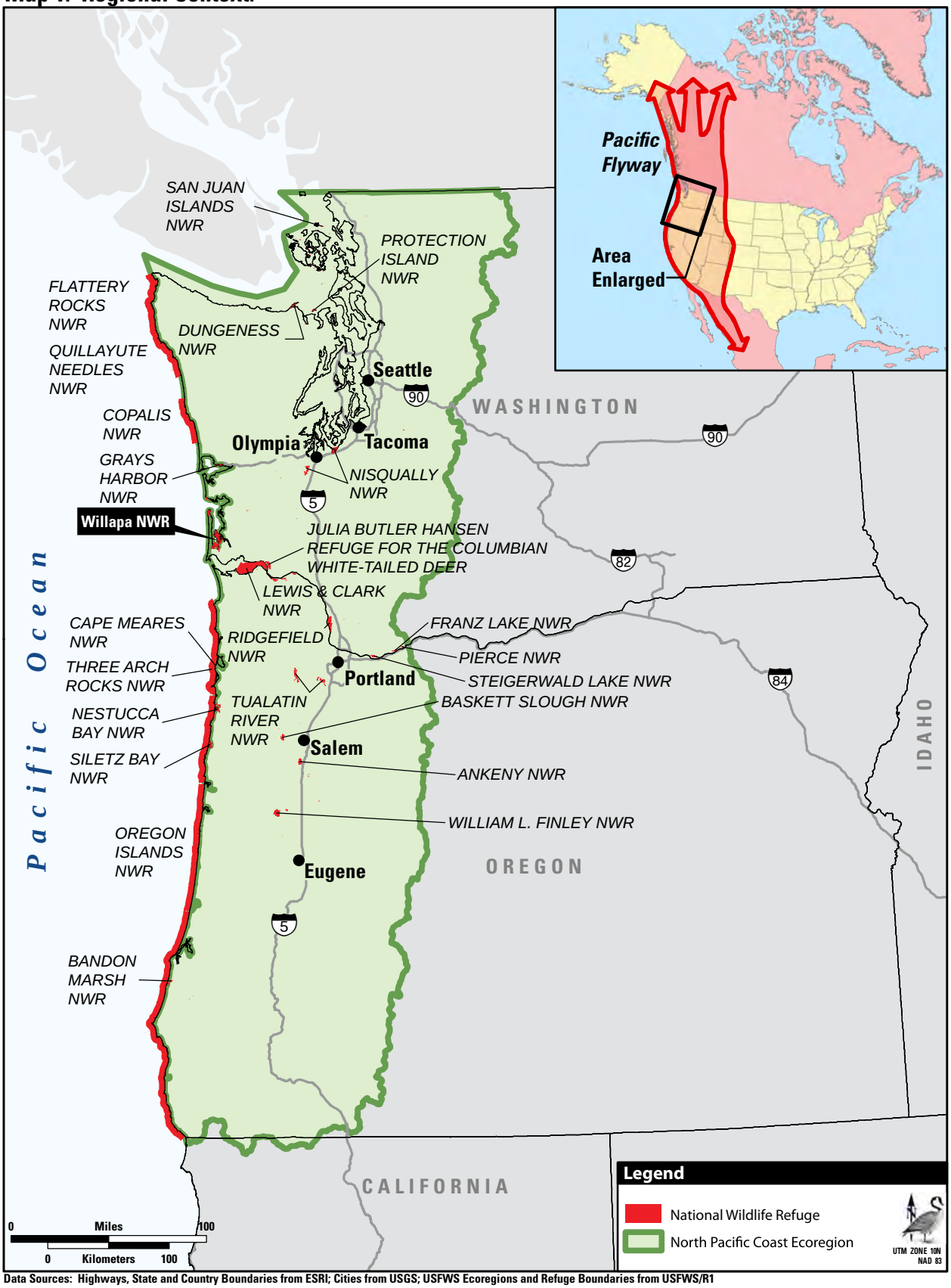
- Sets a long-term vision for the Refuge;
- Establishes management goals, objectives, and strategies for the Refuge and its units;
- Provides the Refuge with a 15-year management plan for the conservation of fish, wildlife, and plant resources and their related habitats;
- Defines compatible public uses;
- Develops a plan that, when fully implemented, will achieve refuge purposes, help fulfill the mission of the Refuge System, and maintain and, where appropriate, restore ecological integrity;
- Communicates the Service's management priorities for the Refuge; and
- Provides a basis for budget needs to support staffing, operations, maintenance, and capital improvements.

The plan was developed to provide reasonable, scientifically grounded guidance for improving the Refuge's habitats for the long-term conservation of native plants and wildlife species. It identifies appropriate actions for protecting and sustaining the cultural and biological features of the Refuge, and threatened, endangered, or rare species. Another purpose of the plan is to evaluate the priority public use programs on the Refuge, which may include hunting, fishing, wildlife observation, photography, environmental education, and interpretation.

The CCP is the needed to identify and set the long-term management priorities for the Refuge, which include:

- Improving refuge habitat conditions through:
  - Management of young forest stands to create maximum trajectory toward establishing healthy old-growth stands;
  - Decommissioning and stabilization of old forest-logging roads;
  - Removal of highly managed artificial freshwater wetlands by re-establishing the historical salt marsh habitat;
  - Restoration efforts for improving grasslands and dune habitats for the benefit of extirpated species, threatened wildlife, and other wildlife and plant species; and
  - Working with private landowners to improve habitat conditions on lands outside the refuge boundary.
- Analyzing the Refuge's wildlife-dependent priority public uses, to determine what improvements or alterations could be made in the pursuit of higher-quality programs for:
  - Continued and expanded quality hunting opportunities;
  - Improved environmental education and interpretation opportunities;
  - Expanded, improved wildlife observation opportunities with a new trail in the South Bay;
  - Expanded waterfowl hunting opportunities after habitat restoration activities in the South Bay; and
  - Maintenance of quality fishing opportunities.

**Map 1. Regional Context.**




Data Sources: Highways, State and Country Boundaries from ESRI; Cities from USGS; USFWS Ecoregions and Refuge Boundaries from USFWS/R1

The back of this map page is blank to facilitate map readability.

- Constructing a visitor/administrative and maintenance replacement facility for the public and the refuge staff and volunteers, which will:
  - Improve visitor access to facilities and staff;
  - Expand environmental education and interpretation programs and opportunities;
  - Improve access to view wildlife of the bay with a new trail and car-top boat launch;
  - Consolidate refuge maintenance facilities; and
  - Improve staff and volunteer office facilities, creating a healthy work site.
- Undertaking landscape habitat planning and planning for potential refuge boundary expansion, which will:
  - Provide future opportunities to work with private landowners and nongovernmental organizations to acquire lands as funding and willing-seller opportunities arise; and
  - Work with landowners to develop cooperative land management agreements.

## 1.4 Content and Scope of the Plan

This CCP provides guidance for management of refuge habitats and wildlife and administration of public uses on refuge lands and waters. Information in the CCP includes:

- An overall vision for the Refuge, its role in the local ecosystem, and its relationship to other plans and the refuge purposes (Chapter 1).
- Goals and objectives for specific conservation targets and public use programs, as well as strategies for achieving the objectives (Chapter 2).
- A description of the physical environment (Chapter 3).
- A description of the conservation targets (habitats and wildlife), their condition and trends on the Refuge and in the local ecosystem, a presentation of the key desired ecological conditions for sustaining the targets, and an analysis of the threats to each target (Chapter 4).
- An overview of the Refuge's public use programs and current facilities, a list of desired future conditions for each program and proposed new facilities, and other management considerations (Chapters 2 and 5).
- Land Protection Plan, including strategies for acquisition boundary expansion (Appendix A).
- Evaluations of existing and proposed public and economic uses for appropriateness and compatibility (Appendices B and C).
- Integrated Pest Management Plan (Appendix H).
- Forest Landscape Plan (Appendix K).
- Predator Management Plan (Appendix L).
- Hunt Plan (Appendix M).
- Estuarine Restoration Plan (Appendix O).
- Headquarters Draft Site Plan (Appendix P)
- Wildlife and plant species lists (Appendix Q)
- Economic effects of the CCP (Appendix R)

# 1.5 U.S. Fish and Wildlife Service and National Wildlife Refuge System Laws and Directives

## 1.5.1 U.S. Fish and Wildlife Service Mission

The mission of the Service is "working with others, to conserve, protect and enhance fish and wildlife and their habitats for the continuing benefit of the American people."

National natural resources entrusted to the Service for conservation and protection include migratory birds, endangered and threatened species, inter-jurisdictional fish, wetlands, and certain marine mammals. The Service also manages national fish hatcheries, enforces Federal wildlife laws and international treaties regarding importing and exporting wildlife, assists with state fish and wildlife programs, and helps other countries develop wildlife conservation programs.

## 1.5.2 National Wildlife Refuge System

The NWRS is the world's largest network of public lands and waters set aside specifically for conserving wildlife and protecting ecosystems. From its inception in 1903, the Refuge System has grown to encompass over 550 national wildlife refuges in all 50 states, and waterfowl production areas in 10 states, covering more than 150 million acres of public lands. More than 40 million visitors annually fish, hunt, observe and photograph wildlife, or participate in environmental education and interpretive activities on national wildlife refuges.

## 1.5.3 National Wildlife Refuge System Administration Act

Of all the laws governing activities on national wildlife refuges, the Refuge Administration Act undoubtedly exerts the greatest influence. In 1997, the Refuge System Administration Act was amended by the National Wildlife Refuge System Improvement Act; it included a unifying mission for all national wildlife refuges as a system, a new process for determining compatible uses on refuges, and a requirement for each refuge to be managed under a CCP, developed in an open public process.

The Refuge Administration Act states that the Secretary of the Interior "shall provide for the conservation of fish, wildlife, and plants, and their habitats within the System" as well as "ensure that the biological integrity, diversity, and environmental health of the System are maintained" House Report 105-106 accompanying the Improvement Act states that "the fundamental mission of our System is wildlife conservation: wildlife and wildlife conservation must come first."

Biological integrity, diversity, and environmental health are critical components of wildlife conservation. As later made clear in Section 1.5B of the Biological Integrity, Diversity, and Environmental Health Policy, "the highest measure of biological integrity, diversity, and environmental health is viewed as those intact and self-sustaining habitats and wildlife populations that existed during historic conditions."

Under the Refuge Administration Act, each refuge must be managed under an approved CCP to fulfill the Refuge System mission as well as the specific purposes for which it was established. The Refuge Administration Act requires the Service to monitor the status and trends of fish, wildlife, and plants on each refuge.

Additionally, the Refuge Administration Act identifies six priority wildlife-dependent recreational uses. These uses are hunting, fishing, wildlife observation and photography, and environmental education and interpretation. Under the Refuge Administration Act, the Service is to grant these six wildlife-dependent public uses special consideration during planning, managing, establishing, and expanding units of the Refuge System. The overarching goal is to enhance wildlife-dependent recreation opportunities and provide access to quality visitor experiences on refuges, while managing the refuge to conserve fish, wildlife, plants, and their habitats.

New and ongoing recreational uses should help visitors focus on wildlife and other natural resources. These uses should provide an opportunity to make visitors aware of resource issues, management plans, and how the refuge contributes to the Refuge System and Service's mission. When determined compatible on a refuge-specific basis, the six priority uses assume priority status among all uses of the refuge in question. The Service is to make extra efforts to facilitate priority wildlife-dependent public use opportunities.

When preparing a CCP, refuge managers must re-evaluate all general public, recreational, and economic uses (even those occurring to further refuge habitat management goals) proposed or occurring on a refuge for appropriateness and compatibility. No refuge use may be allowed or continued unless it is determined to be appropriate and compatible.

Generally, an *appropriate use* is one that contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan. A *compatible use* is a use that, in the sound professional judgment of the refuge manager, will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge. Updated appropriate use and compatibility determinations for existing and proposed uses for the Willapa Refuge are in Appendices B and C.

A CCP must be developed with the participation of the public, as required by the Refuge Administration Act and other formally established guidance. Issues and concerns articulated by the public play a role in the development of the CCP, and together with the formal guidance, can play a role in finalizing the CCP's goals, objectives, and strategies. It is Service policy to develop CCPs in an open public process. The Service is committed to securing public input throughout the CCP planning process.

## 1.5.4 National Wildlife Refuge System Mission and Goals

The mission of the 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 (NWRS Administration Act of 1966, as amended, 16 U.S.C. 668dd-668ee).

Wildlife conservation is the fundamental mission of the Refuge System. The goals of the National Wildlife Refuge System, as articulated in the Mission, Goals, and Purposes Policy (601 FW 1) are:

- 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 inter-jurisdictional 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.

## 1.5.5 Planning and Management Guidance

Refuges are guided by various Federal laws, executive orders, Service policies, and international treaties. Fundamental to the management of every refuge are the mission and goals of the NWRS, and the designated purposes of the refuge unit as described in establishing legislation, executive orders, or other documents establishing, authorizing, or expanding a refuge.

Key concepts and guidance of the Refuge System are derived from the NWRS Act of 1966 as amended (16 U.S.C. 668dd-668ee), the Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4), as amended, Title 50 of the Code of Federal Regulations (C.F.R.), and the Service Manual. The NWRS Administration Act is implemented through regulations covering the NWRS, published in Title 50, subchapter C of the C.F.R. and policies contained in the Service Manual. These regulations and policies govern general administration of units of the Refuge System.

## 1.5.6 Relationship to Previous and Future Refuge Plans

The final CCP will be revised every 15 years or sooner if monitoring and evaluation findings determine that changes are needed to achieve the refuge purposes, visions, goals, or objectives.

The CCP provides guidance in the form of goals, objectives, and strategies for refuge program areas but may in some cases lack some of the specifics needed for implementation. Step-down management plans may, therefore, be developed for individual program areas as needed, following completion of the CCP. Step-down plans may require appropriate National Environmental Policy Act (NEPA) compliance.

Planning has been part of the Refuge's operations since it was established. Although not all past planning processes were carried out in a comprehensive fashion, with the level of public participation considered adequate today, a considerable number of plans have been completed over the years to guide refuge managers. A list of various refuge management plans and the year they were completed follows. Plans marked with an asterisk are covered through this CCP.

- Habitat and Public Use Management (Quarterly/Annual Action Summary)
- Station Safety Plan (updated annually)
- Continuity of Operations Plan (2006)
- Highly Pathogenic Avian Influenza Disease Contingency Plan (2006)
- Fire Management Plan (2004)

- Marsh and Water Management Plan (1990)*
- Refuge Habitat Management Plan (2005)*
- Public Use Management/Development Plan (1988)*
- Willapa Refuge Hunting Plan and Environmental Assessment (1986)*
- Refuge Management Plan (1986)*

## 1.6 Refuge Establishment and Refuge Purposes

The purpose for which a refuge was established or acquired is of major importance in refuge planning. Refuge purposes form the foundation for planning and management decisions. The purposes of a refuge are specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit.

Unless the establishing law, order, or other document indicates otherwise, purposes dealing with the conservation, management, and restoration of fish, wildlife, and plants, and the habitats on which they depend take precedence over other purposes in the management and administration of any Refuge System unit. When a refuge has multiple purposes related to fish, wildlife, and plant conservation, the more specific purpose will take precedence in instances of conflict. When a new refuge unit is acquired under an authority different from the original refuge's establishing authority, the new unit takes on the purpose(s) of the original unit, but the original unit does not take on the purpose(s) of the new addition.

By law, refuges are to be managed to achieve their purposes. When a conflict exists between the Refuge System's mission and the purpose of an individual refuge, the refuge purpose may supersede the Refuge System's mission.

Refuge purposes are also the driving force in the development of a refuge's vision statements, goals, and objectives in the CCP. The purposes are critical to determining the compatibility of all existing and proposed refuge uses.

### 1.6.1 Acquisition History and Purposes

The refuge purposes refer to the justification for the establishment of a refuge within the NWRS as a place owned by the American people and cared for on their behalf. The following purposes form the foundation for management decisions and the planning process for the Willapa NWR, including the development of the goals and objectives.

With passage of the Migratory Bird Conservation Act in 1929, the Migratory Bird Conservation Commission (MBCC) was established to approve land acquisitions from the Migratory Bird Conservation Fund for the NWRS that are considered important to waterfowl. The commission was established largely in response to public concern over plummeting waterfowl populations during the Dust Bowl days of the 1920s and 1930s, reflecting the NWRS's early commitment to waterfowl protection. The MBCC set the stage for the establishment and purchase of lands for the Willapa NWR.

The MBCC (acting under the authority of the Migratory Bird Conservation Act of 1929) on May 7, 1936, approved the acquisition of 24 tracts totaling 4,825 acres in Pacific County, Washington,

authorizing the establishment of the Willapa Migratory Waterfowl Refuge. At that meeting, 1,642 acres were approved for purchase, which included 15 tracts. Specifically the MBCC meeting memorandum no. 16 also identified the tidal marsh around Long Island as

> one of the most important concentration points for migratory waterfowl on the Washington Coast. It has a fine supply of natural aquatic foods, especially eel-grass, and thereby has been for years one of the few suitable wintering grounds available for Black Brant.

The memo also states that Washington ranked fourth in the nation in Duck Stamp sales and further states that "it is essential for the preservation of the Pacific flyway that the Restoration program provide adequate sanctuary facilities for migratory birds in that state."

The meeting minutes also note the management vision by Mr. Gabrielson (Department of Interior): "what we planned to do is to close by executive order the shallow water here where the birds feed. The mud flats are a concentration area."

On October 14, 1936, 196 acres were purchased establishing the Refuge, and the refuge purposes were derived from the earlier MBCC meeting memorandum no. 16. On January 12, 1937, three months after the first property was purchased, President Franklin Roosevelt signed Executive Order 7541, Establishing Public Domain Lands. The Refuge was called Willapa Harbor Migratory Bird Refuge, and it was established "as a refuge and breeding ground for migratory birds and other wildlife." These land tracts (1 and 1a) are currently known as the Shoalwater Unit of Willapa NWR.

Later that year President Roosevelt issued Executive Order 7721, enlarging Willapa Harbor Migratory Bird Refuge "in order to effectuate further the purposes of the Migratory Bird Conservation Act (45 Stat. 1222)." The executive order states:

> The following lands and accretions, comprising approximately 5,000 acres either acquired or be acquired are reserved and set apart subject to existing rights for the use of the Dept. of Agriculture as an addition to the Willapa Harbor Migratory Bird Refuge established by EO 7541.
>
> Provided, that any private lands within the area described shall become a part of the Refuge upon the acquisition of title thereto or lease thereof by the United States.

A few years later, in July 1940, a presidential proclamation was issued that changed the name from the Willapa Harbor Migratory Bird Refuge to Willapa National Wildlife Refuge.

Later that same year Acting Secretary of Interior E.K. Burlew wrote the President a letter dated October 22, 1940 to request an Executive Order, stating that

> after careful consideration of the exigencies of the migratory waterfowl and other migratory birds resident upon the and reporting to the Willapa National Wildlife Refuge, it has been determined that to allow the hunting, taking, capturing, or killing of such migratory birds on the lands and waters in Willapa Bay adjacent to or in the vicinity of the Refuge would defeat the protections sought to be extended to such migratory birds by the establishment of the Willapa refuge.

The letter also states that this proposal is supported by local sportsmen and the Washington State Game Commission. It proceeds with the purpose for the proclamation, which is "to extend

jurisdiction of the Department of Interior over these lands and waters by making them a closed area under the Migratory Bird Treaty Act of July 3, 1918 (40 Stat. 755)."

Later that year on November 7, 1940, the President issued another Proclamation (No. 2439): Regulation Designating As Closed Area under the Migratory Bird Treaty Act Certain Lands and Waters Adjacent to and in the Vicinity of the Willapa National Wildlife Refuge Washington.

As lands were acquired into the Refuge, with purposes derived from the earlier Executive Order, it is also made clear in several MBCC Memoranda that "A Proclamation closes to hunting the water surrounding the island." That "island" refers to Long Island in south Willapa Bay. The Refuge maintains the Presidential Proclamation Boundary specifically prohibiting hunting around Long Island.

Throughout the 1940s and 1950s, the lands approved for purchase were under the purposes derived from Executive Order 7541.

On April 7, 1967, in the Notice of Proposed Withdrawal and Reservation of Land, the purposes of the Leadbetter Point Unit were described: "The applicant desires to use the land for the management of migratory birds and other wildlife as an extension of the Willapa National Wildlife Refuge." One year later (April 16, 1968), Leadbetter Point Unit was added to the Refuge by Public Land Order 4403.

Beginning in 1978 through today, expansion of the Refuge identified specific habitat or wildlife attributes that were described in the environmental assessments (EAs) of those lands. In 1978, the EA for the acquisition of Long Island described its purposes:

- A grove of virgin western red cedars and western hemlock.
- Supports one of largest nesting colonies of great blue herons (150 nests on Burlington Northern land) in the Pacific NW.
- Five plants are listed as endangered by a Smithsonian report: *Aster chilensis hallii*, *Erythronium oregonum*, *Aster curtus*, *Arenaria paludicola*, and *Lasthenia minor maritime*.

An EA in 1983 derived the purposes for the Burlington Northern Land Exchange, Pacific County, Washington Tract: 12, Long Island Unit (92.2 acres): "1. To preserve and protect unique ecosystems associated with Willapa Bay. 2. To provide for maximum use and production by migratory birds other than wintering waterfowl, with special emphasis on bald eagles and marsh and wading birds." Land was exchanged for 175 acres on Little Pend Oreille NWR. Mineral rights were held by Burlington Northern Santa Fe.

In December 1999, the Willapa Addition EA/Land Protection Plan and Conceptual Management Plan describe the purposes for the future boundary expansion of 2,278 acres for the Bear River, Teal Slough, and Tarlatt Slough areas as follows:

- Protect habitat for old-growth dependent species including the threatened marbled murrelet (*Brachyramphus marmoratus*) and threatened northern spotted owl (*Strix occidentalis caurina*).
- Protect and restore upland forest and associated stream habitat in order to protect and enhance declining fish populations, including coastal cutthroat trout, and Chinook, coho, and chum salmon runs.

- Protect and restore coastal wetlands to provide a diversity of habitats for migratory waterfowl, shorebirds, wading birds, and songbirds.
- Protect the intertidal mudflats along Willapa Bay by consolidating *Spartina*-infested lands for better management of control and eradication efforts on existing refuge lands and on adjacent tidelands.
- Provide large scale habitat management through linking existing refuge lands in a contiguous Refuge boundary.
- Provide wildlife-dependent public use opportunities compatible with refuge purposes.

## 1.6.2 Summary of Purposes and Management Direction for the Willapa Refuge

The purposes for the Willapa NWR have been identified in historic legal documentation that established and added to refuge lands. Because the Refuge was originally established to preserve an important wintering and foraging habitat for migratory waterfowl in the Pacific Flyway, preservation of this waterfowl habitat represents a priority for management to achieve the refuge purpose. In accordance with 601 FW 1, all lands acquired since the original establishment of the Refuge retain this purpose.

- "as a refuge and breeding ground for migratory birds and other wildlife" (Executive Order 7541, dated January 22, 1937).

- "for use as an inviolate sanctuary, or for any other management purpose, for migratory birds" (16 U.S.C. 715d, Migratory Bird Conservation Act).

- "suitable for—(1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species" (16 U.S.C. 460k-1).

- "the Secretary … may accept and use … real … property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors" (16 U.S.C. 460k-2, Refuge Recreation Act [16 U.S.C. 460k-460k-4], as amended).

- "for the development, advancement, management, conservation, and protection of fish and wildlife resources" (16 U.S.C. 742f(a)(4)).

- "for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude" (16 U.S.C. 742f(b)(1), Fish and Wildlife Act of 1956).

In accordance with 601 FW 1, all lands acquired since the original establishment of the Refuge retain this purpose.

Management priorities are further stated in subsequent land acquisition documents to preserve, protect, and restore newly acquired habitats and provide habitat for other migratory birds, plants, and wildlife with special emphasis for marbled murrelets, bald eagles, waterfowl, shorebirds, marsh, and wading birds. Documentation for additional lands also identified the following habitats, wildlife,

public opportunities, and management priorities to support a diverse assemblage of native fish, wildlife, and plants:

- Eelgrass beds
- Gravel bars
- Old-growth/mature forests
- Riverine habitats
- Intertidal mudflats
- Sand dune habitat
- Fish species: chum coho, Chinook, and salmon; steelhead; sea-run cutthroat trout
- Amphibian diversity
- Compatible wildlife-dependent recreation
- Educational/research opportunities
- Cultural resource sites

## 1.6.3 Special Land Status

### 1.6.3.1 Research and Natural Areas (Washington State)

The Refuge has three State-registered natural areas that are in the research natural area (RNA) category. These RNAs are owned and administered by the Service to 1) preserve examples of all significant natural ecosystems for comparison with those influenced by humans, 2) provide educational and research areas for ecological and environmental studies, and 3) preserve the genetic and behavioral diversity of native and endangered plants and animals. These areas consist of Diamond Point RNA (88 acres) and Cedar Grove RNA (264 acres), both of which are located on Long Island, and the Leadbetter RNA (1,705 acres). Detailed information regarding these areas can be found in Chapters 4 and 5.

## 1.6.4 Other Laws, Policies, and Orders

Many other laws apply to the USFWS and management of Refuge System lands. Examples include the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended, and the National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. 470), as amended. A list and brief description of each can be found online at http://laws.fws.gov.

In addition, over the last few years, the Service has developed or revised numerous policies and Director's Orders to reflect the mandates and intent of the NWRS Improvement Act. Some of these key policies include the Biological Integrity, Diversity, and Environmental Health Policy (601 FW 3); the Compatibility Policy; the Refuge Planning Policy; Mission, Goals, and Purposes (602 FW 1), Appropriate Refuge Uses (603 FW 1); Wildlife-Dependent Public Uses (605 FW 1); and the Director's Order for Coordination and Cooperative Work with State Fish and Wildlife Agency Representatives on Management of the National Wildlife Refuge System. These policies and others in draft or under development can be found online at http://refuges.fws.gov/policymakers/nwrpolicies.html.

In developing a CCP, refuges must consider these broader laws and policies as well as Refuge System and ecosystem goals and visions. The CCP must be consistent with these and also with the refuge purpose.

# 1.7 CCP Relationship to Other Ecosystem Planning Efforts

One of the major purposes of this CCP is to ensure that refuge management is focused on achieving not only the refuge purposes, but also to analyze and determine the appropriate role of the Refuge in relationship to national, regional, and State entities, as well as watershed districts, in meeting various goals and objectives for conservation of natural resources. These goals are stated in various plans that pertain to individual wildlife species and the Pacific Northwest. A brief summary of the major plans considered during development of this CCP follows.

## 1.7.1 Applicable Recovery Plans

The Service has prepared recovery plans that are intended to serve as guidance documents for agencies, landowners, and the public. Each plan includes recommendations for actions considered necessary to satisfy the biological needs and ensure the recovery of the listed species. These plans also emphasize opportunities for improved management of listed species on Federal and State lands. Recommended actions generally include protection, enhancement, and restoration of those habitats deemed important for recovery, monitoring, research, and public outreach. Recovery plans for federally listed species that occur at Willapa Refuge include:

- Recovery Plan for the Marbled Murrelet (USFWS 1997a)
- Revised Recovery Plan for the Oregon Silverspot Butterfly (USFWS 2001a)
- Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (USFWS 2007a)
- Recovery Plan for the Northern Spotted Owl (USFWS 2008a)

The recommendations provided in the recovery plans for these listed species have been considered during the development of this CCP.

## 1.7.2 Migratory Bird Conservation

### 1.7.2.1 Birds of Management Concern (USFWS 2004a)

Birds of Management Concern (BMC) represent a subset of all species protected by the Migratory Bird Treaty Act (50 C.F.R. 10.13) and includes those which pose special management challenges due to a variety of factors (e.g., too few, too many, conflicts with human interests, or societal demands). BMC comprises both game birds below their desired condition and nongame birds. As indicated in its strategic plan (USFWS 2004a), the Migratory Bird Program places priority emphasis on these birds in its activities.

Willapa NWR provides breeding, wintering, and/or stopover habitat for some of the birds identified as BMC with primary importance in the region. Habitats for 11 focal species are supported on this Refuge. Those species consist of the brown pelican (*Pelecanus occidentalis*), dusky Canada goose (*Branta canadensis occidentalis*), brant (*Branta bernicla nigricans*), northern harrier (*Circus cyaneus*), western snowy plover (*Charadrius alexandrinus nivosus*), whimbrel (*Numenius phaeopus*), red knot (*Calidris canutus roselaari*), band-tailed pigeon (*Columba fasciata*), Vaux's swift (*Chaetura vauxi*), olive-sided flycatcher (*Contopus cooperi*), and red crossbill (*Loxia curvirostra*).

### 1.7.2.2 Birds of Conservation Concern (USFWS 2008b)

The 1988 amendment to the Fish and Wildlife Conservation Act mandates the USFWS to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973." The publication *Birds of Conservation Concern 2008* (BCC) is the most recent effort to carry out this mandate. The BCC identifies the migratory and non-migratory bird species, beyond those already designated as federally threatened or endangered, that represent the Service's highest conservation priorities. BCC species are a select group of birds appearing on the BMC list.

Thirteen BCC species within the U.S. portion of the Northern Pacific Forest, Bird Conservation Region regularly occur at Willapa NWR: northern goshawk (*Accipiter gentilis laingi*), bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), whimbrel, marbled godwit (*Limosa fedoa*), red knot, short-billed dowitcher (*Limnodromus griseus*), Caspian tern (*Sterna caspia*), rufous hummingbird (*Selasphorus rufus*), olive-sided flycatcher, willow flycatcher (*Empidonax traillii*), streaked horned lark (*Eremophila alpestris strigata*), and purple finch (*Carpodacus purpureus*).

### 1.7.2.3 Partners in Flight, North American and State Landbird Conservation Plans

Partners in Flight (PIF) is an international coalition of government agencies, conservation groups, academic institutions, private organizations, and citizens dedicated to the long-term maintenance of healthy populations of native landbirds. The goal of PIF's landbird conservation plans is to focus resources on the improvement of monitoring and inventory, research, management, and education programs involving birds and their habitats. PIF's strategy is to stimulate cooperative public- and private-sector efforts in North America and the Neotropics to meet these goals.

Specific strategies for accomplishing the goals are contained in regional landbird conservation plans. These plans describe priority habitats and species and provide recommended management actions to conserve those habitats and species. The regional plans applicable to the Refuge are entitled *Conservation Strategy for Landbirds in Lowlands and Valleys of Western Oregon and Washington* (Altman 2000) and *Conservation Strategy for Landbirds in Coniferous Forests of Western Oregon and Washington* (Altman 1999). The lowlands and valleys plan identifies three priority habitats: grassland/savannah, oak woodland, and riparian. Two of these habitats, grassland/savannah and riparian, are found within the Refuge. All forest conditions identified in the coniferous forest plan, except the unique classifications, are found on the Refuge. In addition, over 40 focal species identified in the two plans occur on the Refuge.

### 1.7.2.4 Seabird Conservation Plan, Pacific Region (USFWS 2005a)

The California Current System is one of the most ecologically complex habitats. A diverse assemblage of organisms inhabits the California Current, including 60 species of seabirds, many of which breed or migrate through the coastal waters around Willapa NWR. The purpose of the Seabird Conservation Plan is to identify priorities for seabird management, monitoring research, outreach, planning, and coordination (USFWS 2005a). The plan provides guidance and recommendations for conservation actions addressing a prioritized group of species occurring at a regional scale. Specific information on ecology, population, status, distribution, threats, and conservation needs is provided for species breeding in the region.

Although the Refuge does not manage seabird breeding habitats except for that of the marbled murrelet, many species of marine birds occur in the surrounding coastal waters.

### 1.7.2.5 USFWS Regional Marine Bird Policy (USFWS 1985)

This policy was enacted to recognize the significance of maintaining healthy, viable populations of marine birds in the Pacific. It is intended to guide the Service in implementing provisions of the Migratory Bird Treaty Act relative to marine birds. Specifically, the policy sets directives to 1) Utilize current programs and resources to maintain seabird populations at or above current levels, in a naturally diverse state and on native habitats throughout their range; 2) Achieve a goal of establishing and actively protecting colonies, roosts, loafing sites, and adjacent waters as sanctuaries; 3) Encourage the development of comprehensive management plans and appropriate regulations aimed at developing offshore petroleum and mineral resources and the safe transport of such resources that adequately protect marine birds and their habitats; 4) Promote research, survey, and monitoring programs focusing on seabirds and marine ecosystems, especially long-term monitoring that identifies declining species that may require future listing without immediate intervention; and 5) Remove non-native predators from seabird colonies on all National Wildlife Refuges, and encourage their removal from colonies on all other lands.

### 1.7.2.6 Northern Pacific Coast Region, Shorebird Conservation Plan (Drut and Buchanan 2000)

Willapa NWR is also located within the Northern Pacific Coast Region, as defined by the *U.S. Shorebird Conservation Plan* (Brown et al. 2000). The Northern Pacific Coast Region is an important wintering area for shorebirds that breed in the arctic and temperate zones, but it is also important during migration, particularly for arctic-breeding species. There are also important breeding populations in the region. The major regional goal of the *U.S. Shorebird Conservation Plan* is “to ensure that adequate quantity and quality of habitat is identified and maintained to support the different shorebirds that breed in, winter in, and migrate through each region.”

The *Northern Pacific Coast Region Shorebird Conservation Plan* (NPCRSCP) includes several conservation priorities that are relevant to Willapa NWR. These relevant priorities include increasing the breeding population of the highly imperiled western snowy plover to 250 breeding adults within the Oregon and Washington Recovery Unit; increasing and/or maintaining the breeding population of the western snowy plover and killdeer (*Charadrius vociferus*) by restoring, enhancing, and creating nesting habitat; and increasing migratory and wintering populations of all key shorebird species in the region using various protection, restoration, enhancement, and management strategies. The NPCRSCP identifies tidal flats and sand beaches as important shorebird habitat within the coastal areas of Washington. Willapa Bay includes the largest remaining area of tidal mudflat habitat and the most coastal salt marsh habitat in southwestern Washington. Leadbetter Point has the greatest extent of mostly isolated, sparsely vegetated, sand beach on the entire southern Washington coast. Therefore, the NPCRSCP’s habitat goals for tidal wetlands and coastal sand beaches are relevant to the Refuge. These goals include restoring tidal flats and estuarine marshes to benefit shorebirds; enhancing tidal action in existing wetlands through the removal and maintenance of introduced cordgrass; and managing a sufficient amount shallow open water habitat to support shorebird populations; and limiting human disturbance to shorebirds in all seasons. The NPCRSCP recommends restoration and enhancement of sparsely vegetated sand beach habitat by removing and controlling introduced beachgrass. The NPCRSCP also includes goals for managed freshwater

wetlands, which call for improving and maintaining the value of managed freshwater wetlands to benefit shorebirds.

In the NPCRSCP, Willapa Bay has been proposed as a site of international significance supporting more than 100,000 shorebirds, or 15 percent of the Pacific Flyway total (Drut and Buchanan 2000). The Refuge provides breeding, wintering, and/or stopover habitat for most of the shorebirds identified in the NPCRSCP as having primary importance within the region. Of the 20 species of highest concern for which coastal habitats in the Northern Pacific Coast Region are especially important, 11 species—the western snowy plover, black-bellied plover (*Pluvialis squatarola*), killdeer, greater yellowlegs (*Tringa melanoleuca*), whimbrel, marbled godwit, red knot, sanderling (*Calidris alba*), dunlin (*Calidris alpina*), short-billed dowitcher, and western sandpiper (*Calidris mauri*)—are supported on this Refuge.

## 1.7.3 Waterbird Conservation Planning

### 1.7.3.1 North American Waterbird Conservation Plan (Kushlan et al. 2002)

An independent partnership was created to develop a plan that sustains or restores the distribution, diversity, and abundance of breeding, migratory, and non-breeding waterbirds of North and Central America and the Caribbean region (Kushlan et al. 2002). The primary goal of the council formed from this partnership was to develop and facilitate implementation of the North American Waterbird Conservation Plan (NAWCP). Completed in 2002, the NAWCP outlines a continental-scale conservation and management strategy for over 200 aquatic bird species. The NAWCP identifies vulnerabilities and threats to species and their habitats. Habitat and site-based conservation actions throughout the Americas and the North Pacific are promoted by the NAWCP. Conservation priorities, information needs, resources, and infrastructure are identified at regional and local levels in a step-down process through regional working groups.

### 1.7.3.2 North American Waterfowl Management Plan

The North American Waterfowl Management Plan (NAWMP) is an international action plan to conserve migratory birds throughout the continent. The goal of the NAWMP is to return waterfowl populations to their levels in the 1970s by conserving wetland and upland habitat. Canada and the United States signed the NAWMP in 1986, in reaction to critically low numbers of waterfowl. Mexico joined in 1994, making it a truly continental effort. The NAWMP is a partnership of federal, provincial, state and municipal governments, nongovernmental organizations, private companies, and many individuals, all working toward achieving better wetland habitat for the benefit of migratory birds, other wetland-associated species, and people.

Transforming the goals of the NAWMP into on-the-ground actions is accomplished through partnerships called joint ventures. Joint ventures are made up of individuals; corporations; conservation organizations; and local, state, provincial, and federal agencies. There are currently 11 habitat joint ventures in the United States and four in Canada endorsed by the NAWMP committee. One of the habitat joint ventures has international status (Canada–United States). Partners from Canada and the United States also jointly support three species joint ventures. Habitat joint ventures restore and enhance wetlands and associated upland habitats. The species joint ventures address monitoring and research needs of black ducks, Arctic nesting geese, and seaducks.

The Pacific Joint Venture's (PJV) partners work within a planning framework that links local conservation priorities to the regional goals of the Pacific Coast and Intermountain West Joint Ventures. Focus areas are identified within the region. Within the Southern Washington Coast Focus Area, the Pacific Joint Venture is dedicated to ensure habitat objectives are met and sustained through the following recommended actions:

1) Key coastal wetlands are protected for the long term through means such as fee title acquisition, easements, conservation covenants, government land transfers, and management agreements.
2) Degraded or converted wetlands are restored to re-establish ecological relationships that more closely represent the site's original conditions. PJV partners frequently collaborate to restore former agricultural land, tidal marshes, and riparian communities. Examples of restoration projects include re-establishing riverine channels and riparian habitat, planting native vegetation, and restoring tidal flow to diked agricultural areas.
3) Enhancement projects increase the wildlife values of specific habitats on secured lands. One way this is accomplished is through projects that control invasive and non-native plants.

#### 1.7.3.3 Pacific Flyway Management Plan

The Pacific Flyway Council is an administrative body that forges cooperation among public wildlife agencies for the purpose of protecting and conserving migratory game birds in western North America. The council is generally composed of one member from the public wildlife agency in each state and province in the western United States, Canada, and Mexico.

Biologists from state, federal, and provincial wildlife and land-management agencies, university students and faculty, and others develop management plans for the cooperative management of migratory game bird populations in the Pacific Flyway. Biologists from the Central Flyway, Canada, Mexico, and Russia contribute to these plans. The following management plans pertain to refuge habitats and associated waterfowl species.

#### 1.7.3.4 Pacific Flyway Management Plan for the Pacific Population of Aleutian Cackling Goose

The goal of this plan is to identify needs and responsibilities necessary to cooperatively manage the number and distribution of Aleutian cackling geese (*Branta hutchinsii leucopareia*), to provide for optimal aesthetic, educational, scientific, and hunting uses throughout their range (Pacific Flyway Council 1999a).

The Refuge lies within the wintering range of cackling geese in northwestern Oregon and southwestern Washington. Willapa NWR and surrounding fields adjacent to Willapa Bay provide migratory stopover habitat in Washington State (Kraege 2005). Refuge practices discussed in the CCP, including estuarine restoration and mowing of pasture, provide goose habitat. The Refuge also provides sanctuary from disturbance.

#### 1.7.3.5 Pacific Flyway Management Plan for the Pacific Population of Brant

The Pacific brant subspecies breeds in the western Arctic of North America. In the early 1980s, a dramatic decline and redistribution of Pacific brant occurred in western Alaska, a particularly important breeding region for this population. The three-year mean population estimate for Pacific

brant is 88 percent of the plan goal. The Pacific brant population is presently considered stable. A population objective of 12,000 wintering birds was established, and the 2008 population estimate based on an index derived from midwinter surveys totals 24,972.

#### 1.7.3.6 Pacific Flyway Management Plan for the Pacific Population of Dusky Canada Goose

The goal of this management plan is to maintain and enhance the dusky Canada goose population. The objectives of the plan include 1) sustaining a population of between 10,000 to 20,000 geese, as measured by indices of geese on Copper River Delta and Middleton Island; 2) managing and improving breeding ground habitat conditions to achieve average annual production of 20 percent young, measured as the most recent 10-year average; and 3) maintaining and enhancing wintering and migration habitats in sufficient quantity and quality; and 4) managing wintering habitat to provide optimum food, water, and sanctuary conditions, and to provide optimum geographical distribution, with an emphasis on habitat objectives outlined in the Northwest Oregon/Southwest Washington Canada Goose Agricultural Depredation Control Plan (Pacific Flyway Council 1998).

#### 1.7.3.7 Washington Natural Heritage Plan

The Washington Natural Heritage Plan is a product of the Washington Natural Heritage Program, whose mission is to conserve the full range of Washington's native plants, animals, and ecosystems through voluntary and cooperative action. The program uses science to identify high-quality and representative examples of native Washington habitats and species and works to protect these natural treasures through voluntary and cooperative habitat conservation agreements.

The Washington Natural Heritage Plan and Program:

- Describe the components of Washington's natural heritage and biodiversity;
- Identify natural areas of exceptional value for conservation;
- Provide opportunities for voluntary conservation on both public and private lands; and
- Emphasize creating partnerships to enhance the capacity to have a positive conservation impact.

Areas of Critical Environmental Concern, Wilderness Areas, National Monuments, local preserves, and other public lands with management plans that adequately protect Washington's natural heritage are now included with RNAs and preserves as providing complete or partial protection for some ecosystems and species. For NWRs, the plan recommends that RNAs be established to protect natural areas of exceptional value (particularly those areas that are unique, and have no similar examples protected elsewhere). Leadbetter Point, Diamond Point, and the Cedar Grove are all designated RNA sites on Willapa Refuge.

#### 1.7.3.8 Washington Comprehensive Wildlife Conservation Strategy/Washington Wildlife Action Plan

In response to two Federal programs—the Wildlife Conservation and Restoration Program and the State Wildlife Grant Program—the Washington Department of Fish and Wildlife (WDFW) prepared a wildlife action plan (WAP) as part of the Comprehensive Wildlife Conservation Strategy. The WAP includes information on the distribution and abundance of priority wildlife and habitats; provides strategies for conserving and monitoring wildlife and habitat; and provides for coordination with Federal,State, tribal, and local agencies, as well as the public. The WAP emphasizes proactive measures to conserve declining species and habitats, and to maintain the status of common species.

At least 32 species identified as "species of greatest conservation need" in the Washington Wildlife Action Plan (WDFW 2005) occur on the Refuge, including the streaked horned lark, western snowy plover, marbled murrelet, Dunn's salamander (*Plethodon dunni*), Van Dyke's salamander (*P. vandykei*), Columbia torrent salamander (*Rhyacotriton kezeri*), and western pearlshell mussel (*Margaritifera falcate*).

#### 1.7.3.9 South Willapa Bay Conservation Area—Forest Landscape Restoration Plan

In July 2003, The Nature Conservancy (TNC) and the Willapa NWR began a collaborative effort to design and develop a mutual forest management plan with goals and objectives on properties managed by both parties in Pacific County, Washington. The South Willapa Bay Forest Landscape Restoration Plan (Churchill et al. 2007; Appendix K) states the intent of management within the South Willapa Bay Conservation Area (SWBCA) is to restore self-sustaining, natural, ecological processes and healthy forest and stream systems, as opposed to engineering or manipulating habitats to meet specific structural or compositional targets.

Restoration actions, or active management, will primarily include:

1) Carefully designed density management (i.e., thinning) within young-managed forest stands (< 90 years old) to promote forest growth and the development of habitat complexity,
2) Removal, or repair of high risk forest roads, and
3) Improvement to the existing forest road network to minimize impacts to water quality.

Refuge goals related to forest management include:

1) To preserve and protect unique ecosystems associated with Willapa Bay.
2) To manage for the conservation and recovery of threatened and endangered animals in their natural ecosystems.

Under these goals the Refuge has developed specific objectives related to the forest management program.

1) Restore ecological function to refuge forests by creating a natural distribution of stand structure, composition, and successional stages while promoting old-growth/late successional characteristics to benefit forest-dependent wildlife—especially the marbled murrelet.
2) Decommission unnecessary forest roads to reduce/eliminate stream impacts and fragmentation of forest habitat.
3) Adopt forest management practices designed to change fire-prone thickets of western hemlock over a period of time to something that structurally resembles old-growth and reduces fuel loads.
4) Protect, and where appropriate, restore associated stream habitat to prevent further declines of anadromous fish stocks and enhance native amphibian populations and other stream-dependent wildlife species.
5) Reduce risk from insects and disease where epidemics are likely.

## 1.8 The Planning Process

A core planning team, consisting of a project leader, biologist, public use planner, the refuge manager, and a regional refuge conservation planner, began developing the CCP in 2008. An

extended team assisted in development, particularly in providing comments at key milestones. The extended team consisted of various professionals from other agencies (WDFW, Washington Department of Natural Resources [WDNR]) and within the Service. A list of the core team members and their experience is located in Appendix D.

Early in the planning process, the team identified the priority species, groups, and communities for the Refuge. These priorities were also called "conservation targets," and most of the biological emphasis of the CCP is focused on maintaining and restoring these targets.

Public use planning centered on developing goals, objectives, and strategies around the wildlife-dependent public uses. Other non-wildlife-dependent uses that currently occur were also addressed.

Public scoping began in March of 2008. Scoping meetings were held in South Bend and Ilwaco, Washington. Public commentary was also solicited through distribution of a planning update to the Refuge's CCP mailing list, refuge visitors, and other interested parties. A complete summary of public involvement can be found in Appendix E.

## 1.9 Issues, Concerns, and Opportunities

Issues are defined as matters of controversy, dispute, or general concern over resource management activities, the environment, land uses or public use activities. Issues are important to the planning process because they identify topics to be addressed in the CCP, pinpoint the types of information to gather, and help to define alternatives for the CCP. Various issues, concerns, and opportunities were raised by the public as well, and all are addressed in some manner in the CCP.

It is the Service's responsibility to focus planning on major issues. Major issues typically suggest different actions or alternative solutions and are considered within the Refuge's jurisdiction. Major issues may have either a positive or negative effect on the resource. Major issues will influence the decisions proposed in the plan.

The core planning team discussed and presented preliminary issues to the public during public scoping. These preliminary issues were thought to be potential issues of concern for the public. Some of the preliminary issues presented to the public may have been revised, may have played a minor role, or were eliminated from further consideration as a major issue.

Although CCPs are comprehensive plans, no single plan can cover all issues. One issue identified as being outside the current plan is eradication of a non-native cordgrass species, *Spartina alterniflora*; the Service has implemented the *Spartina* Eradication Control Plan.

Presented below are a brief series of questions presented to the public during scoping meetings, designed to open up discussion for each topic. Following the questions, brief descriptions of the major issues, concerns, and opportunities were shared, some of which are presented below. These and other issues identified are later addressed in greater detail within this CCP.

## 1.9.1 Wildlife and Habitat

### 1.9.1.1 Estuarine Restoration

*Is estuarine (tidal marsh) restoration a desirable action? If it is, on which refuge units should restoration be considered? Which units, if any, should remain under current management practices?*

Estuarine restoration is being considered as part of this CCP so that the Refuge can restore a more naturally functioning ecosystem to Willapa Bay. To date, we have restored tidal marshes at Headquarters, Bear River tributaries, and on Long Island. One of the larger refuge units, which consists of 749 acres of former tideland located in the South Bay, is protected by dikes and tidegates. This area is managed primarily for waterfowl, and in some cases for salmonids and amphibians. In this CCP, the Refuge will examine the implications of restoring this area to a native salt marsh.

### 1.9.1.2 Western Snowy Plover Protection

*What management actions would better protect western snowy plovers from disturbance and predation, while measures to protect and restore habitat are occurring?*

The western snowy plover is threatened throughout its range by loss and disturbance of habitat and nesting sites. The primary threats to the snowy plover are habitat degradation caused by human disturbance, urban development, beachgrass introduction, and predators. The plovers nesting on the Leadbetter Point Unit face direct losses of nests and fledglings due to predation, particularly by crows and ravens, resulting in poor hatching and fledging success rates for western snowy plovers.

### 1.9.1.3 Forest Management

*What forest management practices should be implemented to restore forest complexity and biodiversity?*

Forest lands in the Willapa Bay area, including the Refuge, are dominated by second- and/or third-growth forests, very little old-growth or late-successional forest exists. The quantity, distribution, and quality of the forest community has been significantly altered due to past timber harvest practices. These changes have invariably affected the structure of the wildlife community associated with this forest landscape. A variety of wildlife is dependent on these forest types, including the federally threatened marbled murrelet. The lack of late-successional/old-growth forest habitat is one reason for the disappearance of the spotted owl from the Refuge. Forest streams also provide habitat for anadromous fish such as chum, coho, and Chinook salmon, and sea-run cutthroat trout, making stream restoration a necessary part of forest management efforts. Due to the degraded nature of the Refuge's forests, and those in the surrounding areas, a major effort is needed to restore these forests to a semblance of their natural state.

## 1.9.2 Land Protection Planning

### 1.9.2.1 Refuge Boundary Expansion

*Should expansion of the refuge boundary be considered, and if so, what lands and under what circumstances should the Service consider boundary expansion?*

Willapa Refuge currently encompasses approximately 16,000 acres in fee title and includes easements located primarily in the South Bay and on the tip of Leadbetter Peninsula. In 1999, the Service expanded the Refuge's acquisition boundary by 2,200 acres. Since then we have acquired approximately 1,700 acres from willing sellers. A large increase in the amount of land acquired by nonprofit organizations for conservation purposes has occurred in Pacific County, and many groups have expressed interest in strategically expanding the Refuge's boundary to include sensitive habitats in need of protection.

## 1.9.3 Public Use and Access

### 1.9.3.1 Wildlife-dependent Recreational Uses

*Should the Refuge's wildlife-dependent recreational uses be expanded or reduced? What opportunities are available that would satisfy public needs while conserving resources?*

The Refuge currently provides opportunities for high-quality, wildlife-dependent recreational uses that highlight the coastal dunes, open bay waters, salt marshes, mudflats, grasslands, and old-growth forests. The Refuge is open to the public for a variety of uses, including hiking trails, hunting programs (waterfowl, deer, elk, and bear), wildlife observation, clamming, fishing, beach activities, and camping. An opportunity exists to expand and provide additional quality elk hunting opportunities by opening the Leadbetter Point Unit, South Bay Units, and other areas to be included in Washington State's elk hunting season. School groups enjoy environmental education programs both on and off the Refuge. Visitors are introduced to the Refuge's resources through various interpretive exhibits located on the Refuge. A visitor/administrative and maintenance facility will allow for increased on-site interpretation and environmental education programs.

# Chapter 2
# Management Direction

*Western pearlshell mussel*
USFWS

# Chapter 2. Management Direction

## 2.1 Overview

During development of the CCP management direction, the Service reviewed and considered a variety of resource, social, economic, and organizational aspects important for managing the Refuge. As is appropriate for a national wildlife refuge, resource considerations were fundamental in designing the management direction. House Report 105-106 accompanying the NWRS Improvement Act of 1997 (Public Law 105-57) states that "the fundamental mission of our System is wildlife conservation: wildlife and wildlife conservation must come first."

The Service planning team reviewed and used available scientific information (reports and studies) to better understand ecosystem trends and the latest scientific recommendations for species and habitats. The team also met with staff from local, State, and Federal agencies, and elected officials to ascertain priorities and problems as perceived by others. Refuge staff also met with refuge users, nonprofit groups, and community organizations to ensure their comments and ideas were considered during CCP development.

The details of public participation can be found in Appendix E, Summary of Public Involvement and Response to Comments.

## 2.2 Description of Management Direction

The management direction describes a combination of habitat and public use management prescriptions designed to achieve the refuge purpose, goals, and vision. It provides ways to address and respond to major public issues, management concerns, and opportunities identified during the planning process. All of the major issues, activities, and management concerns were evaluated and addressed and are shown in the corresponding maps found in this chapter. A summary of the management direction is presented in Table 2-1 at the end of this chapter. It should be noted that the acreages used in development of the management direction are derived from GIS and include areas of accretion on the Leadbetter Point Unit.

### 2.2.1 Healthy Wildlife Habitats, Endangered Species and Biodiversity Gains, Focused Refuge Expansion, and Expanded Public Use

#### 2.2.2.1 Habitat and Wildlife

The management direction will restore approximately 621 acres of historic estuarine habitats (open water, intertidal flats, and salt marsh) on refuge lands, by removal of all or strategic portions of the dike system in the Lewis, Porter Point, and Riekkola Units (Map 3). As a result of comments received during the Draft CCP/EIS comment period, the Service will restore only a portion of the short-grass fields at the Riekkola Unit (119 acres) to estuarine habitat. The existing subdike that divides the Riekkola Unit will be rebuilt to required standards and two tidegates will be installed (Parker Slough and Dohman Creek). This modification eliminates any tidal influence impacts to adjacent private landowners and to 67th Place, a designated tsunami evacuation route for Pacific County. The remaining 93 acres of short-grass fields will be managed for Canada geese (*Branta canadensis*) and Roosevelt elk (*Cervus elaphus roosevelti*). The engineering for this part of the restoration plan (Appendix O) will be updated accordingly.

The Refuge currently maintains and protects 33 acres of grassland habitat on the Tarlatt Unit; the management direction proposes to restore 15 to 33 acres for the benefit of the Oregon silverspot butterfly (*Speyeria zerene hippolyta*). Restoration activities will require establishment of a thriving self-sustaining population of the native, host plant species (i.e., early blue violet [*Viola adunca*], tufted hairgrass [*Deschampsia caespitosa* var. *Arctica*], red fescue [*Festuca rubra*]) on the Tarlatt Unit (future potential acreage at the Leadbetter Point Unit may be considered). Reintroduction of adult butterflies and larvae would be initiated only when sufficient quality habitat has been restored and successfully established based on expert knowledge and completion of a Long Beach Oregon silverspot butterfly strategic management plan.

Predator management will be implemented annually for the protection of western snowy plovers, particularly nests and fledglings on Leadbetter Point. Initiating a predator management program will likely increase the fledgling success rate and adult survival of the federally threatened, State endangered species as described in detail in Appendix L, Predator Management Plan.

Avian and mammalian predators (i.e., crows, ravens, skunks, coyotes) on the Leadbetter Point Unit during nesting season March through August that are determined to be a threat to nesting plovers could be removed by (Refuge staff, Wildlife Services) using lethal control methods. Current protection efforts and techniques including nest exclosures will also be used. Other benefiting species include the Federal candidate, State endangered streaked horned lark, which is a ground-nesting bird subject to the same predation threats as the western snowy plover (Pearson and Hopey 2005). A proposed increase in refuge law enforcement presence, educational outreach information, and boundary fencing and signage will be implemented to inform the public of the necessity to keep clear of and protect the bird nesting areas.

Inventories, monitoring, research, and studies in support of refuge management decisions will receive greater emphasis. Staff will work to recruit students from universities (when feasible) to assist with necessary research and monitoring activities; research will be designed to support refuge resource management activities.

#### 2.2.2.2 Visitor/Administrative and Maintenance Facilities

The management direction proposes the construction and operation of a replacement Headquarters Complex, including a new Visitor/Administrative Building and a Maintenance Area, consisting of seven shop and/or equipment storage buildings (see Site Plan in Appendix P). It will serve as the new headquarters for the Willapa Refuge Complex to better manage the refuges that are part of the Complex and provide increased accessibility for the visiting public.

The proposed Visitor/Administrative and Maintenance Facility will be located on a parcel owned by the Service on the Long Beach Peninsula in Pacific County near the City of Long Beach, Washington (Map 2). The site is located within the Tarlatt Unit along Sandridge Road south of the intersection with 95th Street. The site has approximately 1,250 linear feet of frontage along Sandridge Road and approximately 2,000 linear feet of frontage along 95th Street.

Although the Tarlatt Unit is the best site at this time, we will continue to consider other sites within the refuge boundary that could best meet all of the visitor and functional needs. Many of the components, the scale of development, and the concept of consolidating facilities on one site as identified in the CCP will be maintained in the selection and implementation of the Visitor/Administrative and Maintenance Facility.

Approximately 29 acres of land area exist at the proposed Visitor/Administrative and Maintenance Facility site, which will be adequate for the relocated facilities proposed. The proposed site currently consists of grassland, emergent wetlands, estuarine wetlands associated with Tarlatt Slough, and patches of native remnant woodland vegetation. Tarlatt Slough winds through the property, generally flowing in a northerly direction, and makes a bend to the east within the property. It is a major stormwater drainage channel for Pacific County, draining the southeastern portions of the Long Beach Peninsula into Willapa Bay. It is anticipated that the total development zone will be approximately 10 acres.

The management direction proposes to construct a new Visitor/Administrative Building. Based upon the USFWS's Standard Suite of Facilities prototypes for a Small Visitor Facility and a Medium Two-story Administration Building, the new building size will be approximately 11,000 square feet. This facility will become the Willapa Refuge's permanent administrative office with staff offices for up to 21 Service staff, not including interns. In addition, volunteers who are involved in day-to-day activities will be provided space in the building. The visitor center will house a gift shop, a substantial lobby area, and an orientation/multipurpose room for interpretive exhibits or events. The new facility will also be available to host community and environmental education events.

It is anticipated that site development for the Visitor/Administrative and Maintenance Facility will require approximately 2 acres and will include the following supporting elements:

- Entrance/welcome plaza space
- Delivery/service/garbage area
- Outdoor space for staff (near employee entrance)
- Outdoor group gathering space with overhead shelter for up to 60 people
- Outdoor nature play area
- Five or six smaller breakout outdoor gathering spaces for smaller groups
- Outdoor area to set up event tents
- Outdoor interpretive display areas integrated with natural environment
- Wildlife observation platform
- Pedestrian bridge over Tarlatt Slough
- Paths and trails to connect to South Bay overlook
- Entrance driveway and site circulation pavement
- Vehicular circulation to accommodate up to a straight-body truck
- Staff parking area for approximately 10 cars
- Visitor parking area for up to 55 cars
- Three bus/RV parking spaces

A new 1-mile trail will be constructed from the new Visitor/Administration Building to a new South Bay overlook, offering enhanced opportunities for wildlife observation, photography, education experiences and hiking in the South Bay. An additional parking lot and new boat launch (car-top boats only) will be located on 67th Street at Dohman Creek for South Bay access.

Construction of a new and consolidated Maintenance Area will require an additional land development area of approximately 3 acres at the Sandridge Road site, including a bone yard area of approximately 5,800 square feet. Seven new buildings are proposed for the Maintenance Area. Building 1 is proposed to be a new shop building of approximately 4,800 square feet. This building

will provide space for vehicle maintenance, a wood shop, and general Willapa Refuge maintenance functions, and will include two pull-through bays and one single-access bay. Building 1 will include an open office component with four work stations and a conference room. Buildings 2 and 3 are proposed to be equipment storage buildings of approximately 4,900 square feet of space each. Building 4 is proposed to provide Boat Storage at approximately 5,670 square feet. Building 5 is proposed to provide additional small equipment storage at approximately 1,260 square feet. Building 6 will be a carport used for fleet vehicles (2,600 square feet), and Building 7, at approximately 150 square feet, is proposed to house hazardous materials.

Associated site development for the Maintenance Area will also include the following supporting elements:

- Vehicular circulation to accommodate up to a conventional semitrailer
- Site circulation pavement
- Separate driveway entrance
- Fleet parking for up to 20 vehicles
- Staff parking for up to 15 vehicles
- Equipment washing area (associated with Shop Building)
- Fuel pumps: one with 550 gallons of gasoline and one with 1,000 gallons of off-road diesel

A new Headquarters Complex will provide a more central location for Willapa Refuge management activities. Willapa Refuge management will benefit by consolidating the multiple maintenance facilities (shops, storage, warehouses) currently located in three areas of the Refuge. Having the equipment and staff centrally located will cut down on extensive building maintenance and utility expenses. The Sandridge Road site will provide safer highway access for large refuge vehicles as compared to the current headquarters site along U.S. Highway 101. The intersection of Sandridge Road and 95th Street will be improved to provide sufficient turning radii for large vehicles.

Other potential off-site improvements will include a southbound left-turn lane and a northbound right-turn lane at required driveway access points onto Sandridge Road. A northbound right-turn taper on Sandridge Road at 95th Street may also be required.

All of the Visitor/Administrative and Maintenance Facility buildings will meet health and safety standards/regulations providing for staff and visitor necessities (drinking water, sewer system, power, telecommunications, and data service). With a Pacific County Public Utilities District (PUD) substation and office bordering the site to the north, providing power to the site will be easily accomplished. Water could likely be obtained through rainwater harvesting and underground well(s), or through the extension of the water main along Sandridge Road. There are no public sewer mains in this region. Neighboring and surrounding properties use on-site septic systems to dispose of sanitary waste. The Visitor/Administrative and Maintenance Facility as proposed will be required to build a new septic system for the new building sewer services. Most likely a sanitary sewage treatment system with a sand mound drain field will be required. Stormwater runoff from the proposed development will need to be separated from sanitary flows. Stormwater management facilities for improved detention and water quality will likely be required for this type of development and will be easily facilitated on the site.

Buildings at the Visitor/Administrative and Maintenance Facility are proposed to be designed and constructed to meet or exceed energy efficiency standards for the Leadership in Energy and

Environmental Design (LEED) Green Building Rating System. Site design will strive to incorporate sustainable design concepts such as integrating aboveground stormwater management facilities within existing site contours to minimize overall site grading, and to incorporate native or climate-adaptive (low water-consumptive) plant materials into facility landscaping. Buildings and landscape will be designed to reflect the rural, coastal vernacular. Site design will include the enhancement of wetland buffer zones by revegetation with native plant materials, the relocation and mitigation of on-site drainage features, and the restoration of local woodland, shrub, and wetland plant communities. The entry sequence through a restored natural landscape will create a compelling setting for visitors to experience the Refuge.

It is anticipated that the new Visitor/Administrative Building at this site will attract a greater number of visitors due to the location in proximity to various peninsula communities and the main access road (Sandridge Road) to Leadbetter State Park and the Refuge's Leadbetter Point Unit. The Refuge anticipates an increase in visitors from approximately 128,000 to an estimated 200,000 annually due to the increased visibility of the Refuge Headquarters and visitor use of new facilities. In addition, site development will accommodate a pedestrian/bicycle connection on the site to the City of Long Beach most likely via Pioneer Street at the south end of the property.

Prior to development, the Wetlands Reserve Program designation will be removed from the proposed Visitor/Administrative and Maintenance Facilityland area. Upon completion of the Visitor/Administrative and Maintenance Facility, the existing headquarters complex and Riekkola shop area will be deconstructed and decommissioned, and the site will be restored to the surrounding natural habitat. The Willapa Art Trail, kiosk, boat launch, and parking area at the existing headquarters site will remain.

### 2.2.2.3 Public Use and Recreation

The Refuge currently provides 2,884 acres available for waterfowl hunting on Leadbetter Point and the South Bay Units. The Refuge also provides 244 acres of regulated goose hunting with eight assigned blinds on the Riekkola and Tarlatt Units. In 2010, 44 hunters (119 visits) used these blinds and harvested an average of 1.34 geese per hunter. This represents only 18 percent occupancy of the Refuge's hunting blinds.

Under the management direction, in the South Bay only, waterfowl hunting (geese included) will be expanded to 5,670 acres once the proposed estuarine restoration project is completed (Map 4). The regulated goose hunting area will be reduced to 100 acres once tidal restoration is complete. Three blinds will be available for goose hunting on the south half of the Riekkola Unit, which will meet or exceed the average use of 4.4 hunters per day. Two additional blinds will be created for waterfowl hunting. Walk-in access to these new blinds for waterfowl hunting will provide a new opportunity for hunters without boats. Furthermore, one waterfowl and one goose blind will also provide barrier-free access for hunters with disabilities. Boat access to the South Bay Units will be provided by car-top boat ramp at Dohman Creek. In addition, a trail from the parking area will provide walk-in hunter access to Porter Point. According to State regulations, waterfowl hunting will be allowed seven days a week and goose hunting will be allowed two days a week (Wednesdays and Saturdays). For additional details about the hunt program see Hunt Plan (Appendix M).

The parking area, car-top boat launch, and trail to Porter Point will be open year-round to all refuge visitors. The blinds will be open only to hunters during the hunting season; however, during the non-hunting season, these blinds will be available to any refuge visitor. This will provide access to

additional areas for wildlife observation, photography, environmental education, and interpretation on the Refuge.

The Refuge currently has 6,980 acres available for big game hunting. Management of Long Island hunting will continue to allow archery-only take of grouse, bear, deer, and elk. The South Bay Units and East Hills Units including Headquarters Unit, Teal Slough Unit, and Bear River Unit will also continue to be open to the take of deer and elk in accordance with WDFW regulations. Expansion of elk and deer hunting opportunities on the Refuge (see Appendix M) will include approximately 2,397 acres on the Leadbetter Point Unit (permit-only muzzleloader hunt and as necessary an expanded permit-only elk hunt). South Bay Units and East Hills Units will include elk and deer hunting as refuge expansion opportunities occur. All new hunting opportunities will be developed and implemented in coordination with WDFW.

The existing camping opportunities on Long Island will be maintained to facilitate archery hunting, photography, and other wildlife-dependent recreation experiences. Approximately 10 miles of old logging roads that serve as trails will be decommissioned, using techniques described in Appendix K.

#### 2.2.2.4 Acquisition Boundary

The land acquisition boundary will be adjusted to include 1,909 acres in the Nemah and Naselle areas and 561 acres in South Bay Units and 4,339 acres in the East Hills Units (Map 2) (Appendix A). This acreage is designed to provide maximum protection of the watershed and habitats adjacent to Willapa Bay and the current refuge boundary. This expansion effort will maximize the opportunities for forest restoration efforts in a holistic landscape and ecosystem manner. The Shoalwater Unit and Wheaton Unit will be divested from the Refuge.

## 2.3 Summary of Management Direction

### 2.3.1 Implementation Subject to Funding Availability

Actions will be implemented over a period of 15 years as funding becomes available. It is the intent of the planning team that annual priorities will follow the CCP guidelines, although funding initiatives, unforeseeable management issues, and budgets may vary from year to year. The CCP will be reviewed every five years and updated as necessary throughout its life.

### 2.3.2 Refuge Revenue Sharing Payment

Under the Uniform Relocation Assistance and Real Property Acquisition Policies Act, as amended (49 C.F.R. 24), landowners who sell their property to the Service are eligible for certain benefits and payments including reimbursement of reasonable moving and related expenses or certain substitute payments; replacement housing payments under certain conditions; relocation assistance services to help locate replacement housing, farmland, or business property; and reimbursement of certain necessary and reasonable expenses incurred in selling real property to the Federal government.

Under provisions of the Refuge Revenue Sharing Act (Public Law 95-469), the Service will annually reimburse Pacific County for tax revenue that is lost as a result of the Service's acquisition of private property. This law states that the Secretary of the Interior (Secretary) shall pay to each county in which any area acquired in fee title is situated, the greater of the following amounts:

- An amount equal to the product of 75 cents multiplied by the total acreage of that portion of the fee area that is located within such county.
- An amount equal to 0.75 percent of the fair market value, as determined by the Secretary, for that portion of the fee area that is located within such county.
- An amount equal to 25 percent of the net receipts collected by the Secretary in connection with the operation and management of such fee area during such fiscal year. If a fee area is located in two or more counties, however, the amount for each county shall be apportioned in relationship to the acreage in that county.

Some payments to the counties have been less than the legislated amounts because of governmental funding deficits. Congress may appropriate, through the budget process, supplemental funds to compensate local governments for any shortfall in revenue sharing payments. The Refuge Revenue Sharing Act requires Service lands be reappraised every five years to ensure that payments to local governments remain equitable. Payments under this Act will be made only on lands that the Service acquires in fee title. On lands where the Service acquires only partial interest through easement, all taxes will remain the responsibility of the individual landowner.

### 2.3.3 Western Snowy Plover Recovery Plan

On March 5, 1993, the Pacific coast population of the western snowy plover was listed as threatened under provisions of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) The Pacific coast population is defined as those individuals that nest within 50 miles of the Pacific Ocean on the mainland coast, peninsulas, offshore islands, bays, estuaries, or rivers of the United States and Baja California, Mexico (USFWS 2007a). Of the six Washington locations identified in the recovery plan as breeding areas, only two are currently occupied. The largest is located at the Leadbetter Point Unit of Willapa NWR. Recommendations and recovery actions identified in the western snowy plover recovery plan were considered in the development of this CCP and are described in further detail in Sections 2.5.6.1 and 4.9.2, and protection efforts are outlined in Appendix L.

### 2.3.4 Oregon Silverspot Recovery Plan

The federally threatened Oregon silverspot butterfly previously inhabited coastal habitat from northern California to southern Washington. It is now extirpated from Washington State and is State listed as endangered. It is found on only a few sites in California and Oregon. No Oregon silverspot butterflies have been documented on the Long Beach Peninsula since 1990 (USFWS 2001a). The Service will work toward establishing one or more healthy sustainable populations of Oregon silverspot butterfly, in accordance with recovery goals described in the revised recovery plan (USFWS 2001a).

### 2.3.5 Recovery Plan for the Marbled Murrelet (Washington, Oregon, and California Populations)

The Washington, Oregon, and California population segment of the marbled murrelet was federally listed as threatened on September 28, 1992 (USFWS 1992a) due to the high rate of nesting habitat loss and fragmentation, and mortality associated with net fisheries and oil spills. The marbled murrelet is State listed as threatened in Washington. The Federal marbled murrelet recovery plan identifies southwest Washington as a significant gap in suitable nesting habitat along the Pacific Northwest coast (USFWS 1997a). Increasing available habitat in this area is critical to expanding the

geographic distribution of the murrelet within its threatened range (Raphael et al. 2008). Unlike most other regions within the range of the murrelet, this area has limited Federal forest ownership with large blocks of intact habitat. Therefore, improving both Federal and non-Federal forests in southwest Washington is critical to marbled murrelet recovery (Raphael et al. 2008).

### 2.3.6 Forest Landscape Restoration Plan

TNC and the Service have developed a forest landscape restoration plan in partnership, to restore young-managed forestlands at a landscape scale across TNC's Ellsworth Creek Preserve and the neighboring Willapa Refuge. The plan is discussed in this CCP and is located in Appendix K.

### 2.3.7 Willapa NWR Fire Management Plan

The 2003 Willapa National Wildlife Refuge Fire Management Plan details how the Refuge will respond to the threat of wildfire and determine what circumstances the refuge staff is to use fire as a tool on refuge lands.

### 2.3.8 Tribal Coordination

Regular communication with Native American tribes that have an interest in the Refuge is part of the management direction. The Shoalwater Bay Tribe and the Refuge will coordinate and consult on a regular basis regarding issues of shared interest. The Service will also seek assistance from the Tribe as necessary for issues related to both the Native American Graves Protection and Repatriation Act and National Historic Preservation Act (NHPA).

### 2.3.9 Wilderness Review

The Service's CCP policy requires that a wilderness review be completed for all CCPs. If it is determined that the potential for wilderness designation is found, the process moves on to the wilderness study phase. As part of the CCP process, the planning team completed an initial wilderness review (Appendix G) and found that currently there are no lands on the Refuge that meet the basic wilderness criteria.

### 2.3.10 Integrated Pest Management

In accordance with 517 DM 1 and 7 RM 14, an integrated pest management (IPM) approach will be used, where practicable, to eradicate, control, or contain pest and invasive species (herein collectively referred to as pests) on the Refuge. IPM will involve using methods based upon effectiveness, cost, and minimal ecological disruption, which considers minimum potential effects to non-target species and the refuge environment. 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 will be needed on refuge lands, the most specific (selective) chemical available for the target species will be used, unless considerations of persistence or other environmental and/or biotic hazards preclude it. In accordance with 517 DM 1, pesticide usage will be further restricted because only pesticides registered with the U.S. Environmental Protection Agency (USEPA) in full compliance with the Federal Insecticide, Fungicide, and Rodenticide Act and as provided in regulations, orders, or permits issued by USEPA may be applied on lands and waters under refuge jurisdiction.

Environmental harm by pest species refers to a biologically substantial decrease in environmental quality as indicated by a variety of potential factors including declines in native species populations or communities, degraded habitat quality or long-term habitat loss, and/or altered ecological processes. Environmental harm may be a result of direct effects of pests on native species including preying and feeding on them; causing or vectoring diseases; preventing them from reproducing or killing their young; 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 can also be the result of an indirect effect of pest species. For example, decreased waterfowl use may result from invasive plant infestations that reduce the availability and/or abundance of native wetland plants for winter forage.

Environmental harm may also include detrimental changes in ecological processes. For example, cheatgrass infestations in shrub steppe can greatly alter fire return intervals displacing native species and communities of bunchgrasses, forbs, and shrubs. 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 grasses that alter entire plant and animal communities eliminating or sharply reducing populations of many native plant and animal species can also greatly increase fire-fighting costs.

For the Refuge's IPM program documentation to manage pests for this CCP, see Appendix H. Along with a more detailed discussion of IPM techniques, this documentation describes the selective use of pesticides for pest management on the Refuge, where necessary. Throughout the life of the CCP, proposed pesticide uses on the Refuge will be evaluated for potential effects to biological resources and environmental quality. Pesticide uses with appropriate and practical best management practices (BMPs) for habitat management as well as cropland/facilities maintenance will be approved for use on the Refuge where there likely will be only minor, temporary, and localized effects to species and environmental quality based upon non-exceedance of threshold values in chemical profiles. However, pesticides may be used on a refuge where substantial effects to species and the environment are possible (exceed threshold values) in order to protect human health and safety (e.g., mosquito-borne disease).

## 2.3.11 Monitor the Effects of Public Use Programs on Wildlife

Monitoring to ensure acceptable levels of impacts to refuge habitat and wildlife will be conducted to assess compatible public uses, contingent upon availability of resources. Areas and/or timing of public use will be modified, if necessary, to provide secure and adequately sized sanctuary areas for western snowy plover, Oregon silverspot butterfly, pink sandverbena, and other sensitive plant and animal species.

## 2.3.12 Regulatory Compliance

Activities in the management direction requiring review, permits, or clearances (e.g., Section 106 of the NHPA, ESA Section 7 endangered species consultation, Clean Water Act Section 401 water quality permit, etc.) will undergo appropriate evaluation to determine necessary permits and/or clearances (Appendix I).

### 2.3.13 Maintaining/Upgrading Existing Facilities

Periodic maintenance and upgrading of the Refuge buildings and facilities will be necessary. Periodic maintenance and upgrading of facilities is necessary for safety and accessibility and to support staff and management needs.

### 2.3.14 State Coordination

The Service will continue to maintain regular discussions and partnership with the State of Washington, Washington State Parks, WDFW, and the Washington Department of Natural Resources. Current topics for discussion continue to be the Western Snowy Plover Recovery Plan (USFWS 2007a) and its continued implementation on Willapa NWR and the surrounding private and public lands, Pacific Flyway Management Plan for the Dusky Canada Goose (Pacific Flyway Council 2007), wildlife monitoring, hunting and fishing seasons and regulations, and listed species management.

### 2.3.15 Volunteer Opportunities

Volunteer opportunities are recognized as components of the successful management of public lands and may become vital to the implementation of refuge programs, plans, and projects, especially in times of declining budgets. Currently the Refuge has a formal and successful volunteer program, despite the rural nature of the Refuge, a small staff, and a large land base to manage. There are currently 20 volunteers.

### 2.3.16 Adaptive Management

Based upon 522 DM 1 (Adaptive Management Implementation Policy), refuge staffs shall use adaptive management (AM) for conserving, protecting, and, where appropriate, restoring lands and resources. Within 43 C.F.R. 46.30, AM is defined as a system of management practices based upon clearly identified outcomes, where monitoring evaluates whether management actions are achieving desired results (objectives). In the recently published Department of Interior Adaptive Management Technical Guide, AM is defined as a decision process that "promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood." Adaptive management accounts for the fact that complete knowledge about fish, wildlife, plants, habitats, and the ecological processes supporting them may be lacking. The role of natural variability contributing to ecological resilience also is recognized as an important principle for AM. It is not a "trial and error" process; rather, AM emphasizes learning while doing. Based upon available scientific information and best professional judgment, site-specific biotic and abiotic factors are considered when making management decisions on refuge lands.

### 2.3.17 Participation in Planning and Review of Regional Development Activities

The Service will actively participate in environmental planning, protection, and studies for ongoing and future development projects. These include engaging in regional land protection planning partnerships and identifying threats to natural resources and other potential concerns that may adversely affect Refuge wildlife resources, habitats, and/or environmental quality. The Service will actively cultivate partnerships with nongovernmental organizations; private landowners; tribes; and

county, State, and Federal agencies to stay abreast of current and potential developments, land protection opportunities. The Service will use outreach and education techniques when necessary to raise awareness of the Refuge's resources and dependence on the local environment.

### 2.3.18 Reintroduction and Augmentation of Flora and Fauna

The Service policy for Biological Integrity, Diversity and Environmental Health (601 FW 3) allows for the reintroduction of native flora and fauna to their historic range. Throughout the life of this CCP, the Service may consider plant and animal reintroductions for the purpose of restoring species to areas where historical use has occurred or areas that are appropriate. As an example, the Refuge has introduced freshwater mussels to refuge streams to actively restore them to their historical range.

Guidelines exist that provide a scientific basis for planning, conducting, and monitoring reintroductions, which range from being nonspecific for taxa under consideration for reintroduction (IUCN 1998) as well as specifically for a group of taxa (e.g., George et al. 2009 for freshwater fish,) or a species (e.g., Dunham and Gallo 2008 for bull trout). These guidelines are intended to assist in evaluating the feasibility of reintroductions, improving the success of management, and applying sound adaptive management, which confer conservation benefits to extirpated or depauperate populations. The Service will consider the appropriate guidelines and policies for reintroductions and augmentation of native flora and fauna in their historic range consistent with policies identified in 7 RM 12 (Propagation and Stocking) and other appropriate policies and guidelines.

Re-establishment or enhancement of native species in their historical habitat may occur in some instances where native populations are extirpated or depauperate. Emphasis will be placed on restoring native fauna to suitable habitats on the Refuge where, in some cases, previous detrimental land use practices have impacted or extirpated species, such as native mussels, lamprey, Oregon silverspot butterflies, pink sandverbena, and salmonids.

### 2.3.19 Presidential Proclamation Boundary

The Presidential Proclamation Boundary was established in 1937 Executive Order 7721 for protection of all migratory birds within the designated area. As stated in the *Federal Register* (Volume 5, Number 221), "the hunting, taking, capturing, or killing of migratory waterfowl or other migratory birds, or the attempt to hunt, capture, or kill such waterfowl or other birds, or the taking of their nests or eggs therein or thereon, is not permitted." Waterfowl hunting is prohibited within this area.

## 2.4 Goals, Objectives, and Strategies

Goals and objectives are the unifying elements of successful refuge management. They identify and focus management priorities, resolve issues, and link to refuge purposes, Service policy, and the Refuge System Mission.

A CCP describes management actions that help bring a refuge closer to its vision. A vision broadly reflects the refuge purposes, the Refuge System mission and goals, other statutory requirements, and larger-scale plans as appropriate. Goals then define general targets in support of the vision, followed by objectives that direct effort into incremental and measurable steps toward achieving those goals. Finally, strategies identify specific tools and actions to accomplish objectives.

The goals for the Willapa NWR to be implemented over the next 15 years under the CCP are presented on the following pages. Each goal is followed by the objectives that pertain to that goal. Below each objective statement are the strategies that could be employed in order to accomplish the objectives. Some objectives pertain to multiple goals and have simply been placed in the most reasonable spot. Similarly, some strategies pertain to multiple objectives.

The goal order does not imply any priority in this CCP. The Implementation Plan articulates the current refuge priorities (Appendix F).

A summary of the management direction is found at the end of this chapter (Table 2-1).

### 2.4.1 Goal 1. Protect, maintain, and restore ecologically functional late-successional forest habitats (mature and old-growth forest) characteristic of the low-elevation temperate forests in the southwest Washington coastal region for the benefit of endangered and threatened species, migratory and resident birds, and a diverse assemblage of other native species.

**Objective 2.4.1.1 Protect and Maintain Late-successional Sitka Spruce Zone Forest**

Protect and maintain 557 acres of existing late-successional Sitka spruce zone forest representative of the unmanaged, forested landscape for the benefit of marbled murrelets, spotted owls (currently extirpated from the Refuge), bald eagles, other migratory and resident birds, bats, and a diverse assemblage of other forest-dependent native species. Late-successional Sitka spruce zone forest is characterized by the following:

- <80% dominant tree canopy cover.
- Multiaged, multilayered, multispecies canopy: Sitka spruce (*Picea sitchensis*), western red cedar (*Thuja plicata*), and western hemlock (*Tsuga heterophylla*).
- Dominant (old-growth and mature) trees 100 to 200+ years; average tree diameters >21 inches; largest tree diameters ranging from 32 to >39 inches.
- Prevalence of large fallen trees and snags.
- A shrub layer composed of native species such as evergreen huckleberry (*Vaccinium ovatum*), salal (*Gautheria shallon*), and red huckleberry (*V. parviflorum*).
- Heavy ground cover composed of native herbaceous species such as oxalis (*Oxalis oregana*), sword fern (*Polystichum munitum*), deer fern (*Blechnum spicant*), mosses, and lichens.

Old-growth west of Cascade crest: Stands of at least two tree species, forming a multilayered canopy with occasional small openings; with at least eight trees per acre >32 inches diameter at breast height (dbh) or >200 years of age; more than four snags per acre over 20 inches in diameter and 15 feet tall; and with numerous downed logs, including four logs per acre >24 inches in diameter and >50 feet long (WDFW 2008a).

Mature forests: Stands with average diameters exceeding 21 inches dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; and 80 to 200 years old west of the Cascade crest (WDFW 2008a).

Late-successional Sitka spruce zone forest will be protected and maintained to aid in the recovery of the marbled murrelet, a federally threatened species. Attributes of marbled murrelet nesting habitat include:

- Large diameter trees (western hemlock, Sitka spruce, western red cedar, Douglas fir [*Pseudotsuga menziesii*]) 32 to >39 inches.
- Large flat moss-covered branches >7 inches in diameter.
- Branches at least 50 feet above the ground.
- Mean nest branch height equal to 120 feet.
- High canopy closure over nest branches.

**Acres to Achieve the Objective: 557**

**Strategies for Achieving the Objective**

A. Use appropriate IPM techniques including mechanical, physical, biological, and chemical methods (see Appendix H) to control invasive or undesirable plant species.

B. Protect and promote natural processes to drive vegetative changes.

C. Use fire suppression techniques (including use of fire-lines, hand tools, backpack and slip-on water pumps) to prevent catastrophic wildfire in forests.

D. Maintain partnerships (e.g., TNC, State) to foster ecosystem/landscape approach to protect habitats.

E. Within new approved refuge boundary, acquire lands with appropriate habitats from willing sellers as funds become available.

F. Monitor presence/absence of marbled murrelets through protocol surveys.

**Rationale:**

Forestlands in the Willapa Bay area are dominated by commercial timberlands. In fact, most of the forested acreage within either the Refuge or Willapa Bay watersheds is second- or third-growth timber. Very little late-successional forest exists. One estimate states that <1% of the original coastal old-growth remains in the 700,000-acre Willapa Bay watershed (Davis et al. 2009). The largest old-growth parcel on the Refuge is the 274-acre Cedar Grove located on Long Island (Map 3). This habitat type is important and a priority for maintaining biological integrity, diversity, and environmental health.

These forests are a high priority due to their limited availability and high vulnerability to habitat alteration (WDFW 2006).

A variety of wildlife uses late-successional forests including black bear (*Ursus americanus*), black-tailed deer (*Odocoileus hemionus columbianus*), Roosevelt elk, salamanders, forest-dwelling bats and other small mammals, marbled murrelets, pileated woodpeckers (*Dryocopus pileatus*) and other forest birds, and a host of fungi and gastropods.

Lack of late-successional/old-growth forest habitat is one reason for the disappearance of the spotted owl from the Refuge. Spotted owls use regenerated forest but depend on old-growth for nesting and prey species.

According to the Recovery Plan for the Marbled Murrelet (USFWS 1997a), the major factors contributing to the threatened status of murrelets include loss of nesting habitats, and poor reproductive success in the habitat that does remain. Loss of high-quality nesting habitat and increased forest fragmentation are the main causes cited in the reduction of marbled murrelet

populations and continue to threaten their recovery (Raphael et al. 2008; USFWS 1997a). The Federal marbled murrelet recovery plan identifies southwest Washington as a significant gap in suitable nesting habitat along the Pacific Northwest coast (USFWS 1997a). Increasing available habitat in this area is critical to expanding the geographic distribution of the murrelet within its threatened range (Raphael et al. 2008). Unlike most other regions within the range of the murrelet, this area has limited Federal forest ownership with large blocks of intact habitat. Therefore, improving both Federal and non-Federal forests in southwest Washington is critical to marbled murrelet recovery (Raphael et al. 2008). With less than 1% of the original old-growth forest remaining, restoration is essential to increasing the viability and resilience of marbled murrelet populations in this area (Davis et al. 2009).

Habitat fragmentation has also resulted in reduced nesting success for murrelets within the remaining habitat by reducing microhabitat quality and increasing rates of predation, especially near artificial edges (Malt 2007). It is thought that these effects should decline as adjacent forests mature. Large core landscapes dedicated to murrelet protection should help reduce the amount of fragmentation over time. Buffering of existing habitat by actively managing young adjacent forests will be an important strategy to improve microhabitat conditions within these core murrelet emphasis areas (Davis et al. 2009).

The Washington, Oregon, and California population segment of the marbled murrelet was federally listed as threatened on September 28, 1992 (USFWS 1992a) due to the high rate of nesting habitat loss and fragmentation, and mortality associated with net fisheries and oil spills. The marbled murrelet is State listed as threatened in Washington.

The strategies outlined to achieve this objective are consistent with the goals of the Recovery Plan for the Marbled Murrelet (USFWS 1997a).

The objective of the recovery plan is “to stabilize population size at or near current levels by (1) maintaining and/or increasing productivity of the population as reflected by changes in total population size, the adult: juvenile ratio, and nesting success by maintaining and/or increasing marine and terrestrial habitat and by (2) removing and/or minimizing threats to survivorship, including mortality from gill-net fisheries and oil spills” (USFWS 1997a).

The marbled murrelet is listed as a resource of concern under the following documents: Determination of Threatened Status for the Washington, Oregon, and California Population of the Marbled Murrelet (USFWS 1992a), Policy on Maintaining the Biological Integrity, Diversity and Environmental Health of the National Wildlife Refuge System (USFWS 2001b), Birds of Conservation Concern (USFWS 2002a), the U.S. Fish and Wildlife Service’s Focal Species Strategy for Migratory Birds (USFWS 2005b), Recovery Plan for the Marbled Murrelet (Washington, Oregon, and California Populations) (USFWS 1997a), North American Waterbird Conservation Plan (Kushlan et al. 2002), Seabird Conservation Plan (USFWS 2005a), Washington’s Comprehensive Wildlife Conservation Strategy (WDFW 2005), State of Washington Natural Heritage Plan 2005 Update (WDNR 2005), and State of Washington Natural Heritage Program Information Systems (WDNR 2007).

| **Objective 2.4.1.2 Restore Late-successional Sitka Spruce Zone Forest** |
|---|
| Initiate restoration activities to create a trajectory toward late successional Sitka spruce zone forest within portions of the 6,178-6,182 acres of this habitat type for the benefit of marbled murrelets, spotted owls (currently extirpated from the Refuge), bald eagles, migratory and resident birds, bats, and other native species. The following attributes characterize a late-successional Sitka spruce zone forest:<br><br>• <80% dominant tree canopy cover.<br>• Multiaged, multilayered, multispecies canopy: Sitka spruce, western red cedar, and western hemlock.<br>• Dominant trees 100 to 200+ years; average tree diameters >21 inches; largest tree diameters ranging from 32 to >39 inches.<br>• Prevalence of large fallen trees and snags.<br>• Shrub layer composed of native species such as evergreen huckleberry, salal, and red huckleberry.<br>• Heavy ground cover composed of native herbaceous species such as oxalis, sword fern, deer fern, mosses, and lichens.<br><br>Attributes of marbled murrelet nesting habitat found within late-successional forests include these characteristics:<br><br>• Large diameter trees (western hemlock, Sitka spruce, western red cedar, Douglas fir) 32 to >39 inches.<br>• Large, flat moss-covered branches >7 inches in diameter.<br>• Branches at least 50 feet above the ground.<br>• Mean nest branch height equal to 120 feet.<br>• High canopy closure over nest branches. |
| **Acres to Achieve the Objective: 6,180** |
| **Strategies for Achieving the Objective** |
| A. Use appropriate forest management techniques (e.g., thinning, planting) to drive desired vegetative changes (see Appendix K). |
| B. Protect and promote natural processes to drive vegetative changes. |
| C. Use appropriate IPM techniques including mechanical, physical, biological, and chemical methods (see Appendix H) to control invasive or undesirable plant species. |
| D. Use fire suppression techniques (including use of fire-lines, hand tools, backpack and slip-on water pumps) to prevent catastrophic wildfire in forests. |
| E. Decommission roads and facilities to reduce fragmentation of forested habitat and maximize stream integrity and water quality. |
| F. Maintain partnerships (e.g., TNC, State) to foster ecosystem/landscape approach to protect habitats. |
| G. Within new approved refuge boundary acquire lands from willing sellers as funds become available. |
| H. Monitor presence/absence of murrelets through protocol surveys, especially in restored habitats. |
| **Rationale:**<br>Forestlands in the Willapa Bay area are dominated by commercial timberlands. In fact, most of the forested acreage within either the Refuge or Willapa Bay watershed is second- or third-growth |

timber. Very little late-successional forest exists. One estimate states that less than <1% of the original coastal old-growth remains in the 700,000-acre Willapa Bay watershed (Davis et al. 2009). The Refuge's largest old-growth parcel is the 274-acre Cedar Grove located on Long Island.

To describe the characteristics of late-successional forest above the team used several criteria from the WDFW Priority Habitats and Species List (WDFW 2008a):

**Old-growth west of Cascade crest:**

- Stands of at least two tree species, forming a multilayered canopy with occasional small openings, with at least eight trees per acre >32 inches dbh or >200 years of age.
- More than four snags per acre over 20 inches in diameter and 15 feet tall.
- Numerous downed logs, including four logs per acre >24 inches in diameter and >50 feet long.

**Mature forests:**

- Stands with average dominant tree diameters exceeding 21 inches dbh.
- Crown cover may be less than 100%.
- Decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth.
- 80 to 200 years old west of the Cascade Crest.

These forests are a high priority due to their limited availability and high vulnerability to habitat alteration (WDFW 2006). Due to the degraded nature of the refuge forests and those in the surrounding areas, a major effort is needed to restore these forests to their natural state. A variety of wildlife use late successional forests including black bear, black-tailed deer, Roosevelt elk, salamanders, forest-dwelling bats and other small mammals, marbled murrelets, pileated woodpeckers, other forest birds, and a host of fungi and gastropods.

The lack of late-successional/old-growth forest habitat is one reason the spotted owl has disappeared from the Refuge. Spotted owls use regenerated forest but depend on old-growth for nesting and prey species.

Late-successional Sitka spruce zone forest will be restored to aid recovery efforts for the marbled murrelet, a federally threatened species. According to the Recovery Plan for the Marble Murrelet (USFWS 1997a), the major factors contributing to the threatened status of murrelets are loss of nesting habitats and poor reproductive success in the habitat that does remain.

Loss of high-quality nesting habitat and increased forest fragmentation are the main causes cited in the reduction of marbled murrelet populations and continue to threaten their recovery (Raphael et al. 2008; USFWS 1997a). The Federal marbled murrelet recovery plan identifies southwest Washington as a significant gap in suitable nesting habitat along the Pacific Northwest coast (USFWS 1997a). Increasing available habitat in this area is critical to expanding the geographic distribution of the murrelet within its threatened range (Raphael et al. 2008). Unlike most other regions within the range of the murrelet, this area has limited Federal forest ownership with large blocks of intact habitat. Therefore, improving both Federal and non-Federal forests in southwest Washington is critical to marbled murrelet recovery (Raphael et al. 2008). With less than 1% of the original old-growth forest remaining, restoration is essential to increasing the viability and resilience of marbled murrelet populations in this area (Davis et al. 2009).

The marbled murrelet recovery plan states that "silvicultural techniques may be appropriate to increase the area of suitable nesting stands and the rate at which they develop" within young-managed forests (USFWS 1997a). Given the lack of suitable habitat in this region, exploring forest restoration strategies intended to increase the amount of marbled murrelet nesting habitat is of particular importance. Habitat fragmentation has also resulted in reduced nesting success for murrelets within the remaining habitat by reducing microhabitat quality and increasing rates of predation, especially near artificial edges (Malt 2007). It is thought that these effects should decline as adjacent forests mature. Large core landscapes dedicated to murrelet protection should help reduce the amount of fragmentation over time. Buffering of existing habitat by actively managing young adjacent forests will be an important strategy to improve microhabitat conditions within these core murrelet emphasis areas. Road decommissioning can also be accomplished to further address habitat fragmentation and re-establish large areas of intact forest.

Thinning can be an important first step in speeding the development of suitable murrelet nesting habitat. If thinning is not conducted in dense coastal stands at this early stage, many stands will lose cedar and spruce cohorts to hemlock competition, diameter growth will be significantly slower, and tree crowns will begin to lift, often leaving stands susceptible to windthrow. Left untreated, development of suitable nesting habitat in these stands can be greatly delayed or may never occur (Davis et al. 2009).

Recent scientific research concludes that it is possible to accelerate forest complexity and habitat development through the application of carefully applied silvicultural practices. Techniques such as variable density thinning, under planting, and the creation of large woody debris (snags and downed logs) have been shown to accelerate the development of complex habitat conditions in young managed stands. Habitat manipulation around isolated legacy trees that remain in young managed forest stands also enhances the forest canopy structure required by murrelets for nesting. Such techniques can be used to promote the development of trees with nesting platforms and canopy characteristics preferred by the murrelet while also benefitting other species of concern. Access to current legacy trees suitable for nesting may also be opened up through these techniques (Davis et al. 2009).

The Washington, Oregon, and California population segment of the marbled murrelet was federally listed as threatened on September 28, 1992 (USFWS 1992a) due to the high rate of nesting habitat loss and fragmentation, and mortality associated with net fisheries and oil spills. The marbled murrelet is State listed as threatened in Washington. The strategies outlined to achieve this objective are consistent with the goals of the Recovery Plan for the Marbled Murrelet (USFWS 1997a).

The objective of the recovery plan is "to stabilize population size at or near current levels by (1) maintaining and/or increasing productivity of the population as reflected by changes in total population size, the adult: juvenile ratio, and nesting success by maintaining and/or increasing marine and terrestrial habitat and by (2) removing and/or minimizing threats to survivorship, including mortality from gill-net fisheries and oil spills" (USFWS 1997a).

The marbled murrelet is listed as a resource of concern under the following documents: Determination of Threatened Status for the Washington, Oregon, and California Population of the Marbled Murrelet (USFWS 1992a), Policy on Maintaining the Biological Integrity, Diversity and Environmental Health of the National Wildlife Refuge System (USFWS 2001b), Birds of Conservation Concern (USFWS 2002a), the U.S. Fish and Wildlife Service's Focal Species

Strategy for Migratory Birds (USFWS 2005b), Recovery Plan for the Marbled Murrelet (Washington, Oregon, and California Populations) (USFWS 1997a), North American Waterbird Conservation Plan (Kushlan et al. 2002), Seabird Conservation Plan (USFWS 2005a), Washington's Comprehensive Wildlife Conservation Strategy (WDFW 2005), State of Washington Natural Heritage Plan 2005 Update (WDNR 2005), and State of Washington Natural Heritage Program Information Systems (WDNR 2007).

### 2.4.2 Goal 2. Protect, maintain, and restore estuarine habitats historically characteristic of the southwest Washington coastal region for the benefit of salmonids, Pacific brant, other waterfowl, shorebirds, seabirds, and a diverse assemblage of other native species.

**Objective 2.4.2.1 Open Water Maintenance**

Annually protect and maintain 878 acres of open water and channel habitat within the Refuge portion of Willapa Bay for the benefit of salmonids, Pacific brant, other waterfowl, and other native species. Open water and channel habitats are characterized by the following:

- Subtidal habitats that are continuously submerged.
- Substrates that are typically sand and/or mud.
- Vegetated (e.g., eelgrasses [*Zostera* spp.]) or unvegetated areas.
- Minimal human disturbance.

**Acres to Achieve the Objective: 878**

**Strategies for Achieving the Objective**

A. Use appropriate IPM techniques including mechanical, physical, biological, and chemical methods (see Appendix H) to control invasive or undesirable plant species.

B. Monitor water quality as warranted.

C. Protect and promote natural processes that create and maintain aquatic habitats.

D. Maintain partnerships to protect ecological integrity of Willapa Bay and its wildlife resources.

**Rationale:**

The open water channels and sloughs of Willapa Bay are habitat for fish and a variety of invertebrate animals and aquatic plants. These aquatic areas serve as pathways and foraging areas for adult salmon (*Oncorhynchus* spp.), eulachon (*Thaleichthys pacificus*), lamprey (*Lampetra* spp.), sea-run cutthroat trout (*O. clarki clarki*), and steelhead (*O. mykiss*) migrating upriver to spawn, and for juveniles moving downstream to the ocean. Sturgeon (*Acipenser* spp.) forage in the deeper channels and holes. Clams, oysters, mussels, aquatic worms, amphipods, and other small organisms are found living along the bottom of this habitat and serve as a valuable food source for many species. The large expanse of open water provides necessary resting and foraging habitat for waterfowl, shorebirds, and marsh and wading birds.

Through an active role in local, State, and Federal partnerships, the refuge staff will work to maintain the ecological integrity and water quality of the Willapa Bay estuary. As with other natural estuarine habitats, this area is subject to natural processes; therefore, little if any physical management actions are appropriate for existing open water areas. A portion of the open water habitat of the Willapa Bay estuary is within the designated boundaries of the Refuge. The Refuge staff will work in concert with the community and sister agencies to provide the necessary

monitoring, protection, resources, and educational information, to maintain the Willapa Bay ecosystem in a healthy sustainable manner.

Willapa Bay is a valuable habitat for migratory birds, juvenile fishes, eelgrass, and clams (Proctor et al. 1980). Estuarine areas on the Refuge have annually provided important habitat for over 20,000 migrating ducks, tens of thousands of shorebirds, and 3,000 migrating geese at a time. The Refuge's open water habitat is essential to sustaining the estimated 2.2 million duck, 400,000 Canada goose, 200,000 brant, and over 2 million shorebird use-days associated with the southern half of Willapa Bay (USFWS 1997b).

Willapa Bay's subtidal system of three main channels and associated complex of smaller drainage channels deliver oceanic nutrients and plankton to feeding areas on the tide flats. The side channels provide fish a route to access the mudflats as well as cover from large predators during low tides (Coastal Resources Alliance 2007).

**Objective 2.4.2.2 Open Water Restoration**

Restore 0.2 acre and annually protect and maintain open water and channel habitat within the refuge portion of Willapa Bay for the benefit of salmonids, Pacific brant, other waterfowl, and other native species. Open water and channel habitats are characterized by the following:

- Subtidal habitats that are continuously submerged.
- Substrates that are typically sand and/or mud.
- Vegetated or unvegetated areas.
- Minimal human disturbance.

**Acres to Achieve the Objective: 0.2**

**Strategies for Achieving the Objective**

A. Remove dikes.

B. Reconnect tidal channels.

C. Protect sanctuary of new open water habitat.

D. Use appropriate IPM techniques including mechanical, physical, biological, and chemical methods (see Appendix H) to control invasive or undesirable plant species.

E. Monitor water quality as warranted.

F. Maintain partnerships to protect ecological integrity of Willapa Bay and its wildlife resources.

**Rationale:**

The open water channels and sloughs of Willapa Bay are habitat for fish and a variety of invertebrate animals and aquatic plants. These aquatic areas serve as pathways and foraging areas for adult salmon, eulachon, lamprey, sea-run cutthroat trout, and steelhead migrating upriver to spawn, and for juveniles moving downstream to the ocean. Sturgeon forage in the deeper channels and holes. Clams, oysters, mussels, aquatic worms, amphipods, and other small organisms are found living along the bottom of this habitat and serve as a valuable food source for many species. The large expanse of open water provides necessary resting and foraging habitat for waterfowl, shorebirds, and marsh and wading birds.

Willapa Bay is a valuable habitat for migratory birds, juvenile fishes, eelgrass, and clams (Proctor et al. 1980). Estuarine areas on the Refuge have annually provided important habitat for over 20,000 migrating ducks, tens of thousands of shorebirds, and 3,000 migrating geese at a time.

Refuge open water habitat are essential to sustaining the estimated 2.2 million duck, 400,000 Canada goose, 200,000 brant, and over 2 million shorebird use-days associated with the southern half of Willapa Bay (USFWS 1997b).

Willapa Bay's subtidal system of three main channels and associated complex of smaller drainage channels deliver oceanic nutrients and plankton to feeding areas on the tide flats. The side channels provide fish a route to access the mudflats as well as cover from large predators during low tides (Coastal Resources Alliance 2007).

The most reliable method of estuarine restoration is dike removal. Once saltwater influence has been restored to diked wetlands, natural processes are initiated that eventually lead to enhanced habitat value (Coastal Resources Alliance 2007). Key ecosystem processes are changed when saltwater influence is restored, including tidal hydrology, cycling of organic matter, and sediment movements. New off-channel habitat is available to fish. Organic nutrients are added. New plant communities grow and make organic matter and prey items available (Coastal Resources Alliance 2007). Removing the dikes would lead to reclamation of a portion of historically open water, maximizing the availability of this valuable habitat for wildlife resources.

**Objective 2.4.2.3 Intertidal Flats Maintenance**

Annually protect and maintain up to 4,178 acres of intertidal flats within the Refuge portion of Willapa Bay for the benefit of Pacific brant and other waterfowl, shorebirds, marine mammals, salmonids, and a variety of native, estuarine species. Intertidal flat habitats are characterized by the following:

- Exposed mud to sandy substrate that is interspersed with eelgrass beds.
- Sand bars that provide roost sites for brown pelicans and haul-outs for marine mammals.
- No *Spartina*.

**Acres to Achieve the Objective: 4,187**

**Strategies for Achieving the Objective**

A. Use appropriate IPM techniques including mechanical, physical, biological, and chemical methods (see Appendix H) to control invasive or undesirable plant species.

B. Allow natural processes to revegetate flats.

**Rationale:**

The expansive intertidal mudflats of Willapa Bay are among its most differentiating and defining features. They are also the basis for its unusual productivity for human communities. The intertidal zone supports a variety of habitats including mud and sand flats, oyster reefs, salt marsh habitat, and eelgrass meadows. Its oyster beds are currently the most productive growing grounds in the United States. Its mudflats are among the 10 most important fueling areas for migratory birds along the Pacific Flyway (Coastal Resources Alliance 2007).

Intertidal mudflats are particularly valuable habitat for migratory birds, juvenile fishes, eelgrass, and clams (Proctor et al. 1980). Such areas on the Refuge have annually provided important feeding habitat for over 20,000 migrating ducks, tens of thousands of shorebirds and 3,000 migrating geese at a time. Refuge tidelands are essential to sustaining the estimated 2.2 million duck, 400,000 Canada goose, 200,000 brant, and over 2 million shorebird use-days associated with the southern half of Willapa Bay (USFWS 1997b). Extensive eelgrass beds on intertidal mudflats

are an important food source for Pacific brant as well as habitat for juvenile salmonids and invertebrates.

In the Pacific Northwest, a large portion of estuarine habitat has been lost to diking, channelization, dredging, and filling. Washington is estimated to have lost between 45% and 62% of its presettlement estuarine habitat (Aitkin 1998).

**Objective 2.4.2.4 Intertidal Flats Restoration**

Restore ≤9 acres of intertidal flats within the Refuge portion of Willapa Bay for the needs of Pacific brant and other waterfowl, seabirds, shorebirds, marine mammals, salmonids, and a variety of other benefiting species. Intertidal flat habitats are characterized by the following:

- Exposed mud to sandy substrate that is interspersed with eelgrass (*Zostera* spp.) beds.
- Sand bars that provide roost sites for brown pelicans and haul-outs for marine mammals.
- No *Spartina*.

**Acres to Achieve the Objective: 9**

**Strategies for Achieving the Objective**

A. Remove dikes using heavy equipment.

B. Reconnect tidal channels.

C. Use appropriate IPM techniques including mechanical, physical, biological, and chemical methods (see Appendix H) to control invasive or undesirable plant species.

**Rationale:**

The expansive intertidal mudflats of Willapa Bay are among its most differentiating and defining features. They are also the basis for its unusual productivity for human communities. The intertidal zone supports a variety of habitats including mud and sand flats, oyster reefs, salt marsh habitat, and eelgrass meadows. Its oysterbeds are currently the most productive growing grounds in the United States. Its mudflats are among the 10 most important fueling areas for migratory birds along the Pacific Flyway (Coastal Resources Alliance 2007).

Intertidal mudflats are particularly valuable habitat for migratory birds, juvenile fishes, eelgrass, and clams (Proctor et al. 1980). Such areas on the Refuge have annually provided important feeding habitat for over 20,000 migrating ducks, tens of thousands of shorebirds, and 3,000 migrating geese at a time. Refuge tidelands are essential to sustaining the estimated 2.2 million duck, 400,000 Canada goose, 200,000 brant, and over 2 million shorebird use-days associated with the southern half of Willapa Bay (USFWS 1997b). Extensive eelgrass beds on intertidal mudflats are an important food source for Pacific brant and habitat for juvenile salmonids and invertebrates.

In the Pacific Northwest a large portion of estuarine habitat has been lost to diking, channelization, dredging, and filling. Washington is estimated to have lost between 45% and 62% of its presettlement estuarine habitat (Aitkin 1998).

The most reliable method of estuarine restoration is dike removal. Once saltwater influence has been restored to diked wetlands, natural processes are initiated that eventually lead to enhanced habitat value (Coastal Resources Alliance 2007).

Key ecosystem processes are changed when saltwater influence is restored including tidal hydrology, cycling of organic matter, and sediment movements. New off-channel habitat is

available to fish. Organic nutrients readded. New plant communities grow and make organic matter and prey items available (Coastal Resources Alliance 2007). Removing the dikes would lead to reclamation of a portion of the historical intertidal mudflats, maximizing the availability of this valuable habitat for wildlife resources.

**Objective 2.4.2.5 Maintain Salt Marsh Habitat**

Annually protect and maintain 1,636 acres of salt marsh within the Refuge portion of Willapa Bay for the benefit of waterfowl, salmonids, wading birds, shorebirds and other native species. Salt marsh habitats are characterized by the following:

- Vegetation that usually occurs within tidal range of 9 to 11 feet NGVD (National Geodetic Vertical Datum) and is dominated primarily by pickleweed (*Salicornia* spp.), tufted hairgrass, seashore salt grass, seacoast angelica (*Angelica lucida*), gumweed (*Grindelia integrifolia*), jaumea (*Jaumea carnosa*), seaside plantain (*Plantago maritime*), small spike-rush (*Eleocharis parvula*), seaside arrowgrass (*Triglochin maritimum*), and Lyngby's sedge (*Carex lyngbyei*).
- Infrequent inundation except on highest high tides.
- Interspersion of tidal sloughs.
- No *Spartina*.

**Acres to Achieve the Objective: 1,636**

**Strategies for Achieving the Objective**

A. Use appropriate IPM techniques including mechanical, physical, biological, and chemical methods (see Appendix H) to control invasive or undesirable plant species.

B. Protect and promote natural processes to drive vegetative changes.

**Rationale:**

The tidal salt marshes on the Refuge provide habitat for a diverse array of species which include waterfowl and other waterbirds, fish, and invertebrates. Salt marshes provide a major source of nutrients for aquatic and terrestrial wildlife. They also provide forage for waterfowl and hunting grounds for bald eagles, northern harriers (*Circus cyaneus*), peregrine falcons, and other raptors. The management strategies identified for this habitat are focused on protection and restoration. The existing salt marshes should be protected and maintained. In the Pacific Northwest, a large portion of estuarine habitat has been lost to diking, channelization, dredging, and filling. Washington is estimated to have lost between 45% and 62% of its presettlement estuarine habitat (Aitkin 1998).

According to Olympic Natural Resources Center (ONRC) calculations, Willapa Bay originally contained approximately 14,620 acres of saltwater wetlands. Now there are 5,277 acres. This represents a 64% loss of estuarine wetlands (Coastal Resources Alliance 2007).

In a recent comparative survey, goose use within two types of habitats—salt marsh (Porter Point Unit) and pasturelands (Riekkola Unit)—the migratory goose utilization of these areas as foraging habitat revealed a greater use by geese on the salt marsh than on the adjacent managed pastures protected by dikes. Goose use of the salt marsh occurred regardless of the level of water coverage by the tides. Survey data suggest that migrating geese utilize salt marsh on average 8.6 times more than on the Riekkola Unit pastures (Patten et al. 2008).

This salt marsh habitat is subject to natural processes and currently there is little physical management activity occurring outside the dikes. Control of invasive species would provide the best opportunity to improve habitat in the naturally occurring emergent tidal salt marsh.

**Objective 2.4.2.6 Salt Marsh Restoration**

Restore and then protect and maintain up to 611 acres of salt marsh within the refuge portion of Willapa Bay for the benefit of waterfowl, salmonids, wading birds, shorebirds, and other native species. Salt marsh habitats are characterized by the following:

- Vegetation that usually occurs within tidal range of 9 to 11 feet NGVD dominated primarily by pickleweed, tufted hairgrass, seashore salt grass, seacoast angelica, gumweed, seaside plantain, small spikerush, seaside arrowgrass, and Lyngby's sedge.
- Infrequent inundation except on highest high tides.
- Interspersion of tidal sloughs.
- No *Spartina*.

**Acres to Achieve the Objective: 611**

**Strategies for Achieving the Objective**

A. Remove dikes.

B. Reconnect tidal channels.

C. Use appropriate IPM techniques including mechanical, physical, biological, and chemical methods (see Appendix H) to control invasive or undesirable plant species.

**Rationale:**

The tidal salt marshes on the Refuge provide habitat for a diverse array of species, including waterfowl and other waterbirds, fish, and invertebrates. Salt marshes provide a major source of nutrients for aquatic and terrestrial wildlife. They also provide forage for waterfowl and hunting grounds for bald eagles, northern harriers, peregrine falcons, and other raptors.

The management strategies identified for this habitat are focused on protection and restoration. A portion of the Refuge's salt marsh habitat was eliminated by diking in the late 1940s and early 1950s to create pasturelands and freshwater wetlands, believed to enhance overall waterfowl use of the Refuge and increase land available for agricultural production. In the Pacific Northwest, a large portion of estuarine habitat has been lost to diking, channelization, dredging, and filling.

Washington is estimated to have lost between 45% and 62% of its presettlement estuarine habitat (Aitkin 1998).

Loss of saltwater wetlands habitat is considered one of the most common limiting factors blamed for the decline of nearshore or estuarine salmon habitat. Wetland loss occurs when a dike is built isolating areas from the reach of tidal waters.

According to ONRC calculations, Willapa Bay originally contained approximately 14,620 acres of saltwater wetlands. Now there are 5,277 acres. This represents a 64% loss of estuarine wetlands (Coastal Resources Alliance 2007).

In a recent comparative survey, goose use within two types of habitats—salt marsh (Porter Point Unit) and pasturelands (Riekkola Unit)—the migratory goose utilization of these areas as foraging

habitat revealed a greater use by geese on the salt marsh than on the adjacent managed pastures protected by dikes. Goose use of the salt marsh occurred regardless of the level of water coverage by the tides. Survey data suggest that migrating geese utilize salt marsh on average 8.6 times more than on the Riekkola Unit pastures (Patten et al. 2008).

The most reliable method of estuarine restoration is dike removal. Once saltwater influence has been restored to diked wetlands, natural processes are initiated that eventually lead to enhanced habitat value (Coastal Resources Alliance 2007).

Key ecosystem processes are changed when saltwater influence is restored including tidal hydrology, cycling of organic matter, and sediment movements. New off-channel habitat isavailable to fish. Organic nutrients are added. New plant communities grow and make organic matter and prey items available (Coastal Resources Alliance 2007).

Removing dikes would restore valuable salt marsh habitat, which is considered one of the most productive ecosystems in the world.

Willapa NWR has previously pursued tidal restoration on other refuge properties (Headquarters Unit, areas near the Bear River, and Long Island). The Refuge has approximately 638.1 acres of former tideland located in the South Bay, which is cut off from the bay by dikes and tidegates. These areas can be returned to estuarine habitat and improve the Refuge's value to waterfowl and native wildlife species. Restoring tidal influence would allow a recovery that would reflect the historical salt marsh habitat. The restoration plan outlined in Appendix O.

### 2.4.3 Goal 3. Protect, maintain, and restore freshwater habitats historically characteristic of the southwest Washington coastal region for the benefit of migratory birds, salmonids, amphibians, mussels, lamprey, and a diverse assemblage of other native species.

**Objective 2.4.3.1 Protect and Maintain Riverine Habitats**

Protect and maintain 27 miles of riverine habitats containing characteristics that represent the historical landscape. A riverine system includes all wetlands and deepwater habitats contained within a channel, with two exceptions: 1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and 2) habitats with water containing ocean-derived salts in excess of 0.5% (Cowardin et al. 1979). As detailed in several sources (Knutson and Naef 1997; Kondolf and Wolman 1993; Laufle et al. 1986; USFWS 2004b) riverine systems containing salmonid habitat are characterized by:

- Periodic flooding with flooding energy variable depending on location of stream or river in landscape.
- Perennial water flows.
- Barrier-free passage for fish.
- At least one piece of large woody debris per channel width.
- Pool-to-riffle ratio of 1:1.
- Abundance of spawning gravel (6-128 mm) for salmonids.
- Low amounts of fine sediments.

- Cool temperatures (<73˚F) with preferred temperature range (40˚F-58˚F).
- Dissolved oxygen levels >5 parts per million.
- Intact riparian corridor providing stream surface shade of 60%-80%.

**Miles to Achieve the Objective: 27**

**Strategies for Achieving the Objective**

A. Use appropriate IPM techniques including mechanical, physical, biological, and chemical methods (see Appendix H) to control invasive or undesirable plant species.

B. Protect and promote natural processes that create and maintain aquatic habitats.

**Rationale:**

An estimated 50%-90% of streams in the State of Washington are in a degraded state (Knutson and Naef 1997).

Rivers and streams in the Willapa NWR support runs of anadromous fish such as chum salmon (*Oncorhynchus keta*), coho salmon (*O. kisutch*), and Chinook salmon (*O. tshawytscha*), and cutthroat trout. River and stream channels provide migration pathways for adult anadromous fish traveling to spawning grounds and juveniles traveling to the estuary and/or Pacific Ocean.

Land use activities have impacted wildlife habitat values in and along rivers and streams in the Willapa Bay watershed. Historical stream processes in many areas have been altered. There has been a loss of connectivity to the estuary due to highway and dike construction. Hydrological regimes have been altered, fish passage barriers exist, there are water quality issues, and exotic species are present. There is a need to protect and maintain ecological processes and functions in streams and associated habitat. Positive effects of healthy streams include enhanced nutrient production and cycling, improved water quality, and support of a diverse riparian and estuarine plant and wildlife community. Optimal stream habitat provides protective cover, improved forage, and structural diversity that results in formation of in-stream riffles and pools for anadromous fish; these conditions would also benefit other stream-dependent wildlife species, including rare amphibian species and invertebrates, such as mollusks, and a large variety of aquatic insects (USFWS 2003a).

**Objective 2.4.3.2 Restore Riverine Habitats**

Conduct restoration activities within various reaches of the 27 miles of riverine habitat that mimic or promote natural processes which create and maintain aquatic habitat conditions representative of the historical landscape. As detailed in several sources ((Knutson and Naef 1997; Kondolf and Wolman 1993; Laufle et al. 1986; USFWS 2004b), riverine systems containing salmonid habitat are characterized by:

- Periodic flooding with flooding energy variable depending on location of stream/river in landscape.
- Perennial water flows.
- Barrier-free passage for fish.
- At least one piece of large woody debris per channel width.
- Pool-to-riffle ratio of 1:1.
- Abundance of spawning gravel (6-128 mm) for salmonids.
- Low amounts of fine sediments.

- Cool temperatures (<73˚F) with preferred temperature range (40˚F-58˚F).
- Well-oxygenated water, with dissolved oxygen levels >5 parts per million.
- Intact riparian corridor providing stream surface shade of 60%-80%.

Restoration may include re-establishment or enhancement of native stream-dependent species in their historical habitat. This may occur in some instances where native populations are extirpated or depauperate.

**Stream Miles Restored and Maintained: 27**

**Strategies for Achieving the Objective**

A. Use appropriate IPM techniques including mechanical, physical, biological, and chemical methods (see Appendix H) to control invasive or undesirable plant species.

B. Compile watershed assessments as needed.

C. Re-establish large woody debris to mimic historical stream complexities.

D. Removal of fish passage barriers.

E. Use of stream restoration techniques (reconnect historic channels, riparian plantings, placement of large woody debris, etc.) as appropriate to improve stream conditions.

**Rationale:**

Stream restoration techniques will be used to maximize healthy stream characteristics. Because an estimated 50%-90% of streams in the State of Washington are in a degraded state, stream restoration is appropriate (Knutson and Naef 1997).

Rivers and streams in the Willapa NWR support declining runs of anadromous fish such as cutthroat trout and chum, coho, and Chinook salmon . Barriers to fish passage and previous land management practices throughout the area have contributed to the decline of fish runs in Willapa Bay.

Land use activities have also impacted other wildlife habitat values along refuge streams. Historical stream processes in many areas of the Refuge have been altered. Wood in many of the streams was removed as part of early logging practices and “stream cleaning” efforts. In addition, the important components of gravel beds suitable for anadromous fish spawning as well as riparian vegetation have previously been compromised. In some areas, fish passage barriers are present. There is a need to restore historical ecological processes and functions in refuge streams and associated habitat. Positive effects of restoration efforts include enhanced nutrient production and cycling, improved water quality, and support of a diverse riparian and estuarine plant and wildlife community. Restored stream habitats would provide protective cover, improved forage, and structural diversity that results in formation of in-stream riffles and pools for anadromous fish; these conditions would also benefit other stream-dependent wildlife species, including rare amphibian species and invertebrates such as mollusks and a large variety of aquatic insects (USFWS 2003a).

Re-establishment or enhancement of native stream-dependent species in their historical habitat may occur in some instances where native populations are extirpated or depauperate. Emphasis will be placed on restoring all native fauna to suitable habitat in refuge streams where previous detrimental land use practices have impacted or extirpated healthy salmonid runs as well as having impacts on other stream-dependent species, such as native mussels and lamprey.

| **Objective 2.4.3.3 Seasonal, Managed Freshwater Wetlands** |
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| Annually protect and maintain 17 acres of seasonal, managed freshwater wetland habitats for the benefit of waterbirds, native fish, and native amphibians. These seasonally managed wetlands will have the following attributes:<br><br>• >40% cover of desirable and native wetland plants and short emergent vegetation (e.g., bur-reed [*Sparganium* sp.], spike-rush, water pennywort, smartweed [*Polygonum* sp.]).<br>• <5% cover of invasive plant species (e.g., bog loosestrife, tussock).<br>• <40% cover of reed canarygrass (*Phalaris arundinacea*).<br>• No bullfrogs (*Rana catesbeiana*).<br>• Variable water levels (6 inches to >4 feet). |
| **Acres to Achieve the Objective: 17** |
| **Strategies for Achieving the Objective** |
| A. Soil disturbance (e.g., disking) to control undesirable plant species. |
| B. Use and maintain infrastructure (e.g., water control structures, dikes) to maintain appropriate water levels and dewater. |
| C. Water draw-downs by mid-June or July to promote germination of native aquatic and desirable moist soil plants and to control bullfrogs. |
| D. Prolonged flood-up (>1 year) on an annual rotational basis on both large and small impoundments for habitat management. |
| E. Use appropriate IPM techniques including mechanical, physical, biological, and chemical methods (see Appendix H) to control invasive or undesirable plant species. |
| **Rationale:**<br>Freshwater wetlands are important habitat for a variety of waterfowl, wading birds, and shorebird species, as well as fish and native amphibians. Active management (which includes draw-downs and mechanical/chemical methods) ensures that these areas do not become dominated by invasive plants such as reed canarygrass and common rush (also known as tussock). Desirable wetland plant species such as spike-rush, smartweed, and bur-reed are maintained by proper application and timing of draw-downs and flood-ups.<br><br>Managed wetlands provide breeding habitat for native amphibians such as red-legged frogs (*Rana aurora*), Pacific treefrogs (*Pseudacris regilla*), and a variety of native salamanders. Proper timing of draw-downs also allows control of non-native bullfrog populations.<br><br>Managed freshwater wetlands currently occur on the Tarlatt, Riekkola, Porter Point, and Lewis Units. Under Objectives 2.4.2.2., 2.4.2.4., 2.4.2.6 the acreage of managed freshwater wetlands in the Porter Point, Lewis, and Riekkola Units will be reduced due to restoration of estuarine open water, intertidal mudflat, and salt marsh habitats, which represent the historical condition of these areas. Due to reduction in the amount of managed freshwater wetlands under the management direction, problematic nonnative species such as reed canarygrass, bullfrogs, and nutria (*Myocastor coypus*) would be naturally reduced/eliminated due to loss of habitat in the conversion of managed freshwater wetlands to estuarine habitat. Managed freshwater wetlands will remain at the Tarlatt Unit. |

| **Objective 2.4.3.4 Permanent/Semipermanent Natural Freshwater Wetlands (Includes Beaver Ponds and Interdunal Wetlands)** |
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| Annually protect and maintain up to 545 acres of permanent and semipermanent, naturally occurring freshwater wetlands (includes beaver ponds and interdunal wetlands) for the benefit of beaver, salmonids (beaver ponds), waterfowl, other waterbirds, landbirds, raptors, and native amphibians. These naturally occurring wetlands are characterized by the following plant communities:<br>• Submergents (e.g., pondweeds) in open water (beaver ponds).<br>• Desirable and native wetland plants and emergent vegetation (e.g., bur-reed, spike-rush, water pennywort, slough sedge [*Carex obnupta*], creeping spearwort [*Ranunculus flammula*], cinquefoil [*Potentilla* sp.], and smartweed).<br>• Willow (*Salix* spp.) shrubs. |
| **Acres to Achieve the Objective: 545** |
| **Strategies for Achieving the Objective** |
| A. Use appropriate IPM techniques including mechanical, physical, biological, and chemical methods (see Appendix H) to control invasive or undesirable plant species. |
| B. Protect and promote natural processes to maintain wetlands. |
| **Rationale:**<br>Permanent and semipermanent natural freshwater wetlands are important habitat for a variety of wildlife. Beaver ponds often contain snags standing in open water. These snags are important nesting habitat for wood ducks (*Aix sponsa*), tree swallows (*Tachycineta bicolor*), and woodpeckers. They are also used as hunting perches by a variety of raptors.<br><br>Cutthroat trout make extensive use of beaver ponds for overwintering and feeding (Johnson et.al. 1999), and coho often use these areas as winter habitat (Narver 1978 *in* McMahon 1983). Beaver ponds on Willapa NWR streams provide winter habitat for both juvenile cutthroat and coho. Maintaining beaver ponds on these streams should benefit cutthroat and coho by providing winter habitat as well as rearing and feeding areas (USFWS 2004b).<br><br>At Leadbetter Point, the deflation plain and dune trough communities containing semipermanent natural wetlands are of relatively high ecological integrity when compared to what remains of these habitats in Washington. Pockets of native plants in these areas are considered significant (Caicco 1989). Waterfowl, waterbirds, songbirds, and native amphibians use these wetlands. |

## 2.4.4 Goal 4. Protect, maintain, and restore coastal beach and dune habitats historically characteristic of the southwest Washington coastal region for the benefit of the western snowy plover, streaked horned lark, pink sandverbena, Oregon silverspot butterfly, and a diverse assemblage of other native species.

| **Objective 2.4.4.1 Protect and Maintain Coastal Dune Ecosystem** |
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| Protect and maintain 1,581 acres of coastal dune habitat (Leadbetter Point Unit excluding wetlands). Coastal dune habitat will be maintained where appropriate for the western snowy plover, streaked horned lark, and pink sandverbena. Coastal dune habitat suitable for these species will be characterized by the following attributes: |

- Sparsely vegetated habitat with a ground layer dominated by sand.
- Large areas of open sand with native beach plants, and shell patches/tidal debris suitable for plover nesting and chick fledging.
- Presence of native beach plants including pink sandverbena, beach morning glory (*Convolvulus soldanella*), gray beach pea (*Lathyrus japonicus*), and a native dune grass (*Leymus mollis*).
- Beach or dune habitat free of introduced beachgrasses (*Ammophila* spp.)

**Acres to Achieve the Objective: 1,581**

**Strategies for Achieving the Objective**

A. Use appropriate IPM techniques including mechanical, physical, biological, and chemical methods (see Appendix H) to control invasive or undesirable plant species.

B. Protect and promote natural processes.

C. Collect seeds for conservation insurance and place them in long-term seed storage.

D. Use fire suppression techniques (including use of fire-lines, hand tools, backpack and slip-on water pumps) to prevent catastrophic wildfire.

E. Maintain previously restored coastal dune habitat and the native species it supports, especially for the western snowy plover, streaked horned lark, and pink sandverbena.

**Rationale:**

Within approximately 1,581 acres of the coastal dune ecosystem, the Refuge has currently restored and maintained 121 acres. Up to an additional 200 acres of coastal dune habitat will be restored for plover nesting. Extensive areas (throughout the Pacific coastline, including the Refuge) of formerly open or sparsely vegetated coastal dune habitat continue to be invaded by exotic beachgrasses, including introduced American beachgrass (*Ammophila breviligulata*) and European beachgrass (*Ammophila arenaria*). These grasses out-compete native vegetation, alter the dune ecosystem, and form dense stands that reduce the amount and quality of nesting habitat for native wildlife, including western snowy plovers and streaked horned larks. The invasion of *Ammophila* has dramatically reduced native coastal plants and is a primary threat to pink sandverbena.

The western snowy plover relies heavily on coastal beaches from southern Washington to Baja California for food, shelter, and raising its young. The Pacific Coast populations of this species have been declining dramatically because of substantial habitat loss related to industrial, urban, and recreational development; human disturbance; and encroachment of invasive plants. The coastal population of western snowy plover was listed as threatened by the USFWS in 1993 (USFWS 1993). It is listed as endangered by the State of Washington.

The Leadbetter Point Unit is one of the northernmost breeding sites for the western snowy plover on the Pacific Coast and is the largest and most significant snowy plover nesting area in Washington. The western snowy plover is listed as a resource of concern (see Section 2.4.6.1) under the following documents: Northern Pacific Coast Regional Shorebird Management Plan—U.S. Shorebird Conservation Plan (Drut and Buchanan 2000), Determination of Threatened Status for the Pacific Coast Populations of the Western Snowy Plover (USFWS 1993), Policy on Maintaining the Biological Integrity, Diversity and Environmental Health of the National Wildlife Refuge System (USFWS 2001b), the U.S. Fish and Wildlife Service's Focal Species Strategy for Migratory Birds (USFWS 2005b), Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (*Charadrius alexandrinus nivosus*) (USFWS 2007a), Washington State Recovery Plan for the Snowy Plover (WDFW 1995), Washington's Comprehensive Wildlife Conservation

Strategy (WDFW 2005), State of Washington Natural Heritage Plan 2005 Update (WDNR 2005), and State of Washington Natural Heritage Program Information Systems (WDNR 2007).

The streaked horned lark is a candidate species for Federal listing under the ESA, an endangered species in Washington State under the Washington Endangered Species Act, and a priority species for conservation by Oregon-Washington Partners in Flight. Lark nesting habitat is low, sparse vegetation with an abundance of bare ground. The Range-wide Streaked Horned Lark (*Eremophila alpestris strigata*) Assessment and Preliminary Conservation Strategy (Pearson and Altman 2005) prioritizes control of invasive beachgrasses at coastal breeding sites. The streaked horned lark is likely to become extinct in Washington unless additional nesting areas are established and protected (WDFW 2005).

The streaked horned lark is listed as a resource of concern under the following documents: Conservation Strategy for Landbirds in Lowlands and Valleys of Western Oregon and Washington (Altman 2000), Policy on Maintaining the Biological Integrity, Diversity and Environmental Health of the National Wildlife Refuge System (USFWS 2001b), Birds of Conservation Concern (USFWS 2002a), Washington's Comprehensive Wildlife Conservation Strategy (WDFW 2005), Range-wide Streaked Horned Lark Assessment and Preliminary Conservation Strategy (Pearson and Altman 2005), State of Washington Natural Heritage Plan 2005 Update (WDNR 2005), and State of Washington Natural Heritage Program Information Systems (WDNR 2007).

A habitat restoration area to create nesting habitat for the western snowy plover was initiated in 2002 and currently supports the only known population of pink sandverbena in Washington State. This plant species was thought to be extirpated in the state (Federal species of concern, Washington State endangered species).

The pink sandverbena is listed as a resource of concern under the following documents: Policy on Maintaining the Biological Integrity, Diversity and Environmental Health of the National Wildlife Refuge System (USFWS 2001b), State of Washington Natural Heritage Plan 2005 Update (WDNR 2005), and State of Washington Natural Heritage Program Information Systems (WDNR 2007).

A long-term goal is to protect and maintain the native coastal dune ecosystem at Leadbetter Point. Recovery needs of the western snowy plover, streaked horned lark, and pink sandverbena are all directly supported by protecting and maintaining coastal dune habitat.

### 2.4.5 Goal 5. Provide short-grass fields (improved pastures) and grasslands for the benefit of Canada geese, Pacific jumping mouse, and other grassland-dependent species, and restore grasslands for the Oregon silverspot butterfly.

**Objective 2.4.5.1 Maintain Short-grass Fields (Improved Pastures)**

Annually maintain 93 acres of improved short-grass fields (pastures) on the Riekkola Unit, providing quality foraging habitat for Canada geese and meeting the life history needs of other grassland-dependent wildlife. Short-grass fields will be characterized by the following:

- Short grasses (<4 inch) by October 1.
- Desirable mix of grasses and grass/legumes (e.g., orchard grass [*Dactylis glomerata*], rye grass, clover [*Trifolium* spp.], bird's-foot trefoil [*Lotus corniculatus*], and native forbs).

- <50% cover of unpalatable/invasive plant species (e.g., reed canarygrass, thistle, tussock, tall fescue [*Festuca arundinaceae*]).

**Acres to Achieve the Objective: 93**

**Strategies for Achieving the Objective**

A. Mow fields (when grazing livestock are not present) to a height of 4 to 6 inches at least twice per year if feasible. Early mowing in May is desirable if fields are dry enough, as is mowing in late September.

B. Graze livestock in fenced fields from mid-April to early October. Use rotational grazing to maintain a vegetation height of 4 to 6 inches.

C. Conduct soil testing. Apply fertilizer and lime as needed to the fields from May to October (at a time not impacting the grazing livestock and with minimal disturbance to migratory birds).

D. Aerate fields, as needed (approximately every five years).

E. Use appropriate IPM techniques including mechanical, physical, biological, and chemical methods (see Appendix H) to control invasive or undesirable plant species.

F. As needed (1-5 years), interseed grass with desirable grass/pasture mix.

**Rationale:**

Canada geese (i.e., dusky and western [*Branta canadensis moffitti*]) use the Refuge and forage in short-grass fields and salt marshes. It is important to maintain managed short-grass fields in a short, immature growth form by repeated mowing or livestock grazing during the growing season prior to arrival of migrating waterfowl. Once grass matures, it becomes coarse and much less digestible, and it has less protein.

Mammals (elk, deer, bear, coyote, etc.) use the short-grass fields as foraging areas and/or travel routes to adjacent lands. Smaller mammals (voles, mice, etc.) thrive in short-grass fields. These smaller mammals serve as prey for raptors such as red-tailed hawks [*Buteo jamaicensis*], northern harriers, American kestrels [*Falco sparverius*], and various species of owls, all of which use the short-grass fields as foraging grounds. Other songbird and shorebird species will use short-grass fields.

## Objective 2.4.5.2 Restore Grasslands

Restore up to 33 acres of grassland habitat especially for the federally threatened Oregon silverspot butterfly and for a variety of other grassland-dependent species. Grassland habitat for the Oregon silverspot butterfly has the following attributes:

**Dominant plant species:**

- Red fescue.
- Tufted hairgrass.
- Early blue violet (host plant for the Oregon silverspot butterfly caterpillar) in patches of 25-35 violets per square meter.
- Five native nectar plants at a density of no fewer than five flowering stems per square meter. Species include pearly-everlasting (*Anaphalis margaritacea*), yarrow (*Achillea millefolium*), California aster, dune goldenrod, and dune thistle.

**Acres to Achieve the Objective: 33**

**Strategies for Achieving the Objective**

A. Use appropriate IPM techniques including mechanical, physical, biological, and chemical

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| methods (see Appendix H) to control invasive or undesirable plant species. |
| B. Use nurseries to raise plant stock. |
| C. Transplant native grasses and forbs. |
| D. Directly seed native grasses and forbs. |
| E. Maintain partnerships to restore habitat suitable for the Oregon silverspot butterfly. |
| F. Private lands biologist position will assist private landowners interested in pursuing management actions that support resources in this objective. |
| **Rationale:**<br>Suitable areas on the Refuge will serve as the focal point for restoration projects to create habitat for the Oregon silverspot butterfly (currently extirpated in Washington State). These areas will be managed long-term to maintain native, early successional grassland communities. The habitat needs of both larval and adult Oregon silverspot butterflies will be met. Habitat management and restoration efforts would provide early blue violet (larval host plant) and promote abundance, provide a minimum of five native nectar species dispersed abundantly throughout the habitat that flower throughout the entire flight period, and reduce the abundance of invasive non-native plant species (USFWS 2001a). Creation of an appropriate number of acres of high-quality habitat would allow reintroduction of this species to occur on the Refuge.<br><br>Mammals (elk, deer, bear, coyote, etc.) use grasslands as foraging areas and/or travel routes to adjacent lands. Smaller mammals (voles, mice, etc.) thrive in grasslands. These smaller mammals serve as prey for raptors such as red-tailed hawks, northern harriers, American kestrels, and various species of owls, all of which use grasslands as foraging grounds. Other songbird and shorebird species will use grasslands.<br><br>For the Oregon silverspot butterfly, invasion by exotic species, natural succession, fire suppression, and land development have resulted in loss and modification of the species' habitat. Land use practices have altered disturbance regimes needed to maintain existing habitats and create new habitats for species expansion. (For the Oregon silverspot butterfly, see also Section 2.4.6.2.) |

| **Objective 2.4.5.3 Restore Coastal Dune Ecosystem** |
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| Restore up to 200 acres of coastal dune habitat and the native species it supports, especially for the western snowy plover, streaked horned lark, and pink sandverbena. Historically, coastal dunes were characterized by:<br>• Sparsely vegetated habitat with a ground layer dominated by sand.<br>• Large areas of open sand with native beach plants, and shell patches/tidal debris suitable for plover nesting and chick fledging.<br>• Native beach plants including pink sandverbena, beach morning glory, gray beach pea, and a native dune grass.<br>• Beach or dune habitat free of introduced beachgrasses (*Ammophila* spp.). |
| **Acres to Achieve the Objective: 200** |
| **Strategies for Achieving the Objective** |
| A. Use appropriate IPM techniques including mechanical, physical, biological, and chemical methods (see Appendix H) to control invasive or undesirable plant species. |
| B. Protect and promote natural processes. |

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| C. Collect seeds for conservation insurance and place them in long-term seed storage. |
| D. Propagate and plant/broadcast seed of native plant species. |
| **Rationale:**<br>Within approximately 1,581 acres of the coastal dune ecosystem, the Refuge has currently restored and maintained 121 acres. Up to an additional 200 acres of coastal dune habitat will be restored for plover nesting. Extensive areas throughout the Pacific coastline, including the Refuge, of formerly open or sparsely vegetated coastal dune habitat continue to be invaded by exotic beachgrasses, including introduced American beachgrass and European beachgrass. These grasses out-compete native vegetation, alter the dune ecosystem, and form dense stands that reduce the amount and quality of nesting habitat for native wildlife, including the western snowy plover and streaked horned lark. The invasion of *Ammophila* has caused a dramatic reduction of coastal native plants and is a primary threat to pink sandverbena.<br><br>Western snowy plover numbers have declined along the U.S. Pacific coast due to habitat degradation and expanding predator populations. One of the most significant causes of habitat loss for coastal breeding snowy plovers has been the encroachment of introduced beachgrasses. Habitat restoration by removal of beachgrass is recommended in both the Federal (USFWS 2007a) and Washington State (WDFW 1995) recovery plans for the western snowy plover. The U.S. National Shorebird Conservation Plan: Northern Pacific Coast Working Group Regional Management Plan (Drut and Buchanan 2000) also calls for the removal of *Ammophila*.<br><br>The western snowy plover relies heavily on coastal beaches from southern Washington to Baja California for food, shelter, and raising its young. The Pacific Coast populations of this species have been declining dramatically because of substantial habitat loss related to industrial, urban, and recreational development; human disturbance; and encroachment of exotic vegetation. On March 5, 1993, the Pacific Coast population of the western snowy plover was listed as threatened under provisions of the ESA(USFWS 1993). It is listed as endangered by the State of Washington.<br><br>The Leadbetter Point Unit of Willapa NWR is one of the northernmost breeding sites for the western snowy plover on the Pacific Coast. Leadbetter Point is the largest and most significant snowy plover nesting area in Washington. If Willapa NWR implements predator management and the plover population increases, then restored suitable habitat at Leadbetter Point would likely be needed by the growing population.<br><br>The western snowy plover is listed as a resource of concern under the following documents: Northern Pacific Coast Regional Shorebird Management plan–U.S. Shorebird Conservation Plan (Drut and Buchanan 2000), Determination of Threatened Status for the Pacific Coast Populations of the Western Snowy Plover (USFWS 1993), Policy on Maintaining the Biological Integrity, Diversity and Environmental Health of the National Wildlife Refuge System (USFWS 2001b), U.S. Fish and Wildlife Service Focal Species Strategy for Migratory Birds (USFWS 2005b), Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (USFWS 2007a), Washington State Recovery Plan for the Snowy Plover (WDFW 1995), Washington's Comprehensive Wildlife Conservation Strategy (WDFW 2005), State of Washington Natural Heritage Plan 2005 Update (WDNR 2005), and State of Washington Natural Heritage Program Information Systems (WDNR 2007). (For the snowy plover, see also Section 2.4.6.1.)<br><br>The streaked horned lark is a candidate species for Federal listing under the ESA, an endangered species in Washington State under the Washington Endangered Species Act, and a priority species for conservation by Oregon-Washington Partners in Flight. Lark nesting habitat is low, sparse |

vegetation with an abundance of bare ground. The Range-wide Streaked Horned Lark Assessment and Preliminary Conservation Strategy (Pearson and Altman 2005) prioritizes control of invasive beachgrasses at coastal breeding sites. The streaked horned lark is likely to become extinct in Washington unless additional nesting areas are established and protected (WDFW 2005).

The streaked horned lark is listed as a resource of concern under the following documents: Conservation Strategy for Landbirds in Lowlands and Valleys of western Oregon and Washington (Altman 2000), Policy on Maintaining the Biological Integrity, Diversity and Environmental Health of the National Wildlife Refuge System (USFWS 2001b), Birds of Conservation Concern (USFWS 2002a), Washington's Comprehensive Wildlife Conservation Strategy (WDFW 2005), Range-wide Streaked Horned Lark Assessment and Preliminary Conservation Strategy (Pearson and Altman 2005), State of Washington Natural Heritage Plan 2005 Update (WDNR 2005), and State of Washington Natural Heritage Program Information Systems (WDNR 2007).

The Leadbetter habitat restoration area supports the only known population of pink sandverbena in Washington State. This plant species was thought to be extirpated in the state; the species is a Federal species of concern and a Washington State endangered species. In 2006, it re-established itself, from a long-term seed bank, because beachgrass had been removed from the site. In addition to removing *Ammophila*, further recovery actions for pink sandverbena include direct augmentation of the population by collecting seed, propagating individuals in a greenhouse, and transplanting those individuals back to the restoration area at Leadbetter or by broadcasting seed. The ultimate goal is to create a self-sustaining pink sandverbena population.

The pink sandverbena is listed as a resource of concern under the following documents: Policy on Maintaining the Biological Integrity, Diversity and Environmental Health of the National Wildlife Refuge System (USFWS 2001b), State of Washington Natural Heritage Plan 2005 Update (WDNR 2005), and State of Washington Natural Heritage Program Information Systems (WDNR 2007).

A long-term goal is to restore additional native coastal dune habitat at Leadbetter Point and then protect and maintain this habitat. Predation risks to plovers and larks are also expected to be somewhat alleviated by this action, thus reducing the detection of nests by predators that may be hunting the edges.

Recovery needs of the western snowy plover, streaked horned lark, and pink sandverbena are all directly supported by restoring coastal dune habitat.

The current habitat restoration area at Leadbetter Point is approximately 121 acres. Additional restoration efforts will take place along the fore dunes and outer beach.

## 2.4.6 Goal 6. Promote the recovery of federally threatened and endangered as well as Federal candidate and State-listed species.

| **Objective 2.4.6.1 Western Snowy Plover (Threatened)** |
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| Contribute to the recovery of the western snowy plover by protecting and maintaining a five-year average population of 40 breeding pairs of western snowy plovers producing >1.0 fledged chick per male on the Refuge at Leadbetter Point Unit. Ensure long-term protection and management of breeding, wintering, and migration areas to maintain the subpopulation sizes and average |

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| productivity; see also Section 2.4.4.1 (Protect and Maintain Coastal Dune Ecosystem) and Section 2.4.4.2 (Restore Coastal Dunes). |
| **Strategies Applied to Achieve Objective** |
| A. Monitor western snowy plover breeding and wintering populations. |
| B. Monitor western snowy plover breeding productivity. |
| C. Research actions as needed. |
| D. Seasonal beach closures and symbolic fencing. |
| E. Install predator exclosures (type of cage) for nest protection from predators. |
| F. As necessary, control specific avian and/or mammalian predators on a seasonal basis during nesting season. |
| G. In cooperation with WDFW, manage disturbance to nesting western snowy plover, and implement a regulated permit-only elk hunt for the Leadbetter Point Unit. |
| H. Annually coordinate western snowy plover monitoring with Leadbetter State Park management. |
| I. Limit and manage human disturbance to nesting western snowy plover by providing a law enforcement presence and educational resources. |
| **Rationale:**<br>The western snowy plover relies heavily on coastal beaches from southern Washington to Baja California, Mexico for food, shelter, and raising its young. The Pacific Coast populations of this species have been declining dramatically because of substantial habitat loss related to industrial, urban, and recreational development; human disturbance; encroachment of exotic vegetation, and the expansion of predator populations. On March 5, 1993, the Pacific Coast population of the western snowy plover was listed as threatened under provisions of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (USFWS 1993). Recovery plans were developed by State and Federal governments to protect this population and its habitat with the ultimate goal of full recovery of the species. The States of Washington and Oregon are considered a combined recovery unit for the purposes of recovery planning.<br><br>The strategies outlined to achieve this objective are consistent with the goals of the Recovery Plan for Western Snowy Plover, Pacific Coast Population (USFWS 2007a) and the Washington State Recovery Plan for the Snowy Plover (WDFW 1995).<br><br>**Federal recovery plan recovery criteria for Washington and Oregon (recovery unit):** 1) 250 breeding adults, 2) A yearly average of productivity of at least one fledged chick per male has been maintained in each recovery unit in the last five years prior to delisting, 3) Mechanisms have been developed and implemented to ensure long-term protection and management of breeding, wintering and migration areas to maintain the subpopulation sizes and average productivity specific in 1) and 2) (USFWS 2007a).<br><br>**State recovery plan recovery criteria for the State of Washington:** The snowy plover will be considered for down-listing to threatened status when the State supports a four-year average of at least 25 pairs, fledging at least one young per pair per year, at two or more nesting areas with secure habitat. Delisting will be considered when the average population reaches 40 breeding pairs at three or more secure nesting areas (WDFW 1995).<br><br>The Leadbetter Point Unit (see Map 3) is one of the northernmost breeding sites for the western snowy plover on the Pacific Coast. Leadbetter Point is the largest and most significant western snowy plover nesting area in Washington. |

The Refuge has recently restored and maintained 121 acres of degraded dune habitat with the primary purpose to enhance the opportunity for the nesting success of these birds. This habitat restoration project for the western snowy plover is discussed in Section 4.9.2 and is further supported in Section 2.4.4.1 (Protect and Maintain Coastal Dune Ecosystem) and Section 2.4.4.2 (Restore Coastal Dunes). During the past four years the Refuge has annually supported approximately 30 breeding adults (95% confidence interval = 11-49). The resulting statewide estimated fledgling success rate is 0.71 young fledged per adult male. Further details can be found in Section 4.9.2.

The primary threats to the snowy plover population on the Refuge at Leadbetter Point are habitat degradation caused by human disturbance, introduced non-native beachgrass, and predators (USFWS 2007a). Additional disturbance and threats to the western snowy plover nesting habitat and potentially individual nests on the Refuge includes an expanding elk population; herds of elk frequently feed on native and non-native plants and grasses within the dune habitat that supports the western snowy plover nesting. Elk have been observed to flush plovers from their nests and cause nest abandonment, and they have damaged exclosures (nest cages) that refuge staff place around the eggs/nests to protect them from predators. However, the most direct losses of nests and chicks are due to predation, particularly by crows and ravens, resulting in poor hatching and fledging success on the Refuge.

The western snowy plover is listed as a resource of concern under the following documents: Northern Pacific Coast Regional Shorebird Management Plan – U.S. Shorebird Conservation Plan (Drut and Buchanan 2000), Determination of Threatened Status for the Pacific Coast Populations of the Western Snowy Plover (USFWS 1993), Policy on Maintaining the Biological Integrity, Diversity and Environmental Health of the National Wildlife Refuge System (USFWS 2001b), the U.S. Fish and Wildlife Service's Focal Species Strategy for Migratory Birds (USFWS 2005b), Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (USFWS 2007a), Washington State Recovery Plan for the Snowy Plover (WDFW 1995), Washington's Comprehensive Wildlife Conservation Strategy (WDFW 2005), State of Washington Natural Heritage Plan 2005 Update (WDNR 2005), and State of Washington Natural Heritage Program Information Systems (WDNR 2007).

In Oregon, lethal predator control has occurred for many years with impressive results in increasing snowy plover productivity. The Refuge will pursue the feasibility of a predator control program targeting specific avian and mammalian predators (see Appendix L, Predator Management Plan).

| **Objective 2.4.6.2 Oregon Silverspot Butterfly (Threatened; Extirpated from Washington State)** |
|---|
| Establish one or more healthy, sustainable populations of the Oregon silverspot butterfly (i.e., 200 to 500 butterflies for at least 10 years). |
| **Strategies for Achieving the Objective** |
| A. Implement strategies under Objective 2.4.5.3 to improve grassland habitat, expanding as needed to meet recovery population goals. |
| B. Partner with various entities as appropriate (i.e., Oregon Zoo, WDFW, Leadbetter State Park, Xerces Society, USFWS Ecological Services, and Friends of Willapa NWR) to establish larval host plant/adult nectar plant populations and reintroduce butterfly populations. |

C. Release larvae and/or adult butterflies when an appropriate amount of high-quality habitat has been established.

**Rationale:**
The federally threatened Oregon silverspot butterfly previously inhabited coastal habitat from northern California to southern Washington. It is now extirpated from Washington State and found only on a few sites in California and Oregon. No Oregon silverspot butterflies have been documented on the Long Beach Peninsula since 1990 (USFWS 2001a). The Oregon silverspot butterfly is State listed as endangered in Washington.

For the Oregon silverspot butterfly, invasion by exotic species, natural succession, fire suppression, and land development have resulted in loss and modification of the species' habitat. The Oregon silverspot inhabits a few areas south of the Refuge located in coastal areas of Oregon.

The Willapa Refuge will identify the appropriate sites within the Refuge and work with partners to establish sustainable populations of the larval host plant (early blue violet) and adult nectaring plants. Maintaining partnerships is critically important to build and maintain a successful long lasting effort for the reintroduction of this species to Washington State.

The Refuge will establish high-quality butterfly habitat, meeting the needs of both larval and adult butterflies, to support a reintroduction effort. Prior to any reintroduction, efforts of the butterfly suitable grassland habitat as described in Section.2.4.5.2 would be fully restored.

**Recovery criteria (local area only).** Delisting can be considered when all of the following conditions have been met:

- At least one viable Oregon silverspot butterfly population exists in protected habitat in the following areas: Long Beach Peninsula, Washington, and Clatsop Plains, Oregon.
- Habitats are managed long-term to maintain and restore native, early successional grassland plant communities.
- A management plan must be developed.
- Each population site supports a minimum viable population of 200 to 500 butterflies for at least 10 consecutive years.

The Refuge will work toward establishing one or more healthy sustainable populations of Oregon silverspot butterfly by meeting recovery goals as outlined in the Federal recovery plan (USFWS 2001a).

The Oregon silverspot butterfly is listed as a resource of concern under the following documents: Policy on maintaining the biological integrity, diversity and environmental health of the National Wildlife Refuge System (USFWS 2001b), Washington's comprehensive wildlife conservation strategy (WDFW 2005), Olympic-Willapa Hills Wildlife Area Management Plan (WDFW 2006), State of Washington Natural Heritage Plan 2005 Update (WDNR 2005), and State of Washington Natural Heritage Program Information Systems (WDNR 2007).

## 2.4.7 Goal 7. Gather scientific information (inventories, monitoring, research, assessments, and studies) in support of adaptive management decisions on the Refuge under Goals 1 through 6.

| **Objective 2.4.7.1 Scientific Information** |
|---|
| Conduct high-priority inventory and monitoring (survey) activities as well as research, assessments, and studies to enhance endangered and threatened species protection and recovery as well as habitat management and restoration activities. The gathering of scientific information will assist in evaluating resource management and public use activities to facilitate adaptive management and contribute to the enhancement, protection, use, preservation and management of wildlife populations and their habitats on and off refuge lands. Specifically, they can be used to evaluate achievement of resource management objectives identified under Goals 1 through 6 in the CCP. These activities have the following attributes:<br><br>• Data collection techniques will likely have minimal animal mortality or disturbance and minimal habitat destruction.<br>• Minimum number of samples (e.g., water, soils, vegetative litter, plants, macroinvertebrates, vertebrates) to meet statistical analysis requirements will be collected for identification and/or experimentation in order to minimize long-term or cumulative impacts.<br>• Proper cleaning of investigator equipment and clothing as well as quarantine methods, where necessary, will minimize the spread or introduction of invasive species.<br>• Projects will adhere to scientifically defensible protocols for data collection, where available and applicable. |
| **Strategies for Achieving the Objective** |
| A. Maintain both a full-time wildlife biologist and a career seasonal wildlife biologist at the Refuge to ensure biological information is gathered and analyzed for species recovery, management actions, and regional/national data needs. |
| B. Monitor the status of western snowy plover, marbled murrelet, streaked horned lark, and pink sandverbena, as well as fish, mammal and priority amphibian and invertebrate species on the Refuge. |
| C. Continue restoration, maintenance, and monitoring of habitat for western snowy plover, streaked horned lark, pink sandverbena, and marbled murrelet, as well as fish and priority amphibian and invertebrate species. |
| D. Monitor priority vegetative habitats on the Refuge. |
| E. Conduct watershed assessments as needed. |
| F. Continue to partner with local universities, nongovernmental organizations, State and local agencies, and others to conduct research and monitoring activities that would advance the science of habitat management on refuge lands. |
| G. Assist State and other Federal efforts as feasible (e.g., range-wide snowy plover breeding and winter window surveys, mid-winter brant surveys). |
| **Rationale:**<br>The NWRS Administration Act of 1966, as amended (16 U.S.C. 668dd-ee) requires that the Service "monitor the status and trends of fish, wildlife, and plants in each refuge." Surveys will be used primarily to evaluate resource response to assess progress toward achieving refuge management objectives (under Goals 1 through 6 in this CCP) derived from the NWRS mission, |

refuge purpose(s), and maintenance of biological integrity, diversity, and environmental health (601 FW 3). Determining resource status and evaluating progress toward achieving objectives is essential to implementing adaptive management on Department of Interior lands as required by policy (522 DM 1). Specifically, results of surveys will be used to refine management strategies, where necessary, over time in order to achieve resource objectives. Surveys would provide the best available scientific information to promote transparent decision-making processes for resource management over time on refuge lands.

Inventories, monitoring, research, assessments, and studies are essential to high-quality habitat and population management. Conducting population surveys for the western snowy plover and compiling data are critical to evaluate population status and measure progress toward goals stated in the Recovery Plan. Similarly, other wildlife populations, habitat conditions, and habitat management practices, including restoration efforts, must be monitored to evaluate their status and effectiveness. Population trends can be used to evaluate habitat effectiveness and guide management actions

Refuges must collect site-specific information and conduct defensible research to provide information for devising, guiding, and adapting management practices. Monitoring habitat conditions provides valuable support and sound decision making as applied to refuge resource management and also contributes to the Service's ability to modify management practices (adaptive management). Applied research on the Refuge would help address management issues and questions, in theory, and would result in improved management decisions for the Refuge and the region. The Refuge has always maintained a close working relationship with several State, tribal, and local agencies and universities in order to advance the knowledge base of a variety of habitats and plant and wildlife species.

Research is valuable for protecting and understanding Refuge resources, determining natural resource components and their interactions, and understanding the consequences of management actions on the parts and the whole. Research is also necessary for the overall advancement of science and scientific inquiry. The Refuge and the surrounding area (with the involvement of TNC) have been recognized as a premier location to conduct forest restoration research due to the character of the forest environment.

Applied research by universities and other entities will be encouraged and will help address management issues and answer questions, allowing an opportunity to improve management decisions.

Invasive species are a major threat to high-quality wildlife habitat, and they pose a major problem in the restoration and recovery of rare and listed species. Efforts will be made to work with partners as much as possible in a combined effort to pinpoint infestations and plan and coordinate control efforts both on and off the Refuge.

## 2.4.8 Goal 8. Foster a connection between refuge visitors and nature. Visitors will have the opportunity to participate in safe, quality, wildlife-dependent recreation activities located throughout Willapa NWR. These activities and programs include wildlife observation, hunting, fishing, environmental education, interpretation, and photography.

| **Objective 2.4.8.1 Wildlife Observation and Photography** |
|---|
| Enhance opportunities for wildlife observation and photography on the Leadbetter, Long Island, and Mainland Units. Successful wildlife observation and photography experiences include:<br><br>• Opportunities for refuge visitors to experience the diversity of ecosystems and wildlife found at Willapa NWR.<br>• Maintenance of existing, and development of new, refuge infrastructure (trails, blinds, viewing structures) to maximize viewing and photography experiences, while minimizing wildlife impacts.<br>• Clear and accurate signage, publications/media (maps, directions, tips, guides), and marketing to educate and direct wildlife observers and photographers to encourage safe, minimum impact use.<br>• Opportunities for refuge visitors to enhance observation and photography skills, and gain greater understanding of the NWR System's role in providing access and opportunities for wildlife-dependent activities. |
| **Strategies for Achieving the Objective** |
| A. Maintain opportunities for wildlife observation and photography on the Leadbetter, Long Island, and Mainland Units. |
| B. Staff, with the help of partners, such as Friends of Willapa NWR, Audubon Society, and local art groups, will conduct ongoing wildlife observation and photography activities that enhance enjoyment of and understanding of Refuge wildlife and current conservation issues (such as workshops, educational programs, lecture series, docent program, special events). |
| C. Maintain existing photo observation blind. |
| D. Work with various partner groups, e.g., Friends of Willapa NWR and Audubon Society, and use the Youth Conservation Corps and volunteers to improve and maintain existing trails. |
| E. Create a new barrier-free trail and observation site to provide viewing opportunities of the South Bay. |
| F. Design and install wayside panels that explore the purpose and progress of tidal restoration in the South Bay, as well as commonly seen wildlife species. |
| G. Create and maintain updated wildlife viewing logs to be posted in visitor center and web/social media. |
| H. Create clear and accurate directional signage to observation and photography sites. |
| I. Use web, publications and social media (Refuge and partners) to advertise viewing opportunities, provide education about ways to minimize impact on wildlife, and current conservation efforts on the Refuge. |
| J. Provide venues for exhibiting photography and media created at Refuge (art shows and/or contests in community, at new Refuge visitor center and/or website). |
| **Rationale:**<br>Wildlife observation and photography are two of the six priority wildlife-dependent uses identified in the amended Refuge Administration Act, with a goal of enhancing recreation opportunities and providing quality visitor experiences. The Act states that new and ongoing recreational uses |

should help visitors focus on wildlife and other natural resources, as well as foster awareness of Refuge management activities within the larger Service. The Act further states that the Service is to make extra efforts to facilitate wildlife-dependent public use opportunities. The USFWS Service Manual (605 FW Chapters 4 and 5) sets guidance for providing safe, enjoyable and accessible wildlife viewing and photography opportunities and facilities that promote visitor understanding of, and increased visitor appreciation for, America's natural resources. These opportunities and facilities must be compatible with wildlife management goals and minimize conflicts with other wildlife-dependent recreation activities. Wildlife observation and photography are the primary visitor activities that occur on the Refuge. These activities promote public understanding and appreciation for natural resources through direct, hands-on experience, helping to ensure the future of conservation.

The Refuge will continue to provide wildlife/nature viewing and photography opportunities in a manner that minimizes disturbance to wildlife and their habitats (Map 4). Current limitations on wildlife viewing and photography are due to few developed access points, restricted staff hours, public awareness of existing opportunities, unimproved signage, and minimal nonpersonal services. Development of a new trail and observation structure will provide viewing opportunities of the South Bay, an area with high concentrations of shorebirds, waterfowl, and raptors (species for which the Refuge has trust responsibilities). The trail will pass through a grassland improved to support Oregon silverspot butterfly recovery, providing additional opportunities to observe unique and threatened habitat and wildlife. The specific location of the planned trail and observation site will provide users an unparalleled opportunity to easily experience habitats and wildlife of the South Bay. Opportunities for users to gain a unique perspective on the importance of salt marsh habitat, the tidal restoration project, and the purpose of the Refuge System are many, including increased access to viewing wildlife and natural areas, and increased opportunity to learn about the Refuge System and current management activities. The location of the new trail, in proximity to the population and activity center of the Long Beach Peninsula and the planned Visitor/Administrative and Maintenance Facility, will also increase access to refuge staff and volunteers.

| **Objective 2.4.8.2 Trails** |
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| Provide up to 13 miles of trails on the Refuge (located on Long Island, Headquarters, Teal Slough, Leadbetter Point, and Tarlatt Units) to support visitor use programs (hunting, wildlife observation and photography, interpretation and environmental education). Maintain and enhance Refuge trails. |
| **Miles of Trail to Achieve the Objective: 13** |
| **Strategies for Achieving the Objective** |
| A. Establish a 1-mile, barrier-free trail and observation point on the Tarlatt Unit. |
| B. Work with various partner groups, (Friends, Audubon Society, hiking groups, volunteers), and use the Youth Conservation Corps to improve existing, and develop new trails. |
| C. Abandon 10 miles of old roads/trails on Long Island. |
| D. Establish 0.6 mile of trail to access the Porter Point Unit. |
| **Rationale:**<br>Trails serve an important role in meeting Service public use goals on the Refuge. Trails provide visitors with a designated route of travel to experience the Refuge's natural resources, as well as provide protection for sensitive resources through proper routing and construction techniques. |

While hiking is not a priority public use of the NWRS, it does support uses such as wildlife observation, photography, hunting, environmental education, and interpretation (Refuge Administration Act as amended by the Improvement Act, USFWS Service Manual 605 FW Chapters 1, 4, 5, 6, and 7). Refuge units with trails include Long Island, Leadbetter Point, East Hills (at Teal Slough and Headquarters), and Tarlatt (Map 4). Carefully planned hiking routes and/or hiking areas, together with use stipulations, can minimize impacts to wildlife while providing high-quality opportunities to experience and learn about the Refuge. Identifying parameters for hiking—such as resource protection needs, seasonal restrictions, group size limitations, facilities, and visitor information needs—will be an important component of the trails design/route. USFWS Service Manual (605 FW 1) encourages the use of partners to achieve refuge goals. Willapa NWR will recruit the help of partners and volunteers to help maintain refuge trails.

The new barrier-free accessible interpretive trail accessing the South Bay will highlight a diversity of habitats; including the post-restoration salt marsh habitat and its wildlife (see Objective 2.4.8.1). The new Porter Point access trail will minimize disturbance to waterfowl hunters using blinds, while providing access to additional wildlife viewing and hunting opportunities. As part of the forest restoration goal, 10 miles of old logging roads/trails will be abandoned using techniques described in Appendix K.

| **Objective 2.4.8.3 Waterfowl and Goose Hunting** |
|---|
| Waterfowl hunters of all abilities will have the opportunity to participate in a quality, safe waterfowl hunt program on up to 5,670 acres that provides a variety of waterfowl hunting experiences that:<br>• Pose minimal conflict with wildlife/habitat objectives.<br>• Pose minimal conflict with other wildlife-dependent recreation activities.<br>• Pose minimal conflict with neighboring lands.<br>• Are accessible to a broad spectrum of visitors.<br>• Promote stewardship and conservation.<br>• Promote understanding and appreciation of natural resources and USFWS role.<br>• Provide reliable/reasonable opportunity to experience wildlife.<br>• Use accessible facilities that blend into landscape.<br>• Use visitor satisfaction to define and evaluate programs. |
| **Acres available to Waterfowl Hunting: 5,670** |
| **Strategies for Achieving the Objective** |
| A. Maintain Presidential Proclamation closure to hunting. |
| B. Retain limited regulated goose hunting on 100 acres of managed pastures of the Riekkola Unit in three assigned blinds including one that is barrier-free to provide access for hunters with disabilities. |
| C. Open 2,686 additional areas of the south Willapa Bay to waterfowl and goose hunting in accordance with State regulations. |
| D. Maintain hunting access at Leadbetter Point Unit, Stanley Point, North Potshot, and Potshot to waterfowl hunting in accordance with State regulations. |
| E. Provide two blinds for waterfowl hunting including one that is barrier-free to provide access for hunters with disabilities. |

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| F. Construct car-top canoe/boat ramp and parking area to access to South Bay Units from Riekkola Unit. |
| G. Provide walk-in access for refuge visitors and hunters via a path/trail (0.6 mile) from the new parking area at the Riekkola Unit to Porter Point. |
| H. Create and enhance signage for changes in hunt programs. |
| **Rationale:**<br>Hunting is identified as a priority public use by the NWRS Improvement Act, when it is compatible with National Wildlife Refuge purposes. Public input during the CCP scoping period identified waterfowl hunting-related issues that included access, facilities, weapon and species restrictions, and the quality of information available on waterfowl and general hunting opportunities.<br><br>Through participation in the waterfowl hunt program, hunters will have an opportunity to learn about and understand the refuge purpose and resource management activities. Providing opportunities for youth is an important initiative in the USFWS and helps address a public desire to see more hunting opportunities for youth.<br><br>Currently, within the State waterfowl hunting season, the Refuge provides waterfowl hunting three days per week and goose hunting two days per week. With the completion of the south Willapa Bay estuarine habitat restoration, the restored salt marsh will be open for waterfowl and goose hunting opportunities (in accordance with State regulations) eliminating the upland hunt restrictions.<br><br>The Presidential Proclamation Boundary was established in 1937 to set aside a waterfowl and migratory bird sanctuary in Willapa Bay. This area will remain closed to all waterfowl and migratory bird hunting activity (Map 4).<br><br>The proposed expanded waterfowl hunt area will include opening an additional 2,686 acres (5,670 acres total) to waterfowl hunting all newly restored areas in the South Bay Units (Map 4). Three blinds will be available for goose hunting on the south half of the Riekkola Unit (100 acres), which will meet or exceed the Refuge's current average use of 4.4 hunters per day. Two additional blinds will be created for waterfowl hunting. One goose blind and one waterfowl blind will provide barrier-free access for hunters with disabilities. Boat access to the South Bay Units will be provided by car-top boat ramp at Dohman Creek. Access to these blinds will be provided on a first-come, first-serve basis from a parking area located near Dohman Creek. In addition, a trail from the parking area will provide walk-in hunter access to Porter Point. According to State regulations, waterfowl hunting will be allowed seven days a week and goose hunting will be allowed two days a week (Wednesdays and Saturdays). See Appendix M for additional details about the waterfowl hunting program. |

| **Objective 2.4.8.4 Big Game and Upland Game Bird Hunting** |
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| Hunters will have the opportunity to participate in a quality, safe big game (elk, deer, bear) and upland game bird (forest grouse) hunt program on up to 10,716 acres that provides a variety of hunting experiences. The big game and upland game bird hunt program will:<br><br>• Pose minimal conflict with wildlife/habitat objectives.<br>• Pose minimal conflict with other wildlife-dependent recreation activities. |

- Pose minimal conflict with neighboring lands.
- Be accessible to a broad spectrum of visitors.
- Promote stewardship and conservation.
- Promote understanding and appreciation of natural resources and USFWS role.
- Provide reliable/reasonable opportunity to experience wildlife.
- Use accessible facilities that blend into landscape.
- Use visitor satisfaction to define and evaluate programs.

**Acres Available to Big Game Hunting: 10,716**

**Strategies for Achieving the Objective**

A. Expand potential hunting opportunities as lands are acquired from willing sellers as outlined in the Land Protection Plan (Appendix A).

B. Expand elk hunting opportunities (permit only) to include a muzzleloader only hunt on the Leadbetter Point Unit.

C. Maintain big game and upland game bird hunting (elk, deer, bear, forest grouse) on the Long Island Unit and the big game hunting (elk and deer) on portions of East Hills Units (Map 4).

D. Create and enhance signage for changes in hunt programs.

**Rationale:**

Recreational hunting (a wildlife-dependent activity) has been identified in the National Wildlife Refuge System Administration Act, as amended, as a priority public use, provided it is compatible with the purpose for which the Refuge was established. The Act declares that compatible wildlife-dependent recreational uses are legitimate and appropriate as priority general public uses of the Refuge System. The six wildlife-dependent recreational uses—hunting, fishing, wildlife observation and photography, and environmental education and interpretation—are to receive enhanced consideration in planning and management over all other general public uses of the Refuge System. When compatible, these wildlife-dependent recreational uses are to be strongly encouraged (see Appendix C). Public input during the CCP scoping period identified hunting-related issues that included access, facilities, weapon and species restrictions, and the quality of information available regarding general hunting opportunities. Across Washington, elk and deer are increasingly causing damage to private and commercial property, including orchards and landscaping. As a result, there are few, if any places remaining in the state that are willing to accept relocated elk or deer. In addition, relocation has proven a costly option and funding is not available for a long-term solution.

Willapa Refuge currently offers existing elk and deer hunting opportunities in the Long Island Unit and designated portions of the East Hills Units from the Bear River to Teal Slough. Proposed elk and deer hunting areas include the upland areas in the South Bay (Lewis, Porter Point, and Riekkola Units). A regulated (permit-only) elk hunt on the Leadbetter Point Unit is proposed. Any additional lands acquired, will be open to elk and deer hunting (Map 4).

Maintaining and/or expanding existing hunting opportunities on the East Hills Units, the South Bay Units, and the Leadbetter Point Unit to hunting will complement State-permitted hunting activities locally. Specific species/numbers to be taken and hunting periods will be set by WDFW to reflect the adjacent areas open to elk and deer hunting. This will resolve potential problems over the exact position of the refuge boundary that would exist with an elk/deer hunt closure, and the associated enforcement of relevant laws and regulations. See Appendix M for additional details about the big game and upland game bird hunting program.

| **Objective 2.4.8.5 Recreational Fishing** |
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| Recreational fishing for salmon, steelhead, sturgeon, and shellfish will be available in accordance with State seasons, while minimizing disturbance and impacts to other resources. |
| **Strategies for Achieving the Objective** |
| A. Provide access for motorized and nonmotorized boats by maintaining a ramp and providing parking at Highway 101. |
| B. Maintain refuge portion of Willapa Bay and channel portion of Bear River open for recreational fishing. |
| C. Maintain public shellfish beds on Long Island. |
| D. Fishing will be prohibited in all nontidal Refuge streams and wetlands not mentioned above. |
| **Rationale:**<br>Fishing is identified as a priority public use by the NWRS Improvement Act, as long as it is found compatible with a refuge's purposes (see Appendix C for this CCP's compatibility determinations). Fishing is a popular visitor activity that occurs on the Refuge. Currently fishing is allowed on Willapa Bay within the Presidential Proclamation Boundary, accessible by boat. A boat launch facility is provided along Highway 101 across from the current refuge headquarters.<br><br>Shellfish harvesting is allowed on public tidelands found on the west side Long Island within the Presidential Proclamation Boundary. Areas identified in the "Recreational Shellfish Harvesting in Pacific County" booklet are Diamond Point and Pinnacle Rock.<br><br>All recreational fishing and shellfish harvesting activities occurring within the refuge boundary are in accordance with Washington State fishing/shellfish regulations.<br><br>Fishing will continue to be prohibited in all nontidal refuge streams and wetlands not mentioned above. |

| **Objective 2.4.8.6 Environmental Education and Interpretation** |
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| Provide environmental education opportunities for up to 4,800 students per year that initiate a sense of wonder and foster a connection with nature and the Refuge for students both on and off the Refuge annually. A high-quality program would:<br>• Fully support national and State academic learning standards.<br>• Provide interdisciplinary opportunities that link natural resources through all subject areas.<br>• Involve local communities, the Friends of Willapa NWR, volunteers, and other partners.<br>• Incorporate the importance of the NWRS and the purpose, goals, and objectives of the Willapa Complex Refuges.<br>• Incorporates current conservation issues and concerns.<br>• Provide experiences that are hands-on and integrate the habitats and associated plants, fish, and wildlife species found on the Refuge.<br>• Use various types of facilities including wildlife observation structures, interpretive exhibits, trails, outdoor classroom shelters, etc.<br>• Take place both on and off the Refuge.<br>• Involve all three of the Willapa Complex Refuges at varying levels.<br>• Be directly linked to wildlife observation and interpretation programs and balanced within the overall public use program. |

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| • Provide interpretive opportunities for up to 155,000 visitors annually. Interpretation activities (including waysides, self-guided activities and guided programs) provide users with an opportunity to find personal meaning inherent in the Refuge's natural and cultural resources. |
| **Estimated No. of Students/yr in Environmental Education Activities: 4,800** |
| **Estimated No. of Visitors/yr in Interpretation Activities: 155,000** |
| **Strategies for Achieving the Objective** |
| A. Encourage and support the Friends of the Willapa NWR to maintain and enhance their fourth grade environmental education program. |
| B. Increase environmental education opportunities for local communities, visiting groups, and members of Refuge Youth Conservation Corps. |
| C. Work with other Federal, State, and county natural resource agencies, tribes, nonprofit conservation organizations, and selected school districts within the local area to help define the specific roles and responsibilities for providing environmental education opportunities on the Refuge. |
| D. Construct a visitor center and administrative facility that includes indoor/outdoor environmental education facilities. |
| E. Establish an environmental education specialist position to enhance the refuge environmental education program. |
| F. Develop and provide site-specific materials and tools for educators' use both on- and off-site. These materials should include information about the NWRS and the unique habitats and associated fish and wildlife species and management programs on the Refuge. |
| G. Use current technology (such as the Internet and social media) to link distant classrooms to the Refuge's natural resources and staff. |
| H. Create opportunities for students to participate in ongoing refuge management (such as wildlife monitoring projects, education and outreach activities, planning and creation of new visitor use facilities, habitat enhancement). |
| I. Model career opportunities to youth. |
| J. Maintain existing interpretation waysides, displays, and temporary exhibits. |
| K. Work with Refuge partners to develop new and enhance existing self-guided interpretation activities (such as audio guides, podcasts, family-focused exploration kits). |
| L. Work with refuge partners to develop new and enhance existing guided interpretation activities (such as demonstrations, walks, workshops, and lecture series). |
| M. Create new waysides, displays, and temporary exhibits (new visitor space in administration building, new trail, and observation point). |
| **Rationale:**<br>Environmental education and interpretation activities can foster an understanding and appreciation for our natural resources. As such, environmental education and interpretation are identified as two of the priority public uses of the NWRS (Improvement Act; Service Manual 605 FW 6).<br><br>With the addition of an environmental education specialist, Willapa NWR has an opportunity to provide expanded and meaningful environmental education programs for local, visiting and distant schools. Approximately (1,600) students currently participate in Refuge and Friends of Willapa NWR environmental education programs, primarily from southwest Washington and northwest Oregon schools. The amount and type of programs are limited by available staff time and adequate classroom and large-group gathering facilities. Environmental education programs will seek |

additional ways to use refuge-centered curriculum to enhance State and national learning requirements with real-life examples. Building capacity through partnerships would allow environmental education programs to leverage existing technology, programs and staff to maximize benefits to students. The environmental education program will focus on integrating environmental concepts and concerns into structured activities on the Refuge, involving educators, students, and subject-matter experts in first-hand activities that promote discovery and fact-finding, developing problem-solving skills, and helping students develop their own ways of personal involvement and action. Youth will have the opportunity to experience and investigate a potential career in natural resources.

Interpretation activities, including waysides, displays, self-guided and guided experiences, are designed to share key refuge stories using techniques that provoke intellectual and emotional connections to the site. The end goals of interpretation is inspiration, with users inspired to learn and experience more about the refuge purpose and the associated wildlife and to become stewards of the natural world. The creation of a new administrative/visitor facility will provide a number of new interpretive experiences including interior and exterior displays and exhibit space, indoor and outdoor gathering locations, and trails and observation site. The location of the new site, near the Long Beach Peninsula's main activity center and the Discovery Trail, and a variety of easy-to-access habitats and wildlife, would encourage use. The addition of permanent and temporary self-guided interpretation activities, such as waysides, exhibits, trails, would create a more meaningful experience. The addition of an environmental education specialist would provide the Visitor Services Manager with more time to enhance and expand self-guided and guided interpretive experiences. The expanded educational opportunities would encourage increased ongoing use by local and visiting public.

See Objectives 2.4.8.1, 2.4.8.2, and 2.4.8.8 for additional information about how environmental education and interpretation activities will be incorporated into refuge facilities and programs.

| **Objective 2.4.8.7 Camping** |
|---|
| To facilitate archery hunting, photography, and wildlife-dependent experiences, camping is available in five designated campgrounds on Long Island. These primitive conditions provide isolated vistas and an intimacy with nature. |
| **Strategies for Achieving the Objective** |
| A. Maintain five campgrounds with 20 campsites on Long Island. |
| B. Update and provide brochures, website, and tear sheets with camping info. |
| C. Provide trail network from several of the campgrounds to the Cedar Grove trail. |
| D. Work with various partner groups, e.g., Friends of Willapa NWR and Audubon Society, and use the Youth Conservation Corps and volunteers to improve/maintain existing trails and campsites. |
| **Rationale:**<br>Public scoping indicated continued demand for camping opportunities on Long Island Unit.<br><br>While camping is not a priority public use of the NWRS, on Long Island it does support wildlife-dependent public uses such as hunting, wildlife observation, photography, environmental education, and interpretation. Maintaining a camping program is important for public safety due to the impacts of tides on island access. |

An appropriate use and compatibility determination have been applied to camping (see Appendices B and C).

Access to Long Island's trails and campsites requires some form of watercraft. Motorized and nonmotorized boating (e.g., canoeing, kayaking) is currently constrained due to the tides (shallowness of the bay at low tides) as well as distance between the boat launch and camping access points. A main trail down the center of the island provides access to several of the campsites. Occasionally, refuge staff and volunteers need to maintain and rehabilitate some of the 20 campsites.

**Objective 2.4.8.8 Develop an Administrative/Maintenance and Visitor Facility**

Design and build a Visitor/Administrative and Maintenance Facility to be constructed within the life of the CCP. An effective design would:

- Meet or exceed LEED standards.
- Consolidate and meet current and future staff office, administrative, and equipment storage and maintenance needs.
- Be integrated in the natural landscape to enhance visitor experience and educational opportunities.
- Create inviting indoor and outdoor gathering spaces for small and large groups.
- Be placed in a location that minimizes impacts to wildlife while maximizing existing county infrastructure and area visitor patterns.
- Become a gateway to experience the natural wonders of a restored South Bay ecosystem.
- Restore current headquarters site to surrounding natural habitat.

| **Strategies for Achieving the Objective** |
|---|
| A. Where possible, use partnerships to enhance building and site design elements. |
| B. Locate the new facility on Tarlatt Unit. |
| C. Create a facility recognized as the latest symbol of energy efficient design in southwest Washington using many partners. Design a facility using effective green energy efficient resources. |
| D. Construct barrier-free, accessible office space for a projected 21 staff. |
| E. Develop approximately 10 acres of Refuge lands for administrative, visitor, and maintenance facilities. |
| F. Remove proposed Visitor/Administrative and Maintenance Facility development area from the wetlands reserve program according to Natural Resources Conservation Science (NRCS) regulations. |
| G. Move Refuge maintenance operations and equipment shop and storage from three existing sites to consolidate operations at proposed Tarlatt Slough Visitor/Administrative and Maintenance Facility site. |
| H. Develop Visitor/Administrative and Maintenance Facility and site to provide visitor parking for 55 cars and three buses, 1 mile of trails; construct an 11,000-square-foot office and visitor building, and construct site amenities to serve up to 45,000 visitors per year. |
| I. Restore current headquarters site and dispersed maintenance facilities to protect, maintain, and restore habitats characteristic of the Willapa Bay region for the benefit of migratory birds, salmonids, amphibians, mussels, lamprey, and a diverse assemblage of other native species. |

| |
|---|
| J. Maintain public access to the Willapa Art Trail, parking lot, and boat ramp on Highway 101. |
| **Rationale:**<br>The Refuge has been identified in the Service's maintenance and management system (MMS) to receive a new visitor contact station and administrative/maintenance facility. Funding is expected within the life of the CCP (15 years). This CCP identifies partners, location, and design elements for the Service's standardized facility. The current office/maintenance and visitor contact facility is located along Highway 101. This office building was formerly a home, built in late 1930s, and has been modified to accommodate limited office space. A change in location is preferred due to the lack of potable water, no sanitation service, electrical wiring issues, inadequate fire escape routes (safety concerns), and visitor access from the highway. Several locations were identified for the new Refuge facility complex, yet due to constraints regarding accessibility of utilities and limited public access, the preferred location was identified on the Tarlatt Unit.<br><br>The location of the proposed facilities will have city water and sewage. It is closer to the population center on the Long Beach Peninsula, which will allow greater public access to Refuge visitor services. The facilities will meet LEED energy conservation and sustainability standards. A site plan combines creatively designed visitor facilities with habitat restoration efforts in an attempt to provide the visitor with a natural and educational experience. Other features of the project include an outdoor classroom shelter and a new interpretive trail. The interpretive trail is designed to use an existing dike road to connect the new visitor information center to a new observation deck on the South Bay. These new facilities will offer unparalleled views of the Bay and migratory birds (many species for which the Refuge has trust responsibilities). See Section 2.2.2.2, for details on the proposed location and design elements.<br><br>Overall, the new facilities and location will better serve the community, improve staff productivity, conserve crucial wildlife habitat, reduce annual operations and maintenance costs, and serve as an interpretive area for approximately 200,000 annual visitors. See Objectives 2.4.8.1, 2.4.8.2, and 2.4.8.6 for additional information on how the new facilities will support many of the System's priority goals.<br><br>Upon completion of the new Visitor/Administrative and Maintenance Facility, the existing headquarters complex and Riekkola shop area will be deconstructed and decommissioned, and the site will be restored to the surrounding natural habitat. The Willapa Art Trail, kiosk, boat launch, and parking area at the existing headquarters site will remain. |

## 2.4.9 Goal 9. Protect and preserve the cultural resources of the Refuge for the benefit of present and future generations.

| **Objective 2.4.9.1 Cultural Resources** |
|---|
| Implement a well-defined cultural resource program to meet Federal requirements, including consultation, identification, inventory, evaluation, and protection of all refuge cultural resources. Enhance and expand environmental education and interpretation materials and activities to include refuge cultural resources where appropriate. |
| **Strategies for Achieving the Objective** |
| A. Work with partners to identify, evaluate the importance of, and seek the appropriate protective designation of cultural resources in accordance with existing legal requirements, regulations, and professional standards. |

| |
|---|
| B. Identify archaeological sites that coincide with existing and planned roads, facilities, public use areas, habitat projects, or areas prone to erosion. |
| C. Prepare and implement activities to mitigate natural or human-caused impacts to significant cultural sites as necessary. |
| D. Evaluate sites for eligibility to the National Register of Historic Places. |
| E. Where appropriate, work with partners to incorporate appropriate cultural themes into existing guided activities. |
| F. Where appropriate, work with partners to create waysides, displays, and self-guided and guided activities that incorporate cultural themes. |
| G. Protect cultural resource sites through law enforcement patrols. |
| **Rationale:**<br>The USFWS has legal responsibility to protect and maintain unique cultural resources while meeting the Service's ongoing natural resource and wildlife responsibilities (614 FW 1 through 5). Various Federal laws govern the management of refuge cultural resources, including the Antiquities Act (16 U.S.C. 431-433), Historic Sites, Building and Antiquities Act (16 U.S.C. 461-467), NHPA of 1966, as amended (16 U.S.C. 470-470t), American Indian Religious Freedom Act (P.L. 95-341), Archaeological Resources Protection Act, as amended (16 U.S.C 470aa-470mm), and Native American Graves Protection and Repatriation Act (25 U.S.C 3001-3013).<br><br>Interpretation of cultural resources can instill a sense of stewardship of the resource (see Objective 2.4.8.6). The goals of the cultural resource education and interpretive program are: to inspire an appreciation for the past and present human experience (of Native Americans, settlers, tourists) with resources now administered by the Refuge, relate the connection between cultural resources and natural resources, and the role of humans in the environment (which is a NWRS goal), and inspire an understanding and the conservation of the nation's cultural heritage, including archaeological sites. |

## 2.4.10 Goal 10. Contribute to the protection of the long-term environmental health of the Willapa Bay ecosystem.

| **Objective 2.4.10.1 Refuge Boundary Expansion** |
|---|
| Within five years, begin implementing the new Land Protection Plan (Appendix A), recognizing the prioritized lands that provide habitat for endangered and threatened wildlife and the overall protection of the Willapa Bay ecosystem. |
| **Acres to Achieve the Objectives: 6,809** |
| **Strategies for Achieving the Objective** |
| A. As funding becomes available, continue to acquire the identified priority lands from willing sellers through fee, easement, or agreement. |
| B. Work with willing sellers within current acquisition boundary. |
| C. Work with partners and neighbors to identify, protect, and restore wildlife resources within the Willapa Bay ecosystem. |
| D. Provide technical assistance and encourage best management practices for private land owners on conservation matters, using the Refuge's private lands biologist. |
| E. Work with the county, State, nongovernmental organizations, and other interested parties to address land protection needs. |
| F. Divest Shoalwater and Wheaton Units of the Refuge. |

**Rationale:**
Land use activities have impacted fish and wildlife habitat values in the Willapa Bay area. Increased pressure from development for residential use as well as timber harvest make additional protection critical. There is a need to restore and increase the amount of late-successional forest, freshwater stream habitat, salt marsh, and other habitats currently at risk to further impacts.

The Refuge contains portions of the typical habitats found in and around Willapa Bay. However, some of the refuge units are small, and the ability of the Refuge to provide landscape-level benefits such as watershed protection and buffers to sensitive habitats is somewhat compromised.

Acquisition efforts will increase land protection and allow habitat restoration efforts to take place for federally threatened species, anadromous fish, migratory birds, and other native wildlife. Efforts to protect and improve forests in the Willapa Bay area will provide habitat for the marbled murrelet and spotted owl, which are both federally listed as threatened (however, the spotted owl is currently believed to be extirpated from the Refuge). Long-term protection of the watershed and water quality will also be provided through these efforts.

Willapa Bay is often described as one of the most pristine water bodies along the western coast of the United States. Mariculture is a large fishing industry that relies completely on the good water quality of the Bay. In addition to commercial shellfish operations and commercial fishing, recreational clamming, crabbing, and fishing are also supported by the excellent water quality and healthy tidelands of Willapa Bay. All are important industries and activities in Pacific County.

Nonpoint source pollution in the bay may increase and degrade the water quality within the watershed as lands are cleared and developed with roads and homes constructed. Potential nutrient loads, sedimentation, concentrations of pollutants, with runoff in the future, may all contribute and degrade this important ecosystem and its fishery resources.

Recovery efforts regarding the marbled murrelet and spotted owl would best be accomplished by large contiguous areas of late-successional forest in the Willapa Bay area. (Late-successional forests are forests in the mature and old-growth age classes). Currently, suitable late-successional forest habitat in the Willapa Bay area is isolated and highly fragmented. Less than 1% of the original old-growth forests remain in the 700,000-acre Willapa Bay watershed (Davis et al. 2009).

Currently, second- and third-growth forests dominate the watershed. According to recommendations in the Recovery Plan for the Threatened Marbled Murrelet, in order to maintain a well-distributed marbled murrelet population, recovery efforts should be directed toward increasing the size and distribution of marbled murrelet populations between the southern Olympic Peninsula and the small populations in southwestern Washington. Non-Federal lands in this area currently provide a limited amount of marbled murrelet nesting habitat and have the potential to be managed to increase the amount of suitable nesting habitat in the future (USFWS 1997a).

Since 2003, the Willapa Refuge and TNC have been collaborating to restore forests on their respective properties at a landscape scale, with a focus on marbled murrelet recovery as well as restoring ecological function to these former commercial forests.

Efforts for additional protection of Willapa Bay's watershed have been initiated between a number of entities including the Refuge and TNC, and State and county agencies and private landowners.

## 2.4.11 Goal 11. Provide support for off-Refuge conservation efforts in southwest Washington in partnership with private landowners, agencies, and nongovernmental organizations.

| **Objective 4.11.1 Private Lands Program** |
|---|
| Work in partnership with private landowners, nongovernmental organizations, tribes, and other agencies for voluntary protection, enhancement, and restoration of native habitats and the associated fish, wildlife, and plants. Habitat and wildlife project assistance will:<br>• Occur on lands near or adjacent to the Refuge.<br>• Provide a connection to active refuge projects.<br>• Benefit and support the Service's trust species and programs (i.e., Birds of Conservation Significance, Birds of Management Concern).<br>• Benefit threatened and endangered species.<br>• Support State wildlife action plans. |
| **Strategies for Achieving the Objective** |
| A. Provide technical assistance and implementation for restoration projects. |
| B. Provide financial assistance to landowners and organizations. |
| C. Develop and maintain memorandums of understanding (and/or cooperative agreements) and other agreements with Federal agencies, tribes, State, local governments, and private stakeholders to share equipment, staff, funds, and services. |
| D. Implement the Partners for Fish and Wildlife Program Strategic Plan within the Willapa Bay and lower Columbia River estuary. |
| **Rationale:**<br>The decline of the quantity and quality of wildlife habitat around Willapa Bay has necessitated looking beyond the refuge boundaries to identify areas for protection and restoration. The private lands program provides the means to initiate partnerships with diverse groups and individuals to complete projects that protect and restore coastal habitats outside of Refuge boundaries. These projects help to restore habitat connectivity and offset increased pressures from development for residential use as well as timber harvest that have impacted fish and wildlife habitat values around the Willapa Bay area.<br><br>The private lands program provides opportunity to work with willing private landowners, nongovernmental organizations, and other government agency partners to protect and restore important wildlife habitat areas on a landscape level. This level of protection and restoration provides benefits such as watershed protection and buffers to sensitive habitats. Working with partners in the private lands program enables conservation to be delivered more effectively and leverage financial and technical resources from other conservation entities including other governmental agencies, nongovernmental organizations, and private landowners. These projects would help to enhance the wildlife habitats currently exiting within the boundary of the Willapa Refuge Complex.<br><br>Developing working relationships with landowners in the Willapa Bay area and outside the refuge boundaries provides opportunity to restore and increase the amount of late-successional forest, freshwater stream habitat, salt marsh, and other habitats currently at risk and at a landscape level. Focusing on a landscape-scale approach to the protection and restoration of these unique habitats helps to offset the loss of and reduces the impacts to native habitats that would negatively affect |

federally threatened species, anadromous fish, migratory birds, and other native wildlife. Efforts to protect and improve forests in the Willapa Bay area would provide habitat for the marbled murrelet and spotted owl which are both listed as threatened under the ESA. (However, the spotted owl is currently extirpated from the area surrounding Willapa Bay.) Long-term protection of the watersheds and water quality would also be provided through these partnership efforts.

The Willapa National Wildlife Refuge contains portions of the typical habitats found in and around Willapa Bay. However, some of the refuge units are small, and the ability of the Refuge to provide landscape-level benefits such as watershed protection and buffers to sensitive habitats is somewhat compromised.

Working with private landowners to restore and protect these unique coastal habitats ensures that protection and restoration is targeted at accomplishing these activities on watershed/landscape levels. To ensure the success of the private lands program and ultimately protect and restore habitat essential to the recovery of threatened and endangered wildlife species partnerships would be developed, projects identified that would enrich existing refuge habitat and obtain funding for these projects to be planned, implemented and completed. The Partners and Coastal Programs enable conservation to be delivered more effectively by leveraging financial and technical resources from other conservation entities (other governmental organizations, nongovernmental organizations, and private landowners).

Willapa Bay is often described as one of the most pristine water bodies along the western coast of the U.S. Mariculture is a large fishing industry that relies completely on good water quality in the bay. In addition to commercial shellfish operations and commercial fishing, recreational clamming, crabbing and fishing are also supported by the water quality and healthy tidelands of Willapa Bay. All are important industries and activities in Pacific County.

Nonpoint source pollution in the bay may increase and degrade the water quality within the watershed as lands are cleared and developed with roads and homes constructed. Potential nutrient loads, sedimentation, and concentrations of pollutants, with runoff in the future, may all contribute and degrade this important ecosystem and its fishery resources.

Recovery efforts regarding the marbled murrelet and spotted owl would best be accomplished by large contiguous areas of late-successional forest in the Willapa Bay area. (Late-successional forests are forests in the mature and old-growth age classes). Currently, suitable late-successional forest habitat in the Willapa Bay area is isolated and highly fragmented. Less than 1% of the original old-growth forests remain in the 700,000-acre Willapa Bay watershed (Davis et al. 2009). Currently, second- and third-growth forests dominate the watershed. According to recommendations in the Recovery Plan for the Threatened Marbled Murrelet, in order to maintain a well-distributed marbled murrelet population, recovery efforts should be directed toward increasing the size and distribution of marbled murrelet populations between the southern Olympic Peninsula and the small populations in southwestern Washington. Non-Federal lands in this area currently provide a limited amount of marbled murrelet nesting habitat and have the potential to be managed to increase the amount of suitable nesting habitat in the future (USFWS 1997a).

Since 2003, the Willapa National Wildlife Refuge and TNC have been collaborating to restore forests on their respective properties at a landscape scale, with a focus on marbled murrelet recovery as well as restoring ecological function to these former commercial forests.

Efforts toward additional protection of the Willapa Bay watershed have been initiated between a number of entities including the Refuge and TNC, as well as State and county agencies as well as private landowners.

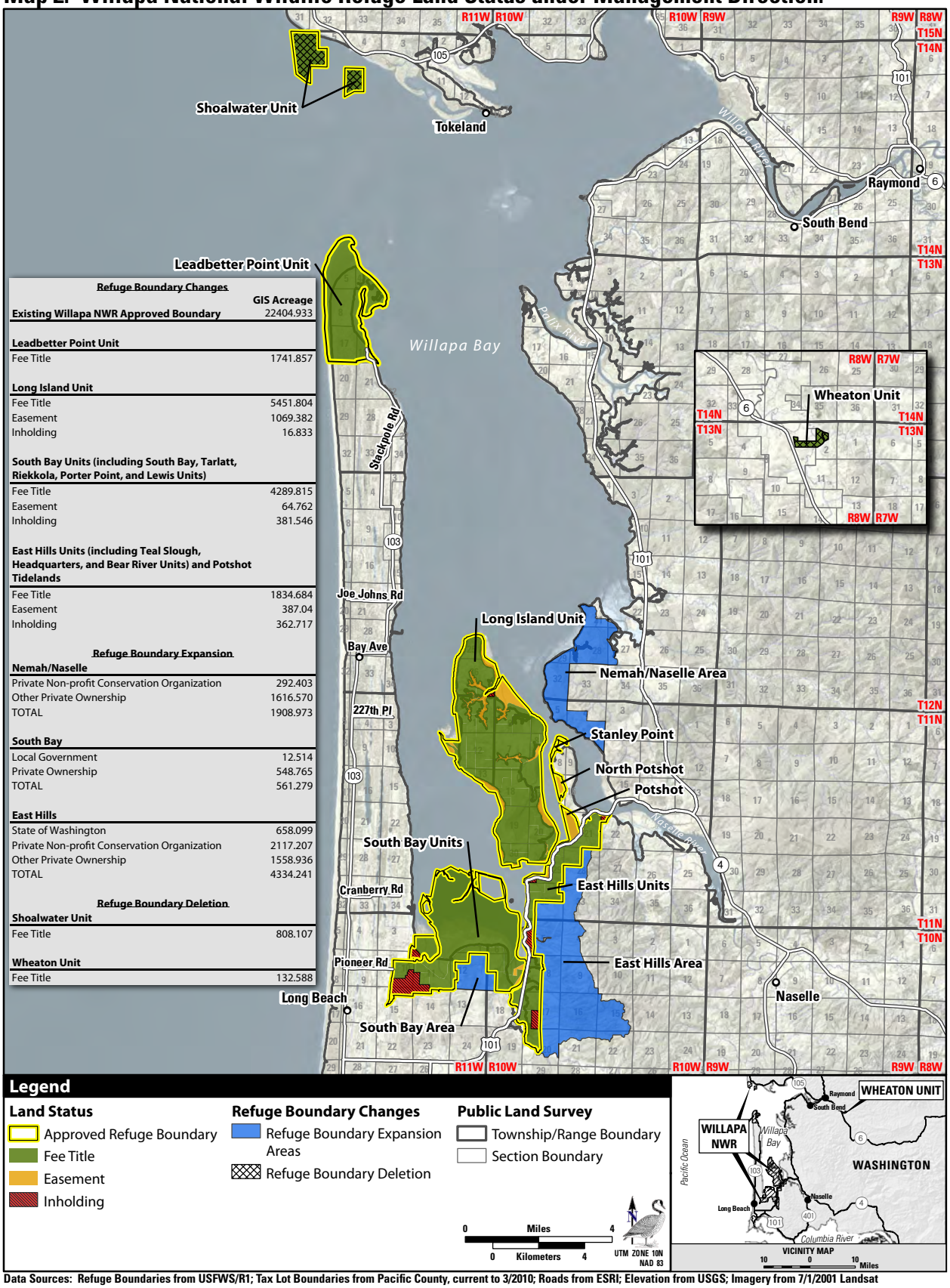
**Table 2-1. Summary Table for the Willapa CCP.**

| Theme/Issue | Management Direction: Healthy Wildlife Habitats, Endangered Species and Biodiversity Gains, Focused Refuge Expansion, Expanded Public Use |
|---|---|
| **Forest Habitat** | |
| **Late-successional Sitka spruce zone forest** | Protect and maintain 557 acres of existing late-successional Sitka spruce forest, while implementing forest management techniques where necessary to accelerate development of late-successional conditions in 6,180 acres of second-growth Sitka spruce forest |
| **Estuarine Habitats** | |
| **Open water** | Annually protect and maintain 878 acres of open water and channel habitat and increase open water on Lewis, Porter Point, and Riekkola Units to county Road (0.2 acre) |
| **Intertidal flats** | Annually protect and maintain 4,178 acres of intertidal flats and increase intertidal flats (9 acres) |
| **Salt marsh** | Annually protect and maintain 1,636 acres of salt marsh and increase salt marsh (611 acres) |
| **Freshwater Aquatic Habitats** | |
| **Riverine** | Protect, maintain, and conduct restoration activities within the 27 miles of riverine habitats |
| **Wetlands, seasonally managed** | Annually protect and maintain 17 acres of seasonal, managed freshwater wetland on the Tarlatt Unit |
| **Wetlands, naturally occurring** | Annually protect and maintain 545 acres of permanent and semipermanent, naturally occurring freshwater wetlands |
| **Coastal Habitat** | |
| **Coastal dune** | Maintain and protect 1,581 acres at Leadbetter Point Unit (not including wetlands) and restore up to 200 acres of coastal dune habitat. |
| **Upland Field Habitats** | |
| **Short-grass fields** | Maintain 93 acres of short-grass fields on the Riekkola Unit |
| **Grassland** | Establish 33 acres of habitat for Oregon silverspot butterfly at Tarlatt/Leadbetter Point Units |
| **Federal and State Listed Species** | |
| **Western snowy plover** | Protect western snowy plover and their habitat from nest predation, human disturbance, and invasive species; avian and mammalian predator management as necessary |
| **Oregon silverspot butterfly** | Reintroduce Oregon silverspot butterfly to suitable host plant habitat (33 acres) |
| **Recreation** | |
| **Wildlife observation and photography** | Maintain opportunities for self-guided wildlife observation and photography on the Leadbetter Point, Long Island, and mainland units, plus expanded opportunities at Tarlatt Unit, new trail and South Bay observation deck, concurrent with tidal restoration |
| **Interpretive trails** | Add a one-mile interpretive trail and a South Bay observation deck, concurrent with tidal restoration |
| **Waterfowl hunting** | Expansion of waterfowl hunting on South Bay Units (5,570 acres) and regulated goose hunting on Riekkola Unit (100 acres) |
| **Big game hunting (archery only on Long Island)** | Long Island and East Hills Units (excluding Headquarters and Bear River Quarters area) open; expand elk and deer hunting in South Bay and permit-only elk hunting on Leadbetter Point Unit, 10,716 acres |
| **Fishing** | Maintain Refuge portion of Willapa Bay and channel portion of Bear River open for fishing. |

| Theme/Issue | Management Direction: Healthy Wildlife Habitats, Endangered Species and Biodiversity Gains, Focused Refuge Expansion, Expanded Public Use |
|---|---|
| **Environmental education and Interpretation** | Maintain current program providing on- and off-site environmental education and interpretation programs, with increased on-site environmental education and interpretation activities resulting from addition of new visitor facilities and position. |
| **Camping** | Maintain five campgrounds with 20 campsites on Long Island |
| **Visitor/ administrative and maintenance facility** | Construct new Visitor/Administrative and Maintenance Facility at Tarlatt Unit |
| **Cultural Resources** | |
| **Cultural resource protection** | Protect cultural resource sites through best management practices with the expansion of cultural resource education and interpretation opportunities. |
| **Refuge Boundary Expansion** | |
| **North Bay** | Divest property Shoalwater and Wheaton Units |
| **Nemah-Naselle** | Proposed expansion 1,909 acres |
| **East Hills** | Proposed expansion 4,339 acres |
| **South Bay** | Proposed expansion 561 acres |

(Maps 2, 3, and 4 follow this page)

## Map 2. Willapa National Wildlife Refuge Land Status under Management Direction.




| Refuge Boundary Changes | GIS Acreage |
|---|---|
| **Existing Willapa NWR Approved Boundary** | 22404.933 |
| **Leadbetter Point Unit** | |
| Fee Title | 1741.857 |
| **Long Island Unit** | |
| Fee Title | 5451.804 |
| Easement | 1069.382 |
| Inholding | 16.833 |
| **South Bay Units (including South Bay, Tarlatt, Riekkola, Porter Point, and Lewis Units)** | |
| Fee Title | 4289.815 |
| Easement | 64.762 |
| Inholding | 381.546 |
| **East Hills Units (including Teal Slough, Headquarters, and Bear River Units) and Potshot Tidelands** | |
| Fee Title | 1834.684 |
| Easement | 387.04 |
| Inholding | 362.717 |
| **Refuge Boundary Expansion** | |
| **Nemah/Naselle** | |
| Private Non-profit Conservation Organization | 292.403 |
| Other Private Ownership | 1616.570 |
| TOTAL | 1908.973 |
| **South Bay** | |
| Local Government | 12.514 |
| Private Ownership | 548.765 |
| TOTAL | 561.279 |
| **East Hills** | |
| State of Washington | 658.099 |
| Private Non-profit Conservation Organization | 2117.207 |
| Other Private Ownership | 1558.936 |
| TOTAL | 4334.241 |
| **Refuge Boundary Deletion** | |
| **Shoalwater Unit** | |
| Fee Title | 808.107 |
| **Wheaton Unit** | |
| Fee Title | 132.588 |

Data Sources: Refuge Boundaries from USFWS/R1; Tax Lot Boundaries from Pacific County, current to 3/2010; Roads from ESRI; Elevation from USGS; Imagery from 7/1/2001 Landsat

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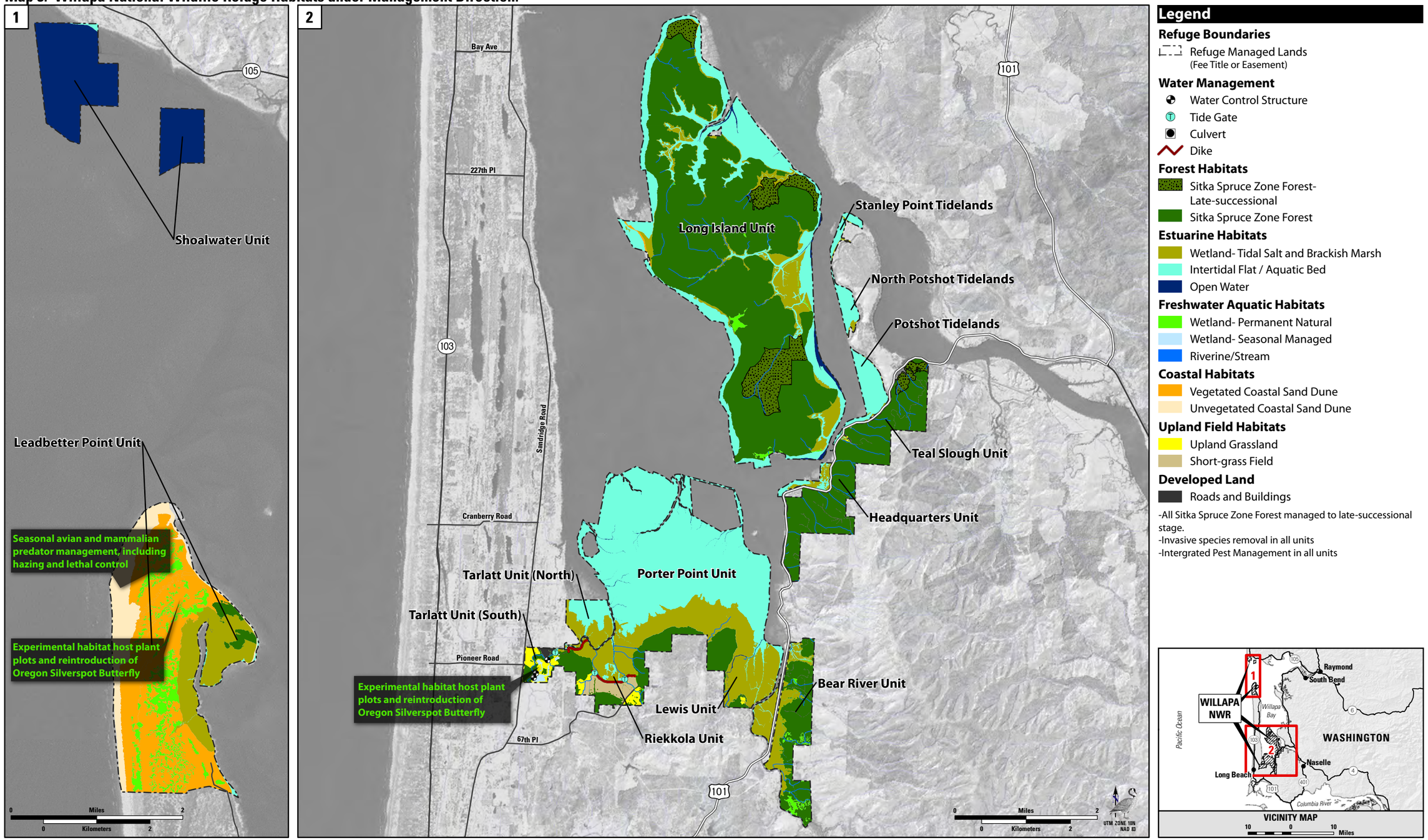
**Map 3. Willapa National Wildlife Refuge Habitats under Management Direction.**




Data Sources: Refuge Boundaries from USFWS/R1; Hydrology from NHD USGS; Roads from ESRI; Imagery fom 07/01/2001 Landsat

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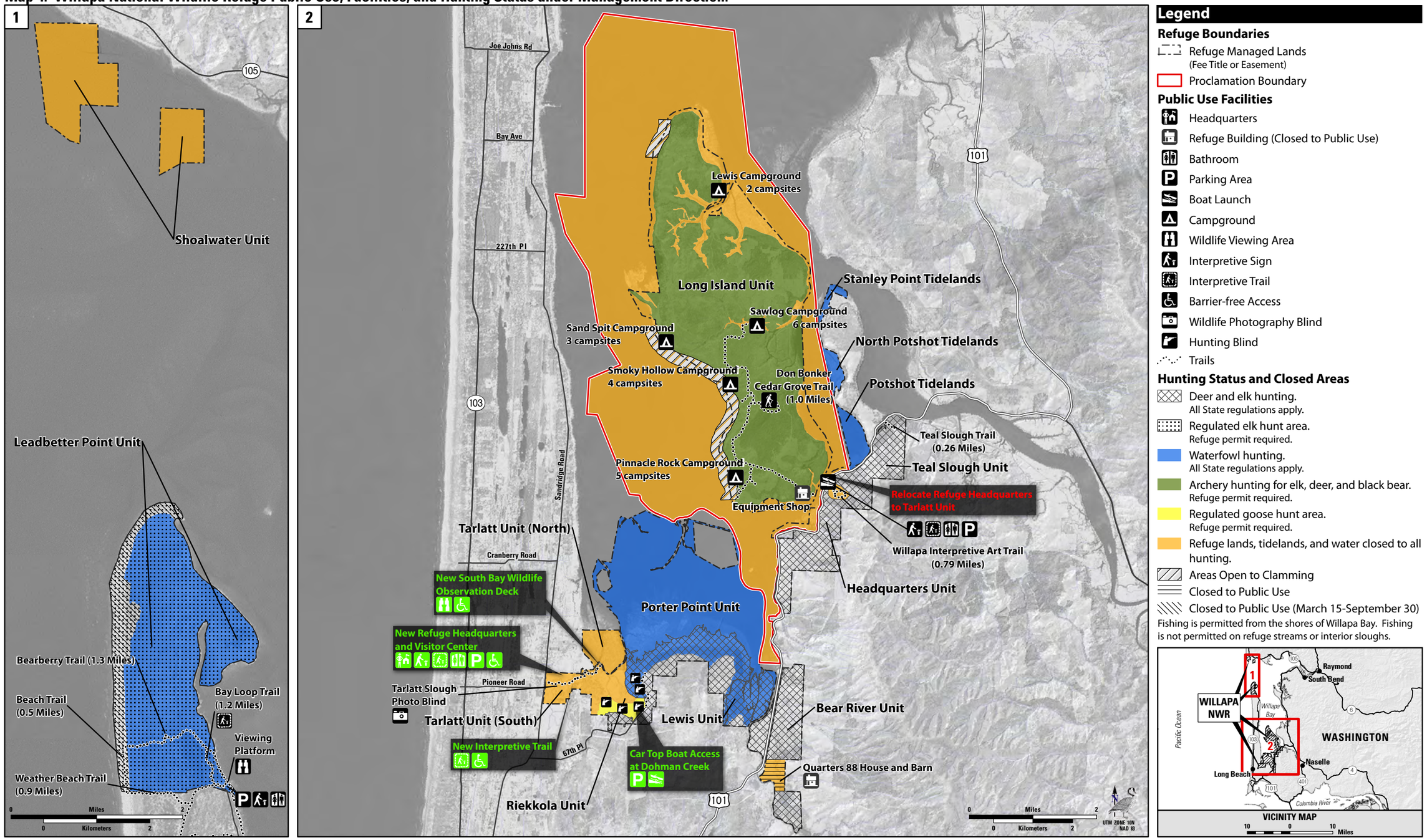
**Map 4. Willapa National Wildlife Refuge Public Use, Facilities, and Hunting Status under Management Direction.**




Data Sources: Refuge Boundaries from USFWS/R1; Hydrology from NHD USGS; Roads from ESRI; Imagery fom 07/01/2001 Landsat

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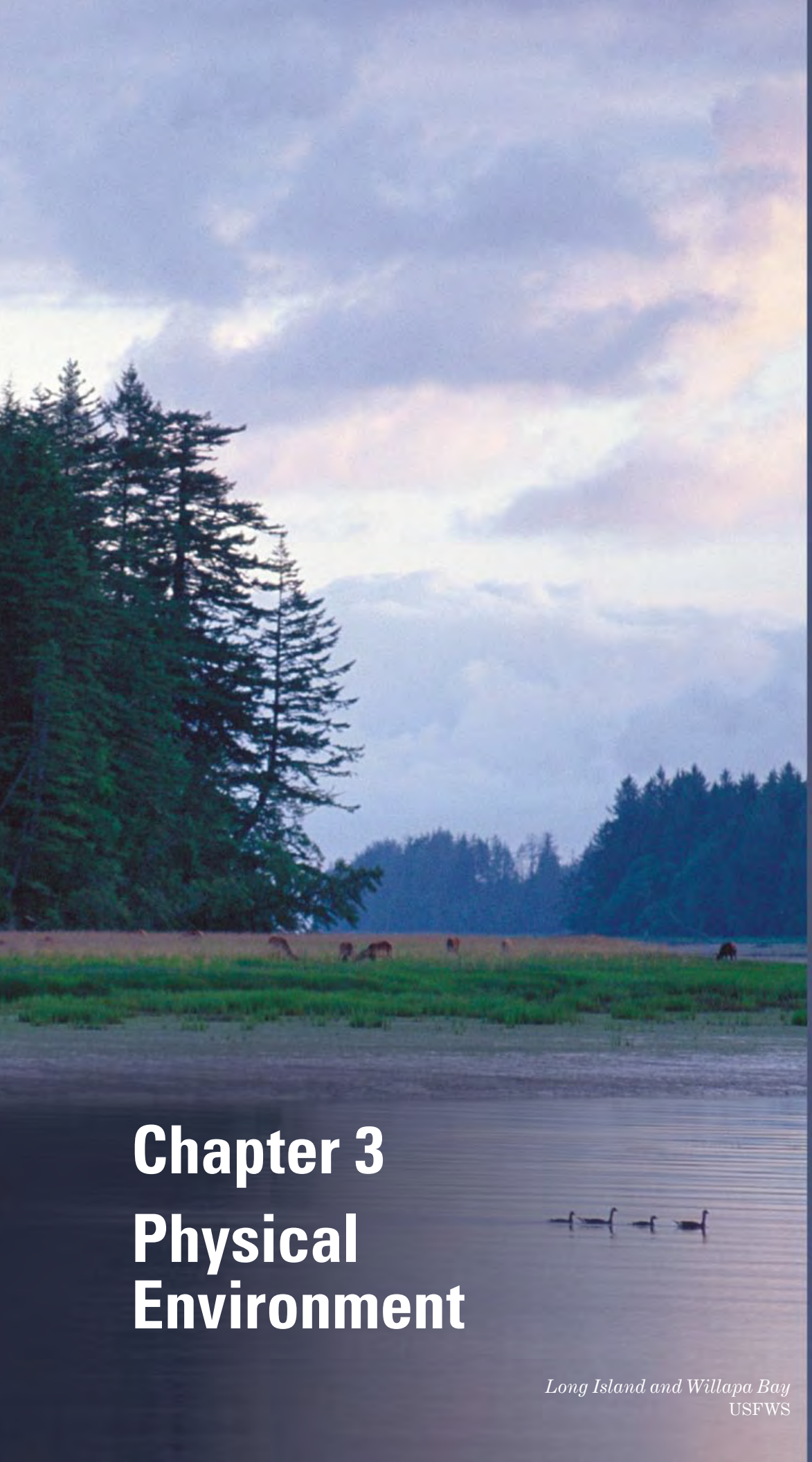

# Chapter 3
# Physical Environment

*Long Island and Willapa Bay*
USFWS

# Chapter 3. Physical Environment

## 3.1 Introduction

The Willapa National Wildlife Refuge is located along U.S. Highway 101 extending from the Naselle River to Bear River and westward to Tarlatt Slough and areas north to the Leadbetter Point and Shoalwater Units. The Refuge encompasses approximately 16,000 acres in the approved refuge boundary, which includes the Presidential Proclamation Boundary waters in the south Willapa Bay area.

## 3.2 Climate

The Refuge has a mild marine climate characterized by moderate temperatures, high humidity, copious rainfall, and breezy winds. Temperature, wind, and snowfall representative of most of the Refuge have been historically measured at the U.S. Weather Station located at the Astoria Airport in Oregon, about 18 miles south of the Refuge headquarters. Other current climatic parameters, such as hourly temperature, humidity, and winds, are measured at the Ocean Park, Washington, weather station, approximately 8 miles west of the Refuge headquarters.

Area temperatures are mild. The average annual temperature in areas surrounding Willapa Bay is 51 degrees Fahrenheit (°F). The annual average maximum and minimum temperatures for the Long Beach area from 1967 to 2000 were 57.8°F and 47.8°F respectively. Annual precipitation on the Refuge ranges from 80 to 115 inches and occurs mostly as rain in the winter. Thunderstorms over the area's lower elevations occur on four to eight days each year and over the mountains on seven to 15 days. Damaging hailstorms rarely occur.

Precipitation can be extreme at Willapa Bay. During the driest months of July and August, it is not unusual for two to four weeks to pass with only a few showers. In the wettest months of December and January, precipitation is frequently recorded on 20 to 25 days or more each month. The average annual total precipitation for the Long Beach area from 1967 to 2000 was 82.18 inches. June, July, and August were the driest months in the period 1967 to 2000. The monthly average precipitation for the Long Beach area from 1967 to 2000 was 3.01 inches in June, 1.61 inches in July, and 1.78 inches in August. Periodic dry weather conditions in the fall typically prompt a temporary fire ban to be issued by Pacific County that lasts about four to eight weeks. During the winter, rainfall is usually of light to moderate intensity and continuous over a period of time rather than heavy downpours for brief periods. Thunderstorms are unusual but occur periodically each year in summer. Fog and drizzle occur year round and often from October through June, particularly on the Long Beach Peninsula. Snowfall occurs almost yearly with an average of 1.6 inches annually.

Onshore westerly winds from the Pacific Ocean are predominant year round at Willapa Bay. The average annual wind speed at the airport in Astoria, Oregon is 7.9 miles per hour (mph). Average monthly wind speeds in Astoria range from 6.8 mph in October to 9.1 mph in December. The prevailing wind direction in summer is northwest and in winter southwest and west. Drier east and southeasterly winds are uncommon but occur periodically each year and are often strong. Strong winds usually accompany annual winter storms, which can result in winds of 40 to 90 mph, with gusts from 65 to over 100 mph. Winter storms often have sustained winds of 40 to 65 mph and gusts that exceed 65 mph. Hurricane force winds (>74 mph) are experienced almost annually and occasionally produce a recognized hurricane. A hurricane with 120 mph winds occurred on October

12, 1962, and a 100-mph wind storm on November 25 of the same year resulted in approximately one million board feet of timber downed on Long Island (USFWS 2003b).

## 3.3 Climate Change

A growing body of scientific evidence has emerged demonstrating that the world climate is changing and that changes in atmospheric composition due to human activity are the drivers for global warming (Bierbaum et al. 2007; IPCC 2007). Average annual air temperatures on the earth's surface have increased by 1.3°F since the mid-nineteenth century. Furthermore, the increasing trend in global temperatures over the last 50 years is approximately twice the trend of the previous 50 years. Globally, 11 of 12 years from 1995 to 2006 surface temperatures were the warmest on record since 1850 (IPCC 2007).

The global climate system controls regional- and local-scale climate conditions within the Pacific Northwest (Washington and Oregon). Projected impacts to the region encompassing the Refuge include changes in seasonal temperatures, precipitation, extreme weather events, oceanic conditions, and sea level rise.

### 3.3.1 Projected Temperature Changes

Since 1920, the annual average temperature in the Pacific Northwest has risen 1.5°F (UWCIG 2009). Further, all of the climate change models used in the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) indicates that the future climate would be warmer than in the past and that the warming rates in the twenty-first century would be greater than those observed in the twentieth century. Averaged across 20 different climate models, the annual average temperature within the Pacific Northwest is projected to increase 2.0°F (range of projections from all models: +1.1°F to +3.3°F) by the 2020s, 3.2°F (range: +1.5°F to +5.2°F) by the 2040s, and 5.3°F (range: +2.8°F to +9.7°F) by the 2080s, compared with the average from 1970 to 1999. The rates of warming range from 0.2° F to 1.0°F per decade. Warming is expected to occur during all seasons with most models projecting the largest temperature increases in summer (Mote and Salanthe 2009).

### 3.3.2 Projected Precipitation Changes

Projected changes in annual precipitation vary considerably between climate change models and therefore are less certain than projected temperature changes (Salanthe et al. 2009). The range of models analyzed by University of Washington Climate Impacts Group (2009) project average annual precipitation increases within the Pacific Northwest of 1.3 percent (range of projections from all models: -9 to 12 percent) by the 2020s, 2.3 percent (range: -11 to 12 percent) by the 2040s, and 3.8 percent (range: -10 to 20 percent) by the 2080s, compared with the average from 1970 to 1999. Studies of twentieth-century climate variability suggest, however, that the relatively small trends in precipitation projected with climate change may be less than the range of precipitation associated with natural decadal-scale variability (Hamlet et al. 2005; Mote 2003).

Some climate change models show large seasonal changes, especially toward wetter autumns and winters and drier summers. Both global and regional climate change models project increases in extreme high precipitation in western Washington (Salanthe et al. 2009). Additionally, projected temperature increases for the coming century are expected to increase the proportion of winter precipitation falling as rain, increase the frequency of winter flooding, reduce snowpack, increase

winter streamflow, result in earlier peak streamflow, and decrease late spring and summer streamflows (Hamlet and Lettenmaier 1999; Hamlet et al. 2007; Mote et al. 2003; Mote et al. 2005; Payne et al. 2004; Tague et al. 2008 *in* Lawler et al. 2008).

### 3.3.3 Projected Change in El Niño/La Niña Events

A seasonal change in the Pacific Ocean circulation brings the effects of the phenomenon known as El Niño to a wide region including the Pacific Northwest. A periodic weakening of the trade winds in the central and western Pacific, often occurring in December, allows warm water to invade the eastern Pacific. This seasonal change in the wind and ocean circulation can have global impacts to weather events. During an El Niño event, the winters of the Pacific Northwest tend to be warmer than usual. An El Niño cycle may be followed by a La Niña event, characterized by a cooler than normal ocean temperature. Likewise, La Niña also can have significant impacts on global weather. In the Pacific Northwest, a La Niña brings cooler than normal winters. Collectively, this cycle is known as the El Niño–Southern Oscillation (ENSO) (Conlan and Service 2000; Newton et al. 2003; Pidwirny 2006). The shift between the two conditions of the ENSO cycle takes about four years (Conlan and Service 2000).

El Niño events are not caused by global climate change; however, global warming trends may exacerbate the impacts of these events. To address the relationship between El Niño and global warming, the National Oceanic and Atmospheric Administration (NOAA 2007) summarizes data from the IPCC's 2001 climate change report, a 2001 report from the National Research Council (NRC), and the NOAA National Climatic Data Center's own data as follows:

> Clear evidence exists from a variety of sources (including archaeological studies) that El Niños have been present for hundreds, and some indicators suggest maybe millions, of years. However, it has been hypothesized that warmer global sea surface temperatures can enhance the El Niño phenomenon, and it is also true that El Niños have been more frequent and intense in recent decades. Recent climate model results that simulate the twenty-first century with increased greenhouse gases suggest that El Niño-like sea surface temperature patterns in the tropical Pacific are likely to be more persistent.

### 3.3.4 Projected Change in Coastal Water Properties

Coastal sea surface temperature helps determine the biological and physical conditions of the marine environment and estuaries of the Pacific Northwest. Climate models project warming in summer sea surface temperatures for the 2040s on the order of 2.2°F. This change is somewhat less than the warming projected in the 2040s for land areas (3.5°F) but is significant relative to the small interannual variability of the ocean (Mote and Salanthe 2009).

How global climate change would influence the ocean currents and coastal upwelling (affecting the nearshore and offshore environments adjacent to Willapa Bay) is unknown. However, current climate model simulations indicate little change in coastal upwelling in any of the major regions of upwelling (Mote and Mantua 2002; Mote and Salanthe 2009).

Ocean acidity is expected to rise as a result of continued increases in atmospheric carbon dioxide, as the additional carbon dioxide is taken up in the ocean, lowering pH. Plankton, fish, and other marine organisms that tolerate lower pH may benefit; however, others will not. Important plankton that form calcite shells will be negatively affected, and lower pH has been found to decrease calcification rates

in mussels, clams, and oysters (Feely et al. 2008; Huppert et al. 2009; Snover et al. 2005). These changes are likely to result in cascading effects to other species at higher trophic levels, such as fish, birds, and marine mammals. The range and magnitude of biological effects are currently uncertain, but are thought to be substantial (NOAA 2008).

### 3.3.5 Sea Level Rise

Sea level rise on the Washington coast and inland marine waters of the state is the result of four major forces: global mean sea level rise driven by the thermal expansion of the ocean, global mean sea level rise driven by the melting of land-based ice, local dynamical sea level rise driven by changes in wind, which pushes coastal waters toward or away from shore, and localized vertical land movements driven primarily by tectonic forces (Mote et al. 2008). Mean sea level is defined as the average sea level over a 19-year period, about which other fluctuations (e.g., tides, storm surges, etc.) occur (Smerling et al. 2005). Global mean sea level rise has been in the range of 1.3 to 2.3 millimeters per year (mm/yr) between 1961 and 2003 (IPCC 2007). This global impact is primarily the result of general thermal expansion of the oceans (as warming occurs, the water volume expands) and ice field and glacier melt-off (Warrick and Oerlemans 1990 *in* Canning 2001). In addition, vertical land movements are occurring as the North American plate and the offshore Juan de Fuca plate collide. Uplift occurs along the Washington coast while subsidence occurs offshore.

Based on monthly mean sea level data from 1973 to 2000, the linear mean sea level trend at Toke Point (north Willapa Bay) is +2.82 ±1.05 mm/yr (Mote et al. 2008). Estimates for sea level rise for central and southern Washington coast by 2050 range from 1 inch under the “very low” scenario to 5 inches under the “medium” scenario to 18 inches under the “very high” scenario. By 2100, estimates for sea level rise range from 2 inches under the “very low” scenario to 11 inches under the “medium” scenario to 43 inches under the “very high” scenario. Both the “very low” and “very high” scenarios are considered low probability (Mote et al. 2008).

### 3.3.6 Potential Changes to the Refuge Due to Climate Change

The climate-induced changes to physical systems are anticipated to have cascading effects on the ecological systems and habitats of Willapa Bay. For example, wetland habitats within the Refuge would be threatened by altered spatial and temporal patterns of temperature and precipitation, increased tidal inundation, and saltwater intrusion. The Sea Level Affecting Marshes Model, Version 5.0 (SLAMM 5.0) was run along the Pacific Coast from Willapa Bay through the Columbia River delta to just south of Tillamook Bay in northwest Oregon in order to simulate the dominant processes involved in wetland conversion and shoreline modification under long-term sea level rise.

The model assumes that global average sea level increases could increase by an average of 28 cm (11.2 inches) by 2050 and by 69 cm (27.3 inches) by 2100. Some of the potential habitat losses that could occur by 2100 within this region under a conservative estimate of sea level rise follow (Glick et al. 2007).

- This region is predicted to lose at least 5,000 hectares (12,355 acres) of dry land.
- There is likely to be extensive loss of tidal flat and area beaches, especially at higher rates of sea level rise.

- Inland and freshwater marsh would be fairly vulnerable at this site to saltwater inundation. By 2100, the region could lose 32 percent of brackish marsh, 31 percent of tidal swamp, 47 percent of estuarine beach, and 63 percent of tidal flats.

Because a significant proportion of the Refuge consists of wetlands, a rise in water levels could impact the management of the Refuge and the type of species and numbers of wildlife that inhabit the area. Additionally, refuge shorelines and spits are anticipated to be adversely affected by climate change. Likely effects due to sea level rise and other factors include increased inundation, erosion, and overwash during storm events, leading to losses of shoreline habitats (Huppert et al. 2009; Mote et al. 2008). Additionally, climate-driven changes in ocean currents, sea temperatures, salinity, and the timing of resource availability have the potential to affect intertidal communities (Menge et al. 2008) and eelgrass beds (Snover et al. 2005).

For the forests occurring on Long Island and the East Hills, the responses to climate change would vary according to local topography, forest type, soil moisture, productivity rates, species distribution and competition, and disturbance regimes. However, based on the projected changes in the spatial and temporal patterns of temperature and precipitation associated with climate change, some general patterns affecting large-scale processes can be described (adapted from Aldous et al. 2007):

- Species distributions are likely to change. Cool coniferous forests in the western part of the Pacific Northwest would contract and be replaced by mixed temperate forests over substantial areas (Mote et al. 2003). Douglas fir appears relatively sensitive to low soil moisture, especially on drier sites (Case 2004, Hessl and Peterson 2004, and Holman 2004 *in* UWCIG 2004).
- Increasing temperature would generally increase forest fire frequency and extent.
- Higher temperatures would increase rates of evapotranspiration, leading to greater water losses from forests.
- The change in seasonality of precipitation could lead to a drier growing season, increasing water stress.
- Warmer temperatures could lead to a change in the timing of reproduction, which may lead to asynchronies between flowering and pollinator activity, fruit ripening, and foraging by fruit consumers or predator behavior by pest-eating species.
- An increase in extreme weather events (e.g., windstorms) could change the frequency of disturbance, leading to a shift to forests that are younger and species that grow faster, have shorter lives, and are more tolerant of disturbance.
- Warmer temperatures could increase development of insect and other pathogen outbreaks, as well as extend their growing season, potentially leading to an increase in the frequency and extent of outbreaks.
- Some tree species may experience an increase in productivity if carbon dioxide acts as a fertilizer and allows trees to increase their water-use efficiency. However, this increased productivity, coupled with warmer temperatures, longer growing seasons, and prolonged drought, may also increase fire frequency and severity.

Numerous other changes to the Refuge's habitat and wildlife would likely result from increases in ambient temperature and precipitation over the next 50 to 100 years. However, until a more detailed analysis of the effects of global climate change can be completed on specific refuge units, more generalized modeling would continue to be used to assess how and what the Refuge should do to prepare for upcoming changes to the natural environment. While this CCP covers a 15-year time

span, it is clear that for the Refuge to adequately plan for climate change, staff would have to look further into the future. During the 15-year time span of this CCP, the Refuge would begin a focused effort to plan on how best to address climate change effects in the Willapa Bay estuary.

## 3.4 Geology and Topography

The areas covered by this plan each have distinct geological, topographic, and soil characteristics. Elevations on the Refuge range from sea level on Willapa Bay up to 1,715 feet at the highest point, along the Bear River Ridge within the coastal hills area.

### 3.4.1 Willapa Hills

The Willapa Hills have a rounded topography, and the landscape is dissected with deep drainage ravines. The refuge portion of the coastal hills includes the Bear River, Headquarters, and Teal Slough Units. Approximately 1,700 acres of the current refuge boundary are included in the Willapa Hills.

This area of Pacific County and the Refuge is made up of marine sedimentary rock from the late Eocene through early Miocene (60 to 20 million years old), which underlies most of this zone and consists of thin-bedded, laminated tuffaceous siltstones and lesser amounts of sandstone (Wells 1989). Middle Miocene intrusions of basalt also exist and are much more resistant to the forces of weathering than the surrounding sedimentary rocks. This contrast in rock hardness has resulted in the development of locally steeper slopes and higher relief and can be found on the Bear River Ridge (Wells 1989).

Due to the lack of glaciation over the last two million years, soils and exposed bedrock are highly weathered. Thick soils have developed on the stable upland surfaces, and the slopes range from a very gentle grade to very steep rocky cliffs.

Three major geologic formations exist in this area: Lincoln Creek, Grand Ronde, and Shoalwater Bay. Each formation has corresponding observable geomorphic features.

The Lincoln Creek formation consists of steep, dissected hill slopes west of the Bear River Ridge divide and west of Ellsworth Creek (Wegmann 2004) where the soils are primarily from the Palix and Narel series. These deep, well-drained soils were generally formed in mixed slope deposits, which are derived from sandstone and siltstone consisting of silt loams and silty clay loams with 10 to 30 percent pebble-sized rock fragments. Partly consolidated sandstone ranges in depth from 40 to 60 inches and water moves readily through these soils.

The Grand Ronde Basalt formation contains steep ridges and cliffs, which are found on the Bear River Ridge and are associated with the Columbia River basalt flows. The soils in this area are highly weathered basalts from the Vesta series on ridgetops and the Knappton series on side slopes. These deep, well-drained soils consist of silt loams and are gravelly with silt clay loams with 0 to 30 percent pebble sized rock fragments. Weathered fractured basalt ranges in depth from 40 to 60 inches, and water moves readily through these soils.

The Shoalwater Bay formation consists of moderately to low dissected hill slopes and bluffs west and north of Bear River Ridge that slope gently toward Willapa Bay. Soils are weathered sandstones and siltstones from the Palix, Ilwaco, Leban, and Treham series, with some intrusions of Knappton soils.

The Ilwaco and Leban series are similar to the Palix series, while the Treham series is similar to Knappton. Intrusions of basalt, with more recent estuarine deposits mixed in, make for a very complex geology.

All of the soils in the Willapa Hills of the SWBCA are fine-textured soils, which, in combination with the abundant rainfall, give the area excellent soil productivity.

The combination of steep slopes, bedrock types, and significant precipitation makes this area of the coastal hills very susceptible to landslides. Although most landslides have been shallow rapid slides or debris flows, there have been some deep-seated landslides that affect much larger areas and consist of poorly sorted colluvium and bedrock slump blocks. In general, Wegmann's (2004) analysis found that forestry activities have greatly hastened landslide activity and that roughly 85 percent of the 319 landslides since 1958 were related to forestry activities within this region of Willapa Bay.

### 3.4.2 Long Island Unit

Long Island is considered its own watershed unit. The island is approximately 6,000 acres in size and is located in the southern portion of Willapa Bay.

Long Island and other areas (Leadbetter Point) bordering Willapa Bay are composed of estuarine terraces and alluvial deposits that are generally flat to gently sloped (Wells 1989). They consist of unconsolidated to semiconsolidated mud and silt, layered with sand lenses. Terrace surfaces occur up to 260 feet above sea level on the approximately 6,000-acre island.

The marine terraces consist of uplifted and wave-cut terraces of highly stratified Willapa Bay estuarine sediments that were laid down over the last two million years, as sea levels fluctuated. These terraces occur on Long Island and parts of the mainland shoreline areas and often overlay older, consolidated sandstone that can be seen on Long Island cliffs. Basalt intrusions are also present. Due to rapid weathering, the geological history here is not well known.

In estuaries, floodplains, and the low terraces of the major streams entering Willapa Bay, soils are derived from recent alluvial sediments. Soils from the Ocosta series are the most prevalent (Pringle 1986). These very deep, poorly drained soils occur in floodplains and the deltas of coastal bays and consist of silty clay loam and silty clay. The Aabab series occurs in terraces along streams and is a silt loam. The small area of the Refuge on Leadbetter Point consists of former sand dunes where soils are from the Netarts and Yaquina series (Pringle 1986).

Soil productivity of marine terrace areas tends to be a little lower than in the coastal hills, but is still quite high as compared to most soil types. Risk of landslides is generally low, except on steep slopes along the edge of the Willapa Bay estuary, which have a history of land sliding in response to forest management activities. Both shallow-rapid and small deep-seated failures have occurred here on the slopes averaging 34 percent, indicating a lower slope threshold for landslide risk than in the coastal hills (Wegmann 2004).

## 3.5 Hydrology and Bathymetry

Estuaries are most commonly defined as semienclosed coastal bodies of water having a free connection with the open sea and within which seawater is diluted measurably by fresh water from land drainage (Litle and Parish 2003).

As a transition zone between freshwater and marine ecosystems, estuaries are highly productive areas that offer habitat of special importance to the early life stages of the many marine animals. Estuaries are categorized according to their physical shape and the forces that created them. Oceanographers describe Willapa Bay as a coastal plain or a "drowned river" estuary, the type most common along the west coast of North America. Drowned river estuaries are remnant river mouths submerged by sea level rise within the past 10,000 years (Litle and Parish 2003). Bordered by the Long Beach Peninsula, a large bar formed from the Columbia River sediments, Willapa Bay's estuary also has some of the features of a bar built estuary.

The Willapa Bay and its surrounding basin lie in a region of cool, dry summers. The moderate winters are often accompanied by heavy rainfall with occasional snowfall in the lowlands. Annual precipitation on the beach ranges from 165 to 216 cm (65-85 inches), while areas in the Willapa Hills receive 254 cm or 100 inches per year. Mean annual runoff ranges from 127 cm (50 inches) in the west and north to about 305 cm (120 inches) in the upper Naselle River Basin. Mean annual runoff for the entire basin is estimated to be 173 cm (68 inches) or 3,400,000 acre-feet per year. There are often winter floods of short duration and the mean maximum discharge at the mouth of the Willapa Bay is 1,600,000 cubic feet per second. Mean daily runoff, however, is estimated to be about 0.004 percent of the total volume of the bay.

The tidal range in Willapa Bay is 4 to 5 m (14 to 16 feet). In some parts of the bay, there are strong rip tides, and the incoming tide rises over the extensive tidal flats at an extremely fast speed. The volume of the bay at mean higher high water (MHHW) is 56,585,900 cubic feet; the volume at mean lower low water (MLLW) is 31,169,000 cubic feet. The difference, 25,416,900 cubic feet, is considered to be the tidal prism, which, according to the U.S. Army Corps of Engineers, Seattle District (1975:20), "means that approximately 45 percent of the water in the bay is emptied into the Pacific Ocean on a tidal cycle from MHHW to MLLW." This seems to suggest that there is only one tide per day, which is not the case; the mixed semidiurnal tides of the Pacific Coast waters result in a discrepancy in the tidal prism volume (i.e., successive tidal prisms are consistently unequal in volume).

There are other factors that inhibit or change the tidal exchange in an estuary of the size of Willapa Bay, and the flushing rate (or residence time) remains to be determined, as indicated in the following:

> While it might appear that the large prism would bring about a fast turnover of the bay water, this is not always the case. Conditions on the ocean determine how much of the water exiting the bay will return on the next incoming tide. In the summer, strong northwesterly winds bring upwelled water from the ocean to the bay, promoting a rapid turnover. Storms and high wave action will also promote mixing. At other times, the Columbia River plume, acting as a discrete water mass, prevents much mixing from occurring and the water from the bay moves back and forth for days. (U.S. Army Corps of Engineers, Seattle District 1975:20)

Willapa Bay is fringed by extensive wetlands, including mudflats and salt marshes. The tidal action, which enables regular exposure to air and light, has stimulated the growth of many shore plants, including buttercups (*Ranunculus* spp.), velvet grass (*Holcus* spp.), monkeyflower, bulrush (*Scirpus* spp.), sedges (*Carex* spp.), and tussocks. With the tidal action, these plants are eventually broken up and transported into the bay. This plant detritus is a significant contribution to the various filter feeders in the bay, especially clams and oyster (Hedgpeth and Obrebski 1981).

### 3.5.1 Riekkola Unit

Historically this refuge unit was tidally influenced. In the 1940s, a dike was built to protect this area from tidal influence, to create freshwater wetlands and manage waterfowl. Active management through haying, grazing, mowing, and weed control provides habitat for geese. The four freshwater wetlands are actively managed by refuge staff. These activities include moist soil management and water control. Management activities are timed annually to maximize the period for wildlife use, native amphibian development, plant development, shorebirds, and invasive plant control.

Dohman Creek crosses through the pastures and exits into the South Bay via a double tidegate located along the dike. This tidegate creates a barrier to saltwater influence within this creek, maintaining the freshwater influence to the surrounding plants.

### 3.5.2 Lewis 1, Lewis 2, and Porter Point Wetland Units

The wetlands are recharged by the watershed immediately located to the south and are fed by Lewis and Porter Point streams. These streams are fed by seeps and rainfall.

These three units are extensively managed by refuge staff and require annual flooding and draw-downs of the wetlands to accomplish moist soil management practices for wildlife purposes.

Lewis 1 and Porter Point wetlands are on a two-year draw-down schedule, on alternate years, for control of reed canarygrass and other non-native species and to offer wildlife an opportunity to find available habitat. The Lewis 2 wetland is drawn down annually in concert with the Lewis 1 or Porter Point draw-down.

Draw-downs are timed to maximize the period for native amphibian development before the impoundment is completely dried out. The exposed mudflats during the draw-down also provide foraging areas for shorebirds.

### 3.5.3 Leadbetter Point Unit

Leadbetter is located on the far north end of the Long Beach Peninsula, north of Leadbetter State Park. This unit is approximately 2,397 acres (including accreted lands) and is affected by the tidal exchange in the estuary on the bay side. The west side of the unit is affected by the open ocean tides. Located throughout this unit are several ephemeral wetlands.

### 3.5.4 Tarlatt Unit

Willapa Bay is the local collection basin for eastern Long Beach Peninsula storm drainage of the surrounding land and coastal hillsides. The proposed new Visitor/Administrative and Maintenance Facility site for the Willapa National Wildlife Refuge is located along Sandridge Road south of the intersection with 95th Street in Pacific County. From this intersection, the USFWS has a larger land holding that extends south to 85th Street, and eastward to land directly abutting other refuge property and Willapa Bay. Approximately 29 acres of the northeastern corner of the site is available for the new Visitor/Administrative and Maintenance Facility development. All of this land drains into Tarlatt Slough, which winds through the property, generally flowing in a northerly direction before making a bend to the east within the property.

Tarlatt Slough is a major stormwater drainage channel for Pacific County, draining the southeastern portions of the Long Beach Peninsula into Willapa Bay. Historically, Tarlatt Slough was tidally influenced but may not be now due to the downstream dike at its outlet into Willapa Bay. According to a recent wetland delineation performed on the new Visitor/Administrative and Maintenance Facility site, the vegetated edge along Tarlatt Slough would also be considered a Category I estuarine wetland. The source of hydrology for the large Category I wetland is Tarlatt Slough (Key Environmental Solutions 2010).

Several Category IV freshwater depressional wetlands are also found on the site. One hydrology source for the Category IV wetlands appears to be culverts draining from 95th Street onto the site. There is also drainage coming off of Sandridge Road down a slope and a high groundwater table found in the depressional areas (Key Environmental Solutions 2010).

According to the Flood Insurance Rate Map for Pacific County (FEMA 1985), much of the easterly portion of the property is considered to be within the 100-year floodplain. For planning purposes, the elevation of the 100-year flood occurrence on the property is estimated to be 13.2 feet (North American Vertical Datum of 1988) (Parametrix 2009). However, flooding of the site during a significant event is unlikely due to a county-owned dike and tidegate system that is currently in place. It is unlikely that the portions of the dike system that prevent flooding on this and adjacent properties will be removed in the future.

### 3.5.5 Wheaton Unit

The Willapa River and Mill Creek run through the Wheaton Unit, which is located east of Raymond, Washington. Both the river and creek are tidally influenced and are prone to floods during times of high rain/snow runoff.

## 3.6 Soils

Soils are the natural bodies of loose material on the earth's surface. They are formed by the dynamics between climate and living matter acting on parent material. Five factors determine the properties of soil: the physical and mineral composition of the parent material; the climate under which the soil material has accumulated and existed since accumulating; the relief, or position of the land; living organisms; and the length of time the soil forming forces have acted on the parent material.

The following soil information was taken from a soil survey of Grays Harbor, Pacific, and Wahkiakum counties, published by the Soil Conservation Service (Pringle 1986), which is now known as the NRCS.

### 3.6.1 Headquarters Unit (Current)

The Headquarters Unit is made up of Palix silt loam soils on slopes ranging from 8 to 90 percent. The Palix silt loam soils are deep, well-drained soils. These soils support productive western hemlock and Douglas fir forest, as well as red alder (*Alnus rubra*), Sitka spruce, and western red cedar. Without vegetation the Palix silt loam soils are unstable, hard to pack, and subject to erosion when wet.

The Omeara's Point area, within the Headquarters Unit, is made up of several soil types: Palix, Ilwaco, Vesta, Knappton, and Montesa silt loams. Palix silt loam occurs on 30 to 90 percent slopes.

Ilwaco silt loam is a very deep, well-drained soil occurring on broad ridgetops, small plateaus, shoulders, and the back slopes of uplands. The principal tree species found on Ilwaco silt loams is western hemlock where it grows well.

Vesta silt loam occurs on 1 to 8 percent slopes over much of the Omeara's Point area. Vesta silt loam is a very deep, well-drained soil formed from basalt parent material on ridgetops. Vesta silt loams are slightly more productive for growing western hemlock than Palix and Ilwaco silt loams.

Knappton silt loams generally support the growth of western hemlock and Douglas fir forest. Knappton silt loam is moderately permeable with a rapid runoff rate; therefore, the hazard of water erosion on this soil is severe.

The Montesa silt loam occurs on alluvial fans, the broad fan-like deposits of soil at the mouth of small streams. These very deep, somewhat poorly drained deposits were formed from sedimentary and igneous sediments at low elevations (25 to 300 feet elevation). The seasonal water table occurs at 18 to 30 inches from fall to spring. Montesa silt loam typically produces red alder.

## 3.6.2 Bear River Unit

The Bear River area of the Refuge contains a diverse group of soils including Knappton, Palix, Lebam, and Nuby silt loams, and Ocosta silty clay loam, as well as smaller areas of Traham very gravelly loam and Orcas peat. Lebam silt loam is very deep, well-drained soil occurring on 1 to 30 percent slopes. It has slow runoff and does not easily erode from water, but does get muddy when wet.

Nuby silt loam is a very deep, poorly drained soil occurring on floodplains, where it was deposited by the Bear River. The seasonal water table in this soil is at a depth of 24 to 36 inches. Nuby soil is moderately permeable and occurs on flat (0 to 3 percent slope) areas that are subject to brief periods of winter flooding. Red alder is the principal forest species on Nuby soils.

Traham loam soils are very rocky and on the Bear River Unit, this type occurs on a narrow ridgetop. Traham soil occurs on 5 to 30 percent slopes and is a moderately deep, well-drained soil. Traham soil is generally used for forest production. Western hemlock is the principal tree species found on Traham soil. Tree root depth is limited to 24 to 36 inches, the depth at which fractured basalt is found.

Two small areas of Orcas peat soil are present in the lower portion of the Bear River area. Orcas peat is a very deep, very poorly drained soil occurring in depressions. The native vegetation of Orcas peat is living sphagnum (*Sphagnum* sp.), bog Labrador tea (*Ledum groenlandicum*), rushes, and sedges.

## 3.6.3 Long Island Unit

Long Island soils are made up primarily of Willapa silt loam and Ilwaco silt loam, with lesser amounts of Newskah loam, Palix silt loam, and Ocosta silty clay loam. Willapa silt loam is very deep, moderately well-drained soil that supports the growth of western hemlock, Sitka spruce, western red cedar, and red alder in a major part of the island's northern interior, north of Sawlog

Slough. The soil surface is typically covered with about 1 inch of duff. Willapa silt loam has a seasonally high water table that is at a depth of 30 to 42 inches in winter. Runoff is slow and water erosion hazard is slight for this soil, although it is muddy when wet and can be damaged without its protective duff layer.

Ilwaco silt loam is a very deep, well-drained soil on broad ridgetops, small plateaus, and shoulders. It has a 2-inch layer of duff on the surface, slow runoff, and slight hazard for erosion, except when steeply cut. Ilwaco silt loam primarily supports western hemlock and Sitka spruce and is the soil type in the old-growth Cedar Grove and other parts of the island south of Sawlog Slough.

Newskah loam is a very deep, well-drained soil on terraces and back slopes of terraces, occurring south of Sawlog Slough. It supports primarily western hemlock and has a protective surface covering of 3-inch-thick moss, needles, and twigs. Newskah loam erodes readily if steeply cut, wet, or devoid of vegetation or its duff layer.

Palix silt loam is a deep, well-drained soil that occurs along the island's steep shorelines. Ocosta silty clay loam occurs near sloughs and marshes.

### 3.6.4 Tarlatt Unit

According to the Soil Survey for Grays Harbor County Area, Pacific County and Wahkiakum County, Washington (NRCS 2009), three soil types are found on the new Visitor/Administrative and Maintenance Facility property: Yaquina loamy fine sand (162), Netarts fine sand, 3 to 12 percent slopes (92), and Ocosta silty clay loam (104), with the Netarts fine sand unit apparently occurring on slightly higher elevations.

Yaquina loamy fine sand is typically found in depressional landforms and is considered somewhat poorly drained with a frequent occurrence of ponding. The Yaquina loamy find sand unit has a water table that is near the ground surface. Netarts fine sand is a deep, well-drained soil type found on dune formations with little to no occurrence of ponding. The Netarts fine sand unit has a depth to water table that is listed as more than 80 inches and no frequency of flooding. Ocosta silty clay loam is a very deep, poorly drained soil found on floodplains and deltas protected from tidal overflow. On the new Visitor/Administrative and Maintenance Facility site, the Ocosta silty clay loam unit is primarily associated with Tarlatt Slough.

All three soil types found on the site are listed on the hydric soils list for Washington (NRCS 1995). However, the presence of mapped hydric soils does not necessarily correlate directly with the presence of mapped wetlands on this site. In order to classify an area as wetland, hydrology and hydrophytic vegetation must be present (Key Environmental Solutions 2010).

Netarts fine sand and Yaquina loamy fine sand are also considered very limited for septic drain field construction: Netarts fine sand because of slope and Yaquina loamy find sand due to the depth to water table. Both soil types are also considered very limited for building site development.

The proposed new Visitor/Administrative and Maintenance Facility site topography is relatively flat, and elevations are within 10 to 20 feet above sea level. Slopes on the site are generally quite flat within the Yaquina loamy fine sand soil mapping unit, and a little steeper and higher in elevation within the Netarts fine sand unit. Actual elevations and grades have been surveyed for only part of the site: the area studied internally by the USFWS, which measures approximately 1,250 by 400

feet. There is a slight ridge running generally north and south through the surveyed portion of the site, apparently where the transition from dune landform to the depressional landform occurs on the site (also likely the transition between the two soil mapping units). Slopes on this ridge range from 2 to 14 percent. Elsewhere on the site, slopes are generally flatter, in the 0 to 5 percent range.

According to the soil survey for the site (NRCS 2009), a Netarts fine sand soil mapping unit can be found along 95th Street and east of the USFWS study area portion of the site. There is also an area of Netarts fine sand identified just south and east of the surveyed zone. It is possible that these land areas are slightly higher, with a greater depth to water table than the adjacent depressional areas within the Yaquina loamy fine sand unit.

### 3.6.5 Riekkola, Lewis, and Porter Point Units

Riekkola, Lewis, and Porter Point Units consist primarily of Ocosta silty clay loam in the diked pastures and marsh areas. Forested areas in the higher elevations surrounding the units, including Lewis Hill, consist of Palix silt loam and some Ilwaco silt loam.

### 3.6.6 Leadbetter Point Unit

The Leadbetter Point Unit has five soil types. The outer beach above mean high tide is classified as beach; this area has no vegetation and is subject to continual wave action during high tide. Dune land makes up the majority of outer peninsula westward and north. The dune land is very deep fine sand, drains excessively, and is constantly shifted by strong coastal winds. The dune land topography consists of a primary foredune, an interdune area of dunes and hollows and foredune ridges that run parallel with prevailing winds from the shoreline (also called the foredune complex), and a relatively flat deflation plain still further inland. The water table is at the surface of the interdune area during the winter months. The beachgrass and lodgepole pine (*Pinus contorta*) areas of the peninsula tip and interior of Grassy Island are Westport fine sand, which forms on slightly weathered stabilized sand dunes. Westport fine sand is covered in a thin mat of organic material and is also very deep and excessively drained. The protective organic layer of Westport fine sand is extremely fragile. The dune land and Westport fine sand are highly susceptible to wind erosion when exposed.

The salt marsh and most of the southern portion of Grassy Island are Ocosta silty clay loam. The forested area near the Leadbetter parking area is Yaquina loamy fine sand, a very deep, somewhat poorly drained soil. The water table in winter is from 24 inches deep to the surface of this soil. The duff layer is half an inch thick (USFWS 2003b).

### 3.6.7 Wheaton Unit

Wheaton Unit has three soil types: Arta silt loam, Grehelam silt loam, and Rennie silty clay loam. Arta silt loam is a very deep, moderately well-drained soil present in the eastern hay field and higher areas of the homestead site and field. Runoff is slow and the hazard of water erosion is slight in Arta soil. Arta soil supports hemlock and red alder forest but is presently maintained as pasture. Grehelam silt loam is also a very deep, well-drained soil found on the natural dikes of the floodplain, which makes up the majority of the unit and includes the west field that is across the Willapa River and the field that is between Mill Creek and the Willapa River. Grehelam soil is subject to brief periods of flooding in winter. Grehelam soil typically supports Douglas fir and red alder forest but is maintained as pasture. A small area of Rennie silty clay loam exists in the oxbow wetland on the north side of the Willapa River, near the bend in the boundary fence. Rennie soil is a very deep,

poorly drained soil occurring on the floodplain. Permeability is slow, the water table is high seasonally and runoff is very slow in this soil, resulting in the formation of small seasonal wetlands.

# 3.7 Environmental Contaminants

## 3.7.1 Air Quality

The air quality may be affected by various activities on and adjacent to the Refuge including marine vessels, industrial facilities, automobiles, and other human-caused activities such as outdoor burning, wood stoves, and operation of various vehicles and machines (e.g., gasoline-powered equipment, motorboats). The refuge staff uses various types of equipment and transportation methods to achieve the refuge habitat conservation projects and research. Habitat improvement projects and daily monitoring activities may include the use of tractors or heavy equipment (bulldozer, backhoe, and excavator) and/or the operation of trucks, boats, or other vessels to access Long Island or other portions of the Refuge found in Willapa Bay. Refuge visitors generally drive their automobiles to visit the various units of the Refuge, and others operate motorboats to visit Long Island or participate in wildlife-dependent recreation opportunities on the bay (hunting, fishing, wildlife observation).

## 3.7.2 Water Quality

The Washington Department of Ecology (WDOE) is responsible for water quality defined under Chapter 173-201A of Washington Administrative Code (WAC), "Water Quality Standards for Surface Waters of the State of Washington." Willapa Bay and its tributaries are classified as Class A excellent waters, which "shall meet or exceed the requirement for all or substantially all beneficial water uses."

These water uses include:

- Domestic consumption.
- Primary and secondary contact recreation.
- Fish and shellfish spawning, rearing, and harvesting.
- Wildlife habitat.
- Stock watering.
- Commerce and navigation.
- Aesthetic enjoyment.

Bacteria levels are one of the common measures used to identify the waters ability to provide beneficial uses. In Class A fresh water (rivers, streams), fecal coliform organisms "shall not exceeded a geometric mean value of 100 colonies per 100 mL, with no more than 10 percent of samples exceeding 200 colonies per 100 mL" (WAC 173-201A-030(2)(c)(1)(A)) Class A marine waters "shall not exceed a geometric mean value of 14 colonies per 100 mL, with not more that 10 percent samples exceeding 43 colonies per 100 mL" (WAC 173-201A-030(2) (c)(1)(B)). In estuarine conditions (Willapa Bay) the marine criteria are applicable when ambient water salinity is equal or greater than 10 parts per thousand (WAC 173-201A-060(2)).

The overall water quality conditions in the bay are influenced by the tidal flushing characteristics. In Willapa Bay, tidal volumes are five to 10 times the watershed's freshwater input, even during periods of high river discharge. Diurnal tidal ranges (MHHW to MLLW) are 8.1 to 10.2 feet (2.5 to 3.1 m) at locations within Willapa Bay. The volume of the bay at MHHW is 56,585,900 cubic feet (1,602,513

$m^3$); the volume at MLLW is 31,169,000 cubic feet (882,706 $m^3$). The difference, 25,416,900 cubic feet (719,807 $m^3$), is the tidal prism (Hedgpeth and Obreski 1981).

The flushing rate of the bay is also influenced by coastal and oceanic processes. A low salinity plume (area where fresh water and salt water mix) from the mouth of the Columbia River is evident year-round and is carried north into Willapa Bay during the cooler and wetter months of October through April (Hedgpeth and Obreski 1981). The salinity and temperature data collected in Willapa Bay show that the Columbia River plume influence lowers salinity and increases water temperatures within the bay in the winter months relative to ocean conditions. The intrusion of colder, more saline oceanic waters may occur in the summer months when the increased plume influences are absent due to lower freshwater input/volume during drier summer months (unpublished Washington State Department of Fisheries data). The plume influence increases oceanic vertical stability, decreases vertical mixing, reduces upwelling, and diverts ocean currents. In this way the plume acts as a discrete water mass to limit oceanic mixing with Willapa Bay and may reduce the flushing rate of the bay (Strickland and Chasan 1989).

The overall Willapa Bay estuary is 92 square miles (238 $km^3$) at MHHW, and the watershed is 1,100 square miles (2,850 $km^3$). The watershed's influence on the bay's water quality is shaped by the rural nature of the surrounding land uses, which are primarily intensively managed forests for timber production. Over 20 tributaries are found within the watershed and water runoff drains the managed forest uplands, agricultural holdings, and urban areas located here, along the shoreline of the bay. Pacific County, which has a resource-based economy with no large industries, supports approximately 19,400 permanent residents. Tourism annually accounts for approximately 450,000 to 500,000 visitors to the Long Beach Peninsula alone (Long Beach Peninsula Visitors Bureau 2010).

The Refuge's Presidential Proclamation Boundary (approximately 11,000 acres) is located in the southern portion of the bay surrounding the Long Island Unit. The Class A water quality of the bay is important because it supports a strong mariculture industry as well as the privately owned oyster beds within the Refuge's Proclamation Boundary. The Refuge has approximately 25 miles of shoreline along the bay. A continued goal for the Refuge is maintaining the high water quality for wildlife.

### 3.7.2.1 Proposed Visitor/Administrative and Maintenance Site Potable Water

There is no public water distribution system serving the proposed project site. Neighboring and surrounding properties throughout the region use wells to meet domestic water demands. Well log data for the PUD substation facility adjacent to the site, just north of 95th Street, suggest that domestic water is supplied from a 20-foot-deep well on the PUD property, which supplies approximately 20 gallons per minute. This would suggest that a well is viable for providing water to the new Visitor/Administrative and Maintenance Facility site (KPFF Consulting Engineers 2009).

The closest public water distribution system is from the City of Long Beach. Conversations with the water district suggest that the pipe network ends approximately half a mile south of the project site along Sandridge Road at 79th Street. The water system has sufficient capacity to serve the site, and the long-range plan for the district is to extend the main along Sandridge Road and loop it back to the city system at Cranberry Road. This 12-inch water main at 79th Street can be extended north to serve the site but would require coordination with Pacific County for construction of the water main in the right-of-way. There may be an opportunity to approach adjacent property owners for potential

service connections under a Late-Comers Agreement process to offset the cost for construction (KPFF Consulting Engineers 2009).

Because this region gets 120 inches of rain per year, a portion of the water demands, such as bathroom toilets, can be met by installing a rainwater harvesting system (KPFF Consulting Engineers 2009).

Fire protection is currently provided by Pacific County Fire District 1. Without a public water distribution system, fire suppression is accomplished by transporting water to the site with tender trucks and pressurizing the hoses with pumper trucks. According to conversations with the District 1 fire chief, the tender trucks would be filled with water at the closest hydrant, which in this case is supplied by the City of Long Beach Water District. If the building size warrants a sprinkler system per code, then an appropriately sized water reservoir and fire pump would be required as part of the project improvements (KPFF Consulting Engineers 2009).

### 3.7.2.2 Potential Threats to Water Quality

As stated earlier the water quality of Willapa Bay and its tributaries is currently classified by the State of Washington as Class A, excellent quality. Identifying potential threats is an opportunity to correct whenever possible the potential for future negative impacts to water quality.

Potential nonpoint bacterial sources identified in various locations in the watershed include malfunctioning or inadequate on-site septic systems, urban stormwater, livestock, boats, and wildlife. Only on-site systems, urban stormwater, and livestock have been identified as serious threats to water quality. Boats and wildlife have been considered highly localized sources with unquantified contamination potential (Seyferlich and Joy 1993).

Historical surveys and monitoring data have documented various nonpoint sources of bacteria in the Willapa Bay watershed. By far, evidence of fecal coliform has been the most common data collected for evaluation of bacterial contamination. Most of the bacterial sources are located in and around towns/cities and agricultural areas along the bay shoreline and in the river valleys. Although the interior hills make up most of the watershed area, only the wildlife and recreational land uses would be the likely candidates for generating additional bacterial loads on these lands. The sources that may contribute to the bacterial contamination around the bay include malfunctioning or inadequate on-site septic systems, urban/community stormwater runoff, livestock, and wildlife. The current refuge office site relies on a septic system.

Stormwater from developed communities and urban areas tends to increase the velocity and amount of water runoff, increasing peak flows in constructed and localized natural drainage systems. Stormwater runoff from towns and cities can potentially carry a substantial load of various point and nonpoint source pollutants including toxic chemicals, bacteria, and pathogens. In older sewage collection systems, stormwater can get mixed with sanitary wastewater. Some of the most serious threats to the water quality of the area may initiate from the communities located near or on the Willapa Bay and its tributaries.

Livestock manure can be a major source of bacterial contamination and is considered a serious threat to the water quality of the bay. Implementing BMPs for pasturing and manure management may prevent waste and wastewater from reaching water courses (drainages, streams, rivers, and estuary). Agricultural areas with livestock and farming practices within the Willapa Bay watershed are

primarily located along the river valleys and the bay. The Refuge integrates BMPs (i.e., grazing rotation, erosion control) within the Cooperative Land Management Agreements for all grazing activities on the Refuge lands (currently on the Riekkola, Tarlatt and Wheaton Units).

Boats and wildlife have been considered highly localized sources with unquantified contamination potential (Seyferlich and Joy 1993). There are a total of six boating facilities with 249 wet moorage slips available in Willapa Bay. Four major moorage areas are Bay Center, the Port of Nachotta, the Port of Willapa, and the Tokeland Marina. All of these moorage slips are occupied during the summer months.

The Refuge staff uses boats to implement specific projects and law enforcement patrols, all of which may require use of motorized boats on Willapa Bay and Bear River. Operations include the use of air boats, 12- to 18-foot skiffs, inboard and outboard motors, and motorized and nonmotorized boats. Peak boat use occurs in the spring and summer for refuge conservation purposes.

In addition to potential threats from humans to the water quality of the bay there are also naturally occurring impacts from wildlife. In Willapa Bay there are 32 observed and documented seal haul-out sites on intertidal sand bars and mudflats (Beach et al. 1985). The estimated population of harbor seals (*Phoca vitulina*) in Willapa Bay is 4,000 to 6,000 (Jeffries 1992 *in* Seyferlich and Joy 1993). The breeding season from May to August presents the largest gatherings, when over 2,000 seals congregate at the most popular sites. In August, after the end of the pupping season, the seals congregate in large haul-out groups on the entrance shoals along Pine Island Channel. Winter populations may be as high as a 1,000 or more at these sites (Beach et al. 1985). The harbor seal population in Willapa Bay increased between 1976 and 1982 at approximately 10 percent annually. The high range estimates for fecal coliform production per adult seal per day is $55\times10^{9}$ bacteria (Caalambokidis et al. 1989). This implies a potential fecal coliform load from 6,000 seals could be as high as $33\times10^{13}$ colony-forming units per day. Seals use haul-outs on the South Bay and along the shores of Leadbetter Point.

The list of year-round waterfowl in Willapa Bay includes mergansers, teal (*Anas* spp.), wood duck, mallard (*Anas platyrhynchos*), bald eagle, great blue heron (*Ardea herodias*), gulls, grebes, and more. These species do not occur in large populations. The dominant migratory species is the American wigeon (*Anas americana*). The highest quarterly loadings of fecal coliform from birds occur in April through June. The October through December period has the second highest quarterly loading (Seyferlich and Joy 1993).

## 3.8 Surrounding Land Uses and Roads

Directly adjacent to the Willapa NWR Headquarters Unit is TNC Ellsworth Creek Preserve. TNC is an international nonprofit conservation organization whose mission is to preserve plants, animals, and natural communities that represent the diversity of life on earth by protecting the lands and waters they need to survive. TNC of Washington began acquiring properties as part of the Ellsworth Creek Preserve in 1998. Currently, the Ellsworth Creek Preserve covers approximately 7,436 acres, encompassing almost the entire Ellsworth Creek watershed, and it includes upland forest and estuarine habitats, as well as freshwater stream systems.

Primary goals for the Ellsworth Creek Preserve include:

1) Restoring ecologically functional estuarine, freshwater, and upland forest habitats that support species and ecological processes representative of those found within unmanaged late-successional forest landscapes of the Pacific Northwest coast.
2) Developing and implementing restoration strategies that accomplish ecological goals in a cost-effective and financially replicable manner.
3) Maximizing opportunities for learning how coastal forest landscapes respond to restoration treatments and exporting those lessons to other forest resource managers.
4) Managing the preserve with exemplary stewardship that earns respect and builds productive relationships within the local community and among resource management partners.
5) Attaining and maintaining Forest Stewardship Council certification.
6) Serving as a contributor to positive carbon sequestration.

The Refuge and TNC have formed a forest landscape restoration partnership and work closely together protecting, managing, and restoring the forest landscapes within the watershed.

One of the larger tributaries that drains into Willapa Bay is the Naselle River. Along the banks of this river is the small community of Naselle, which is currently an unincorporated town of approximately 400 residents with approximately 1,400 people living within the school district. Primary economic activity centers on timber production and commercial fishing and decreasingly on farming (see Appendix K).

Land use patterns in largely rural Pacific County are dominated by private forestland dedicated to commercial timber production. Private homes are generally located on large lots and are scattered along major highways and secondary county roads. This pattern is consistent within the immediate vicinity of the Refuge. That is, neighboring lands are, by in large, commercial timber holdings with limited numbers of home sites adjacent to county roads. The commercial timberlands directly adjacent to the Refuge are largely owned by investment groups and managed by timber investment management organizations. The Campbell Group and Hancock Investments manage adjacent forestland for investment return purposes.

The city of Long Beach is located in Pacific County, south of the Leadbetter Point Unit and west of Tarlatt Slough Unit. According to the U.S. Census Bureau (2000), the community encompasses a total area of 1.26 square miles of land on the Long Beach Peninsula. The main industry to this area is tourism. The Long Beach Peninsula includes the communities of Long Beach, Ilwaco, Seaview, Nahcotta, Ocean Park, and Oysterville. There are approximately 450,000 to 500,000 visitors to the peninsula on an annual basis (Long Beach Peninsula Visitors Bureau 2010). The local communities offer many tourist attractions.

Cape Disappointment State Park is located in the area of the historical military installation Fort Canby, with two lighthouses and opportunities for hiking, biking, kayaking, fishing, beach combing, bird watching, horseback riding, and clam digging. Local museums include the Cranberry Museum and the World Kite Museum. The Washington State International Kite Festival, held in late summer every year, draws kite flyers from all over the world. In late April or early May, the Blessing of the Fleet is held in Ilwaco in conjunction with Loyalty Day Celebrations. The annual Northwest Garlic Festival takes place in June, and the Annual Sand Stations Sand Sculpture Contest is held in July. Salmon derbies also take place throughout the year (Long Beach Peninsula Visitors Bureau 2010).

A small unincorporated town, Oysterville is located on Willapa Bay side of the Long Beach Peninsula. This town was listed on the National Register of Historic Places as a National Historic District in 1976 and encompasses about 80 acres. The historic and current mariculture industry (production and harvest of oysters, clams, and crabs) has sustained the economy of this community for over a century. The high quality of the annual harvest is due to the overall water quality of Willapa Bay. Willapa Bay oysters are shipped to restaurants and enjoyed all over the world.

### 3.8.1 Proposed Visitor/Administrative and Maintenance Facility Site Context and Surrounding Land Use

The proposed new Visitor/Administrative and Maintenance Facility site is generally north and east of the municipality of Long Beach, Washington, in unincorporated Pacific County, and is considered to be outside of the urban growth boundary of this community. Approaching the site from the south along Sandridge Road, the site vicinity has a rural, residential quality. Agricultural land uses are readily visible, such as cranberry farming, cattle grazing, and a horse arena. Large-lot single-family residences dot the landscape directly across the street from the site along Sandridge Road. The land surrounding the site is predominantly zoned agricultural. The site itself is zoned conservation district. As such, all U.S. government facilities are permitted outright within the conservation district. In areas zoned as conservation district, Pacific County code also allows nature parks and interpretive centers including buildings, trails, parking areas, interpretive areas, and signs describing natural history, cultural history, and/or natural habitat.

The property is abutted on the north by a Pacific County PUD substation. A series of 115-kV transmission lines enter and leave the substation along both sides of 95th Street, and along the east side of Sandridge Road. The 115-kV line is owned and maintained by Bonneville Power Administration (BPA) along 95th Street, and according to BPA personnel, the PUD owns the 115-kV line along Sandridge Road. Distribution voltage (15 kV) circuits exit the substation underground and daylight at PUD utility poles along Sandridge Road. There is additional under-build along the common transmission/distribution pole line on the east side of Sandridge Road that fronts the west edge of the site (PAE Consulting Engineers 2010).

With the multiservice pole line along the east edge of Sandridge Road, electrical and telecommunications services to the new Visitor/Administrative and Maintenance Facility development will be readily available. The transmission lines will have the largest easements associated with overhead systems, and while a 100-foot easement is common for this voltage, actual size and location are unknown at this time. According to the PUD, new building structures should be no closer than 25 feet to the pole line, and trees should be no closer than 40 feet to the pole line along Sandridge Road (PAE Consulting Engineers 2010).

Pacific County governs the roadways in the direct vicinity and would be expected to be the lead review agency from a transportation perspective. Pacific County has the discretionary authority to require a traffic study in conjunction with future development activities. Based upon preliminary conversations with county staff, a few traffic studies have been completed in the area in the past few years. The initial inclination of county staff is that a full traffic study would not likely be required but the county will not make a determination until a conceptual site plan can be reviewed. The county also governs the location of any driveway(s) that will serve the new Visitor/Administrative and Maintenance Facility site. The county will require that an access permit be obtained for any driveway (Kittelson & Associates 2009).

Pacific County classifies Sandridge Road as a major collector, the highest level facility designation the county employs. Pioneer Road is located south of the site and connects Sandridge Road with Highway 103 and downtown Long Beach. Pioneer Road is also classified as an east-west major collector on the peninsula. Within the vicinity of the new Visitor/Administrative and Maintenance Facility site, both roadways have a two-lane cross section (one travel lane in each direction) with gravel shoulders. No sidewalks or bicycle lanes are currently provided. County staff have indicated that the county is planning to provide a sidewalk and bicycle lanes on Pioneer Road in the future (Kittelson & Associates 2009).

Preliminary review of Pacific County Road Standards indicates that some off-site roadway improvements may be required to improve safety in the vicinity of the proposed site when developed. A 100-foot-long northbound right-turn deceleration taper on Sandridge Road at 95th Street as well as a 55-foot radius may be required based upon the county's road standards for intersection design. This widening would help facilitate large equipment accessing the site, but the area required could interfere with a large power pole located on the southeast corner of the intersection (Kittelson & Associates 2009).

Based upon the review of other intersections and driveways in the site vicinity along Sandridge Road, a southbound left-turn lane may also be warranted at the site access point. The need for a separate southbound left-turn lane on Sandridge Road at the site driveway (or at 95th Street) could be evaluated in conjunction with a transportation impact analysis for the proposed Visitor/Administrative and Maintenance Facility project (Kittelson & Associates 2009).

Right-of-way improvements, such as sidewalks and landscape strips with street tree plantings, are likely not required for the proposed Visitor/Administrative and Maintenance Facility , because this site is within a rural district and there are no frontage improvements along adjacent properties. Pacific County does not have any specific requirements set up for implementing frontage improvements at this site (KPFF Consulting Engineers 2009).

Long Beach Peninsula and Pacific County are Pacific Ocean coastal communities and, as such, have been engaged in tsunami evacuation planning. On Pacific County Emergency Management maps, the proposed Visitor/Administrative and Maintenance Facility site is shown to be within the greatest risk tsunami hazard zone, although a boundary of this zone is just south of the site, near the intersection of Sandridge Road and Pioneer Street. The evacuation route for the site is well established to be southbound on Sandridge Road. The nearest designated assembly area is located south and east of the new Visitor/Administrative and Maintenance Facility site at 67th Place, east of Sandridge Road (Kittelson & Associates 2009).

## 3.9 Effects to Physical Environment

This section provides an analysis of the environmental consequences of implementing the management direction as described in Chapter 2, specifically as they relate to the physical environment. Topics not covered consist of climate, climate change, and geology, because these areas would not be affected by the management activities.

## 3.9.1 Habitat Management

### 3.9.1.1 Effects to Hydrology

Under the management direction, the Lewis, Porter Point, and Riekkola dikes will be removed, historical tidal flow regimes would be re-established, and previously disconnected sloughs would be reconnected. The management direction will maximize the restoration processes specifically increasing 0.2 acre of open water, 9 acres of intertidal flats, and 611 acres of salt marsh. The dike will be removed and the grade restored, borrow ditches will be filled, and deeper connector channels created in the restored areas. The existing subdike that divides the Riekkola Unit will be rebuilt to required standards and two tidegates will be installed (Parker Slough and Dohman Creek). The seasonally flooded and highly managed freshwater wetlands and pastures would transition to tidal influences, and the historical estuarine habitat conditions on 621 acres of the South Bay would return.

The new Visitor/Administrative and Maintenance Facility at Sandridge Road and 95th Street may impact on-site wetland resources. Careful facility planning and site design will minimize wetland impacts. Where wetland impacts are unavoidable in order to accommodate the area required for new facilities, these will be mitigated on-site with the in-kind construction of replacement wetlands. As previously mentioned, dike removal within the Refuge would not likely affect flood levels on the new Visitor/Administrative and Maintenance Facility site. Pacific County Flood Damage Prevention Ordinance No. 116B will require that the lowest floors, including the basement, be elevated 1 foot or more above the elevation of the base flood. Where elevating a structure is considered impractical due to site constraints, three other criteria must be met, as follows: flood-proofing, structurally designing facilities to resist flood pressures, and certification by a registered professional engineer. However, it may be possible to make the case that the remaining dike system left in place will prevent a flood of 100-year magnitude from ever reaching the developable portions of the new Visitor/Administrative and Maintenance Facility site.

### 3.9.1.2 Effects to Soil

The effects to soils would largely be due to the activities and the changes from seasonally flooded and highly managed freshwater wetlands and pastures as they transition to the tidal influences and the historical estuarine conditions of the South Bay. Saltwater influences would dramatically change the soil salinity in the areas impacted by the proposed dike removal and restoration. The project timing, extent, and contouring would be designed to minimize the erosion and sediments in water runoff.

During construction of the new Visitor/Administrative and Maintenance Facility , soils would be disturbed to form graded surfaces and adequate foundations for proposed buildings and paved areas. Equipment and material staging areas would be identified to minimize soil disturbance and compaction on the site. The collective footprint of the facility—buildings, parking lots, vehicle access routes and maintenance yard facilities—would occupy approximately 10 acres.

On-site soils would be used to the extent possible. Required fill would be balanced with required excavations. Given that much of the site is currently considered to be below the 100-year flood elevation, it is possible that site grading would be required to result in no net change in the volume of soil storage on the site.

Topography can also affect buildable area facility development and septic suitability. From a constructability perspective, slopes of less than 5 percent are the easiest to build on and can readily accommodate barrier-free access. Slopes of 5 to 10 percent are still workable for road or path construction but would involve some grading to create functional solutions and building pads. The facility would be designed to minimize extensive grading. Erosion control measures would be incorporated into site development plans to reduce or eliminate loss of site soils during construction.

The effects to soils due to the implementation of the forest restoration activities (Appendix K) on current refuge lands and proposed lands (Appendix A) would most likely eliminate soil erosion caused by direct forest management practices and road decommissioning. BMPs would be used to minimize soil erosion from occurring. Future land acquisitions would, in the long term, eliminate soil erosion caused by road building, road maintenance, and commercial logging activities on these proposed lands.

#### 3.9.1.3 Effects to Air Quality

The restoration activities may result in a slight temporary increase in emissions due to the proposed estuarine restoration. During the restoration and construction projects, a temporary increase in emissions would occur; however, once the projects are completed and natural processes are restored there would be no need for further active management or to access these areas with equipment or vehicles. A modest increase in vehicular emissions could be expected due to an increase in visitation with the proposed construction of a visitor/administrative facility.

#### 3.9.1.4 Effects to Water Quality and Salinity

With the implementation and removal of the dike or portions of the dike, the tidal inundation would change the fresh water to salt water and change soil characteristics and the associated flora. Short-term effects to water quality are expected in terms of the biological oxygen demand and would likely increase locally as die back of decaying plant matter would result from the tidal restoration. Long-term beneficial effects to water quality would be expected.

The proposed action of extending the 12-inch water main along Sandridge Road would supply the proposed new Visitor/Administrative and Maintenance Facility site with adequate potable water supplies and benefit the local community by providing a high-quality water supply to adjacent land owners. The potential installation of a rainwater harvesting system would supplement a portion of water demands with a sustainable water source. The stored water could be used to flush toilets, thereby reducing domestic water usage. Extension of the public water main as discussed above would provide water to the site and also negate the need for the reservoir and fire pump. There are no anticipated long-term effects to water quality.

Implementation and completion of the proposed forest restoration activities on current refuge lands and proposed lands (Appendix A), downstream water quality is likely to improve by eliminating commercial logging activities and the need for road building and maintenance.

#### 3.9.1.5 Effects to Surrounding Land Uses

Under the management direction, land uses would change (upon acquisition from willing sellers) on 6,809 acres, resulting in a change away from commercial timber production to managed forest harvest activities needed for long-term ecological restoration.

Land uses in Pacific County would not change by implementing the Visitor/Administrative and Maintenance Facility (which would include the Refuge Headquarters) proposed as part of the management direction. All U.S. government facilities are permitted outright at the Sandridge Road site, and under the site's zoning designation, Pacific County code allows for interpretive centers and natural areas, with related amenities such as buildings, parking, trails, and signage.

A new headquarters located along Sandridge Road would provide a more central location for Willapa Refuge management activities. Willapa Refuge management would benefit by consolidating the multiple maintenance facilities (shops, storage, warehouses) located in three separate areas of the refuge. Having the equipment and staff centrally located would cut down on extensive building maintenance and utility expenses, and on travel within Pacific County between the various facilities. The Sandridge Road site would provide safer highway access for large refuge vehicles, compared to the current headquarters site along U.S. Highway 101.

It is anticipated that off-site roadway improvements to Pacific County roads would be necessary to accommodate refuge vehicles and provide safe ingress/egress to the new headquarters site. The intersection of Sandridge Road and 95th Street would be improved to provide sufficient turning radii for large vehicles. Other potential roadway improvements would include a southbound left-turn land and a northbound right-turn lane at required driveway access points onto Sandridge Road. A northbound right-turn taper on Sandridge Road at 95th Street may also be required. These types of roadway improvements were recently implemented on Sandridge Road for another site development north of the project site and would be considered typical for site development in this area. When developed, site design should address potential impacts to local residents along the west side of Sandridge Road. Care should be taken to locate any site driveway in a manner that avoids headlight glare into residential homes. If the primary access point is the intersection of Sandridge Road and 95th Street, these impacts would be minimal.

Sandridge Road is currently used by refuge visitors to reach the Leadbetter Point Unit. Relocating the Refuge Headquarters to the Sandridge Road site may result in increased visitation to the facility, which may increase local traffic on the county roadway. However, traffic impacts have not been studied.

Pioneer Road can potentially serve as a primary route from the Visitor/Administrative and Maintenance Facility to the city of Long Beach. The future provision of sidewalk and bicycle facilities by Pacific County along Pioneer Road would create an opportunity to better link downtown Long Beach with the existing Cranberry Museum (on Pioneer Road, west of the site) and the new Visitor/Administrative and Maintenance Facility site.

Relocating the Refuge Headquarters to the Sandridge Road site also offers future opportunities for local residents and environmental education groups to access Willapa Bay via the system of dike trails, which wind around the eastern portions of the site. When developed, the overlook feature will offer spectacular views of Willapa Bay, as well as wildlife observation, environmental education, and interpretive opportunities. A trail system will be provided through the Sandridge Road site that links the local community to this invaluable natural resource. Site planning and design will need to consider the possible need for evacuation in the future event of a tsunami.

## 3.9.2 Public Use

### 3.9.2.1 Effects to Geology, Hydrology, Soils, Air Quality, and Water Quality, and Effects from Environmental Contaminants

The new trail site established for the new Visitor/Administrative and Maintenance Facility and enlarged environmental education program would produce localized areas of soil compaction from foot traffic. BMPs regarding site locations and design would be considered to minimize all effects to geology, hydrology, soils, air quality, and water quality Some minor effects on soils would occur from new construction and vehicle parking areas and foot traffic, but these would be expected to be less than current conditions because of planned improvements in access and facilities consolidation.

The proposed action of developing a new Visitor/Administrative and Maintenance Facility at Sandridge Road and 95th Street may impact site wetland resources. Careful facility planning and site design will minimize wetland impacts. Where wetland impacts are unavoidable in order to accommodate the area required for new facilities, these will be mitigated on-site with the in-kind construction of replacement wetlands. As previously mentioned, dike removal within the Refuge would not affect flood levels on the new Visitor/Administrative and Maintenance Facility site.

Pacific County Flood Damage Prevention Ordinance No. 116B will require that the lowest floors, including the basement, be elevated 1 foot or more above the elevation of the base flood. Where elevating a structure is considered impractical due to site constraints, three other criteria must be met: flood-proofing, structurally designing facilities to resist flood pressures, and certification by a registered professional engineer. However, it may be possible to make the case that the remaining dike system left in place will prevent a flood of 100-year magnitude from ever reaching the developable portions of the new Visitor/Administrative and Maintenance Facility site.

Reduction of human activities at the old headquarters site and other scattered maintenance facilities would help to restore more natural process to those sites, while combining all activities at one location . Effects from an expanded elk hunting program on refuge soils would be negligible, but with a successful hunt program, the associated benefits may reduce impacts to soils from the expanding elk population.

## 3.9.3 Refuge Boundary Expansion

### 3.9.3.1 Effects to Geology, Hydrology, Soils, Air Quality, and Water Quality, and Effects from Environmental Contaminants

Refuge boundary expansion (6,809 acres) would benefit some of these physical factors. Refuge expansion would protect and restore lands that would continue to be managed as commercial forestland or otherwise be developed for residential or commercial development or that would not be restored.

Additional protection of areas would prevent accelerated erosion caused by development or continued commercial logging. Retaining more habitats in a natural, vegetated condition would improve water quality in wetlands and waterways by reducing erosion and sedimentation and nonpoint source contamination from stormwater and runoff from adjacent commercially logged lands or developments and roadways build on those lands. Areas that have been logged and many areas that were used as a road system would be reforested, improving watershed protection.

Wetland areas store floodwaters and help maintain water quality by trapping sediments and removing excess nutrients. Air quality may decline if residential and commercial development increase in the area, as effects associated with increased traffic, industrial development, and other pollutant sources such as wood stoves increase. Refuge expansion would reduce this possibility.

Improved protection of this portion of the lower Willapa Bay watershed would maintain or improve the natural tributary processes that protect water quality, reduce flooding effects to human infrastructure, and distribute river and stream sediments naturally.

# Chapter 4
# Biological Environment

*Western snowy plover*
© Rudy Schuver

# Chapter 4. Biological Environment

## 4.1 Biological Integrity Analysis

The National Wildlife Refuge System Improvement Act of 1997 directs the USFWS to ensure that the biological integrity, diversity, and environmental health (BIDEH) of the System are maintained for the benefit of present and future generations of Americans. In simplistic terms, elements of BIDEH are represented by native fish, wildlife, plants, and their habitats as well as those ecological processes that support them. National Wildlife Refuge System policy on BIDEH (601 FW 3) also provides guidance on consideration and protection of the broad spectrum of fish, wildlife, and habitat resources found on refuges and associated ecosystems that represent BIDEH on each refuge. The BIDEH of the Willapa Bay watershed and estuary have been negatively affected by human activities. Land use activities in particular have had an impact on fish and wildlife habitat values.

In the Pacific Northwest, a large portion of historical estuarine habitat has been lost to diking, channelization, dredging, and filling. Washington is estimated to have lost between 45 and 62 percent of its presettlement estuarine habitat (Aitkin 1998). According to ONRC calculations, Willapa Bay originally contained approximately 14,620 acres of saltwater wetlands. Now there are 5,277 acres. This represents a 64 percent loss of estuarine wetlands (Coastal Resources Alliance 2007). Loss of saltwater wetland habitat is considered one of the most common limiting factors related to the decline of nearshore or estuarine salmon habitat.

An estimated 50 to 90 percent of streams in the State of Washington are in a degraded state (Knutson and Naef 1997). Rivers and streams in the Willapa NWR support runs of anadromous fish such as chum, coho, and Chinook salmon, as well as cutthroat trout. River and stream channels provide migration pathways for adult anadromous fish traveling to spawning grounds and juveniles traveling to the estuary and the Pacific Ocean.

Land use activities have impacted wildlife habitat values in and along rivers and streams in the Willapa Bay watershed. Stream processes in many areas have been altered. Degradation of streams, including those on the Refuge, has occurred historically. Problems include loss of connectivity to the estuary due to highway and dike construction, hydrologic regime alteration, presence of fish passage barriers, water quality issues (i.e., temperature and sedimentation), and presence of exotic species.

There is a need to protect and maintain ecological processes and functions in streams and associated habitat. Positive effects of healthy streams include enhanced nutrient production and cycling, improved water quality, and support of a diverse riparian and estuarine plant and wildlife community.

Late-successional forest habitat in the Willapa Bay area is isolated and highly fragmented. Less than 1 percent of the original old-growth forests remain in the 700,000-acre Willapa Bay watershed (Davis et al. 2009). Currently, second- and third-growth forests dominate the watershed.

Native grassland habitat has been affected by invasion by exotic species, natural succession, fire suppression, conversion to pasture, and land development. The loss of native grasslands has resulted in loss of a federally threatened species, the Oregon silverspot butterfly, which has been extirpated from the State of Washington.

Extensive areas of formerly open or sparsely vegetated coastal dune habitat have been invaded by exotic beachgrasses of the genus *Ammophila*, including introduced American beachgrass and European beachgrass. These grasses out-compete native vegetation, alter the dune ecosystem, and form dense stands that reduce the amount and quality of nesting habitat for native wildlife, including the federally threatened western snowy plover and a Federal candidate species, the streaked horned lark. The invasion of *Ammophila* has caused a dramatic reduction of coastal native plants and is a primary threat to a Federal species of concern, the pink sandverbena. In addition, substantial loss of coastal dune habitat has occurred due to industrial, urban, and recreational development.

As a consequence of habitat loss, anadromous fish, migratory birds, and many other native wildlife species of the watershed and estuary have declined. Other factors such as pollution and overuse by humans have played a role in wildlife losses, but it is certain that wildlife cannot persist without suitable habitat. At least 34 wildlife and plant species of the Willapa Bay watershed and estuary area are now federally or State listed as endangered or threatened (The Willapa Alliance 1993).

Habitat and wildlife losses have magnified the importance of conservation and management activities on the Refuge. Willapa NWR currently contains about 16,000 acres of wildlife habitat. Habitats include Sitka spruce–zone forest (including late-successional forest), estuarine open water, intertidal flats, salt marsh, rivers and streams, freshwater wetlands, coastal dunes, and grasslands. These habitats represent vegetative communities important for the maintenance of BIDEH in the Willapa Bay watershed and estuary. The Refuge is vital to preserving the natural environment as well as native species of fish, wildlife, and plants of the entire watershed and estuary.

Although protected from development, refuge habitats and wildlife still face threats. Invasive plants and pest animals can displace and compete for resources with native species. Reed canarygrass is especially pervasive and monopolizes much of the aquatic habitat, especially in managed wetlands. It has little value to wildlife compared to the native diversity of wetland plants it displaces. Bog loosestrife has invaded ditches and managed wetlands. Formerly, *Spartina*, a non-native cordgrass that was accidently introduced to the Willapa Bay ecosystem, covered a large portion of Willapa Bay. However, due to eradication efforts by Federal, State, and county agencies as well as the efforts of the oyster industry and private landowners, *Spartina* is now virtually absent from the bay. Non-native nutria and bullfrogs frequent refuge wetlands. Non-native invasive species found in refuge forests include English ivy (*Hedera helix*) and English holly (*Ilex aquifolium*). Several exotic invertebrate species are also found within the waters of Willapa Bay. New invasive species may appear in the future. Nonpoint source pollution in the bay may increase and degrade the water quality within the watershed as lands are cleared and developed for roads and home sites. Potential nutrient loads, sedimentation, concentrations of pollutants, and associated runoff, may all contribute to degradation of this important ecosystem and its fishery resources.

These problems, while serious, are surmountable. Pollutant sources are being addressed. New methods of slowing or stopping the spread of invasive plants are being adopted. Efforts toward additional protection of the Willapa Bay watershed have been initiated among a number of entities including the Refuge, TNC, State and county agencies, and private landowners. Overall, the refuge environment is relatively healthy, and the varied habitats support an abundance and diversity of wildlife.

## 4.2 Identification of Refuge Resources of Concern and Analysis

In preparing this plan, the Service reviewed other local, regional, and national plans that pertain to the wildlife and habitats of the Willapa Bay watershed and estuary. The Service also sought input from Washington State conservation agencies, nongovernmental organizations, and the general public. The refuge purposes, as stated in the enabling legislation for the Refuge (see Chapter 1), were carefully reviewed as was the Refuge's contribution to maintenance of BIDEH in the Willapa Bay watershed and estuary. As a result of this information-gathering and review process, certain species and habitats were identified as resources of concern (Table 4-1). From this list of resources of concern, those species and habitats that are most representative of refuge purposes, BIDEH (Table 4-2), and other USFWS and ecosystem priorities were chosen as priority resources of concern. Examples include the western snowy plover, marbled murrelet, and brant. The complete list of priority resources of concern (i.e., focal species and habitat types) for the Refuge is contained in Table 4-3. These priority resources of concern are the species and habitats whose conservation and enhancement will guide refuge management now and in the future. Potential management actions will be evaluated on their effectiveness in achieving refuge goals and objectives for the priority resources of concern.

Management of refuge focal species and the habitats that support them will benefit many other native species that are present on the Refuge. Many of the species that will benefit from management of the refuge focal species are identified in the "Other Benefiting Species" column in Table 4-3. Through the consideration of BIDEH, the Refuge will maintain all appropriate native habitats and species. Refuge management priorities may change over time. Therefore the CCP is designed to be a living, flexible document, and changes will be made at appropriate times.

**Table 4-1. NWRS Resources of Concern for Willapa National Wildlife Refuge.**

| SPECIES | Refuge Purpose | Biological Integrity, Diversity Health [a] | Federally Listed | Washington Listed | Partners in Flight [b] | Birds of Conservation Concern [c] | Bird Focal Species [d] | State Wildlife Plan [e] | Shorebird Plan [f] (score 1-5)[2] | N.A. Waterbird Conservation Plan [g] | Pacific Flyway Management Plans [h] | WDFW 2006 [i] | NAWMP [j] | WA NHP [k] | Seabird Cons. Plan [l] | HABITAT TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mammals** | | | | | | | | | | | | | | | | |
| Yuma myotis bat | | | SoC[1] | | | | | ✓ | | | | | | S5[3] | | Forests, forest openings, riparian areas, wetlands |
| Long-eared myotis bat | | | SoC[1] | SM[1] | | | | ✓ | | | | | | S4[3] | | Forests, forest openings, riparian areas, wetlands |
| Fringed myotis* | | | SoC[1] | SM[1] | | | | ✓ | | | | | | S3[3] | | Forests, forest openings, riparian areas, wetlands |
| Long-legged myotis bat | | | SoC[1] | SM[1] | | | | ✓ | | | | | | S3/S4[3] | | Forests, forest openings, riparian areas, wetlands |
| Keen's myotis* | | | | SC[1] | | | | ✓ | | | | | | S1[3] | | Forests, forest openings, riparian areas, wetlands |
| Pacific Townsend's big-eared bat* | | | SoC[1] | SC[1] | | | | ✓ | | | | | | S3[3] | | Forests, forest openings, riparian areas, wetlands |
| Mazama pocket gopher* | | | FC[1] | T[1] | | | | ✓ | | | | | | S1[3] | | Meadows, grasslands |
| Pine marten | | | | | | | | ✓ | | | | | | S4[3] | | Dense coniferous forests |
| Fisher* | | | FC[1] | E[1] | | | | ✓ | | | | | | SH | | Coniferous forests |
| Gray whale* | | | | SS[1] | | | | ✓ | | | | | | | | Open ocean and bay |
| Pacific harbor porpoise | | | | SC[1] | | | | ✓ | | | | | | | | Open ocean and bay |
| Stellar sea-lion (eastern DPS) | | | T[1] | T[1] | | | | ✓ | | | | | | S2[3] | | Open water, sandbars for resting |
| Harbor seal | | | | SM[1] | | | | ✓ | | | | | | S4[3] | | Open water, sandbars for resting |
| Northern sea otter* | | | SoC[1] | E[1] | | | | ✓ | | | | | | S2[3] | | Outer coast |
| Roosevelt elk | | | | | | | | ✓ | | | | ✓ | | S5 | | Grassland, riparian forest and shrub, tidal and nontidal marsh |

| SPECIES | Refuge Purpose | Biological Integrity, Diversity Health [a] | Federally Listed | Washington Listed | Partners in Flight [b] | Birds of Conservation Concern [c] | Bird Focal Species [d] | State Wildlife Plan [e] | Shorebird Plan [f] (score 1-5)[2] | N.A. Waterbird Conservation Plan [g] | Pacific Flyway Management Plans [h] | WDFW 2006 [i] | NAWMP [j] | WA NHP [k] | Seabird Cons. Plan [l] | HABITAT TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Birds** | | | | | | | | | | | | | | | | |
| Common loon | | | | SS[1] | | | | ✓ | | ✓ | | | | S3[3] | | Ocean and bay |
| Red-throated loon | | | | | | | ✓ | | | ✓ | | | | S3/S4[3] | | Ocean and bay |
| Pacific loon | | | | | | | | | | ✓ | | | | S4/S5[3] | | Ocean and bay |
| Western grebe | | | | SC[1] | | | | ✓ | | MC[4] | | | | S3[3] | | Ocean and bay |
| Short-tailed albatross* | | | E[1] | SC[1] | | | ✓ | ✓ | | HC[4] | | | | | ✓ | Open ocean |
| Black-footed albatross* | | | | | | ✓ | ✓ | | | HI[4] | | | | S3[3] | ✓ | Open ocean |
| Brown pelican | | | SoC[1] | E[1] | | | ✓ | ✓ | | ✓ | | | | S3[3] | ✓ | Ocean, bay, sandbars and islands, shore edge |
| Brandt's cormorant* | | | | SC[1] | | | | ✓ | | HC[4] | | | | S3/S4[3] | ✓ | Ocean, bay, grassy slopes, cliff tops |
| Double-crested cormorant | | | | | | | ✓ | ✓ | | NAR[4] | | | | S4/S5[3] | ✓ | Open water |
| Great blue heron | | | | SM[1] | | | | ✓ | | NAR[4] | | | | S4/S5[3] | | Tidal and nontidal marsh, shallow open water, forested wetland, coastal forest |
| Tundra swan | ✓ | | | | | | | ✓ | | | ✓ | | NT[5] | S4[3] | | Tidal and nontidal marsh |
| Trumpeter swan (Pacific pop.) | ✓ | ✓ | | | | | | ✓ | | | ✓ | | I[5] | S3[3] | | Tidal and nontidal marsh, bay |
| Tule greater white-fronted goose | ✓ | | | | | | ✓ | ✓ | | | ✓ | | NT[5] | S3/S4[3] | | Grassland, open water (roosting), tidal and nontidal marsh |
| Snow goose (lesser) | ✓ | | | | | | ✓ | ✓ | | | ✓ | | I[5] | S3[3] | | Grassland, open water (roosting), tidal and nontidal marsh |
| Emperor goose | ✓ | | | | | | ✓ | | | | ✓ | | NT[5] | | | Grassland, open water (roosting), tidal and nontidal marsh |

| SPECIES | Refuge Purpose | Biological Integrity, Diversity Health [a] | Federally Listed | Washington Listed | Partners in Flight [b] | Birds of Conservation Concern [c] | Bird Focal Species [d] | State Wildlife Plan [e] | Shorebird Plan [f] (score 1-5)[2] | N.A. Waterbird Conservation Plan [g] | Pacific Flyway Management Plans [h] | WDFW 2006 [i] | NAWMP [j] | WA NHP [k] | Seabird Cons. Plan [l] | HABITAT TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cackling Canada goose | ✓ | | | | | | ✓ | ✓ | | | ✓ | | NT[5] | | | Grassland, open water (roosting), tidal and nontidal marsh |
| Aleutian cackling goose | ✓ | | SoC[1] | SM[1] | | | | ✓ | | | ✓ | | I[5] | | | Grassland, open water (roosting), tidal and nontidal marsh |
| Dusky Canada goose | ✓ | | | | | | ✓ | ✓ | | | ✓ | | U[5] | | | Grassland, open water (roosting), tidal and nontidal marsh |
| Western Canada goose | ✓ | | | | | | ✓ | ✓ | | | ✓ | | U[5] | S5[3] | | Grassland, open water (roosting), tidal and nontidal marsh |
| Brant | ✓ | ✓ | | | | | ✓ | ✓ | | | ✓ | | NT[5] | S3[3] | | Estuary |
| Wood duck | | | | | | | ✓ | ✓ | | | | | I[5] | S4[3] | | Forested wetland, riparian forest, tidal and nontidal marsh |
| Mallard | ✓ | | | | | | ✓ | ✓ | | | | | NT[5] | S5[3] | | Tidal and nontidal marsh, bay |
| American wigeon | ✓ | | | | | | ✓ | ✓ | | | | | NT[5] | S4/S5[3] | | Grassland, tidal and nontidal marsh |
| Northern pintail | ✓ | | | | | | ✓ | ✓ | | | | | D[5] | S3/S4[3] | | Tidal and nontidal marsh, bay |
| Greater scaup | ✓ | | | | | | ✓ | ✓ | | | | | D[5] | S3[3] | | Open water |
| Lesser scaup | ✓ | | | | | | ✓ | ✓ | | | | | D[5] | S3[3] | | Open water |
| White-winged scoter | ✓ | | | | | | ✓ | ✓ | | | | | D[5] | S3[3] | | Open water |
| Surf scoter | ✓ | | | | | | ✓ | ✓ | | | | | D[5] | S3[3] | | Open water |
| Long-tailed duck | ✓ | | | | | | ✓ | ✓ | | | | | D[5] | S3/S4[3] | | Open water |
| Northern harrier | | | | | ✓ | ✓ | | | | | | | | S4[3] | | Grassland, tidal and nontidal marsh |
| Golden eagle | | | | SC[1] | | | | ✓ | | | | | | S3[3] | | Open areas |

| SPECIES | Refuge Purpose | Biological Integrity, Diversity Health [a] | Federally Listed | Washington Listed | Partners in Flight [b] | Birds of Conservation Concern [c] | Bird Focal Species [d] | State Wildlife Plan [e] | Shorebird Plan [f] (score 1-5)[2] | N.A. Waterbird Conservation Plan [g] | Pacific Flyway Management Plans [h] | WDFW 2006 [i] | NAWMP [j] | WA NHP [k] | Seabird Cons. Plan [l] | HABITAT TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bald eagle | | ✓ | SoC[1] | SS[1] | | | | ✓ | | | | | | S4[3] | | Forested wetland, riparian forest, open water, tidal and nontidal marsh |
| Cooper's hawk | | | | | ✓ | | | | | | | | | S4[3] | | Riparian forest; large structurally diverse patches |
| Northern goshawk | | | SoC[1] | SC[1] | | ✓ | | ✓ | | | | | | S3[3] | | Forests |
| American kestrel | | | | | ✓ | | | ✓ | | | | | | S4/S5[3] | | Grassland, riparian forest |
| Merlin | | | | SC[1] | | | | ✓ | | | | | | S3[3] | | Grassland, forested wetland, riparian forest, tidal and nontidal marsh |
| Peregrine falcon (American) *anatum* | | | SoC[1] | SS[1] | | ✓ | ✓ | ✓ | | | | | | S2[3] | | Forested wetland, riparian forest, tidal and nontidal marsh, ocean beach, cliffs/human-made structures for nesting |
| Peregrine falcon (Arctic) *tundrius* | | | SoC[1] | SS[1] | | ✓ | ✓ | ✓ | | | | | | S2[3] | | Open areas, especially ocean beach |
| Peregrine falcon (Peale's) *pealei* | | | SoC[1] | SS[1] | | ✓ | ✓ | ✓ | | | | | | S2[3] | | Open areas, especially ocean beach |
| Sandhill crane | | | | E[1] | | | ✓ | ✓ | | ✓ | ✓ | | | S2[3] | | Shallow wetlands, freshwater marshes |
| Willet | | | | | | | | ✓ | 2 | | | | | S3[3] | | Coastal beaches and bay edges |
| Black-bellied plover | | | | | | | | ✓ | 4 | | | | | S4[3] | | Coastal beaches and bay edges |
| Western snowy plover | | ✓ | T[1] | E[1] | | | ✓ | ✓ | 5 | | | | | S1[3] | | Coastal beaches and dunes |
| Semipalmated plover | | | | | | | | | 3 | | | | | S4[3] | | Coastal beaches and bay edges |
| Killdeer | | | | | ✓ | | | ✓ | 4 | | | | | S4[3] | | Grassland, tidal and nontidal marsh |
| Greater yellowlegs | | | | | | | | ✓ | 4 | | | | | S4/S5[3] | | Tidal and nontidal marsh, freshwater wetlands |
| Whimbrel | | | | | | ✓ | | ✓ | 4 | | | | | S3[3] | | Coastal beaches and bay edges |

| SPECIES | Refuge Purpose | Biological Integrity, Diversity Health [a] | Federally Listed | Washington Listed | Partners in Flight [b] | Birds of Conservation Concern [c] | Bird Focal Species [d] | State Wildlife Plan [e] | Shorebird Plan [f] (score 1-5)[2] | N.A. Waterbird Conservation Plan [g] | Pacific Flyway Management Plans [h] | WDFW 2006 [i] | NAWMP [j] | WA NHP [k] | Seabird Cons. Plan [l] | HABITAT TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Marbled godwit | | | | | | ✓ | ✓ | ✓ | 4 | | | | | S3[3] | | Coastal beaches and bay edges |
| Ruddy turnstone | | | | | | | | ✓ | 4 | | | | | S4[3] | | Coastal beaches and bay edges |
| Black turnstone | | | | | | ✓ | | ✓ | 4 | | | | | S4/S5[3] | | Coastal beaches and bay edges |
| Red knot | | | | | | ✓ | | ✓ | 4 | | | | | S3[3] | | Coastal beaches and bay edges |
| Sanderling | | | | | | | | ✓ | 4 | | | | | S4[3] | | Coastal beaches and bay edges |
| Dunlin | | | | | | ✓ | | ✓ | 4 | | | | | S4/S5[3] | | Coastal beaches and bay edges |
| Western sandpiper | | | | | | | | ✓ | 4 | | | | | S4/S5[3] | | Coastal beaches and bay edges |
| Least sandpiper | | | | | | | | | 3 | | | | | S4[3] | | Coastal beaches and bay edges |
| Short-billed dowitcher | | | | | | ✓ | | ✓ | 4 | | | | | S4[3] | | Coastal beaches and bay edges |
| Long-billed dowitcher | | | | | | | | | 3 | | | | | S4/S5[3] | | Freshwater wetlands, bay edges |
| Wilson's snipe | | | | | | | | ✓ | 4 | | | | | S4/S5[3] | | Grassland, tidal and nontidal marsh |
| Red phalarope | | | | | | | | ✓ | 4 | | | | | S4[3] | | Open ocean, ponds |
| Red-necked phalarope | | | | | | | | ✓ | 4 | | | | | S4[3] | | Open ocean, ponds |
| Western gull | | | | | | | | | | LC[4] | | | | S4[3] | | Coastal beaches, open ocean and bay |
| Glaucous-winged gull | | | | | | | | | | LC[4] | | | | S5[3] | | Coastal beaches, open ocean and bay |
| California gull | | | | | | | | | | MC[4] | | | | S4/S5[3] | | Coastal beaches, open ocean and bay |
| Heermann's gull | | | | | | | | | | MC[4] | | | | S5[3] | | Coastal beaches, open ocean and bay |
| Caspian tern | | | | SM[1] | | ✓ | ✓ | ✓ | | LC[4] | | | | S3[3] | ✓ | Coastal beaches, open ocean and bay |
| Common tern | | | | | | | ✓ | | | LC[4] | | | | S4[3] | | Coastal beaches, open ocean and bay |
| Common murre | | | | SC[1] | | | | ✓ | | MC[4] | | | | S4/S5[3] | ✓ | Open ocean and bay |
| Marbled murrelet | | ✓ | T[1] | T[1] | | ✓ | ✓ | ✓ | | HC[4] | | | | S3[3] | ✓ | Open ocean and bay; old-growth forest for nesting |

| SPECIES | Refuge Purpose | Biological Integrity, Diversity Health [a] | Federally Listed | Washington Listed | Partners in Flight [b] | Birds of Conservation Concern [c] | Bird Focal Species [d] | State Wildlife Plan [e] | Shorebird Plan [f] (score 1-5)[2] | N.A. Waterbird Conservation Plan [g] | Pacific Flyway Management Plans [h] | WDFW 2006 [i] | NAWMP [j] | WA NHP [k] | Seabird Cons. Plan [l] | HABITAT TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ancient murrelet* | | | | | | | | ✓ | | HC[4] | | | | S3/S4[3] | ✓ | Open ocean and bay |
| Cassin's auklet* | | | SoC[1] | SC[1] | | | ✓ | ✓ | | MC[4] | | | | S3[3] | ✓ | Open ocean and bay |
| Tufted puffin* | | | SoC[1] | SC[1] | | | | ✓ | | ✓ | | | | S3/S4[3] | ✓ | Open ocean |
| Band-tailed pigeon | | | | | ✓ | | ✓ | ✓ | | | ✓ | | | S4[3] | | Coniferous forest, riparian forest and shrub, mineral springs |
| Short-eared owl | | | | | ✓ | | ✓ | ✓ | | | | | | S4[3] | | Grassland, tidal and nontidal marsh |
| Northern spotted owl** | | | T[1] | E[1] | | | | ✓ | | | | | | S2[3] | | Late-successional forest |
| Western screech owl | | | | | ✓ | | | ✓ | | | | | | S4[3] | | Coniferous forest, riparian forest, grassland |
| Northern saw-whet owl | | | | | | | ✓ | | | | | | | S4[3] | | Coniferous and riparian forest |
| Common nighthawk | | | | | ✓ | | | ✓ | | | | | | S4[3] | | Grassland, bare ground |
| Vaux's swift | | ✓ | | SC[1] | ✓ | | | ✓ | | | | | | S3[3] | | Old-growth forest, large snags |
| Rufous hummingbird | | | | | ✓ | ✓ | | ✓ | | | | | | S4/S5[3] | | Early seral forest, nectar producing plants |
| Downy woodpecker | | | | | ✓ | | | ✓ | | | | | | S4/S5[3] | | Coniferous forest, riparian forest, snags |
| Pileated woodpecker | | ✓ | | SC[1] | ✓ | | | ✓ | | | | | | S4[3] | | Mature multilayered forest, large snags |
| Olive-sided flycatcher | | | SoC[1] | | ✓ | ✓ | ✓ | ✓ | | | | | | S4[3] | | Forested wetland, riparian forest, tidal and nontidal marsh |
| Willow flycatcher | | | SoC[1] | | ✓ | | | ✓ | | | | | | S4/S5[3] | | Riparian shrub, dense shrub layer |
| Hammond's flycatcher | | | | | ✓ | | | ✓ | | | | | | S5[3] | | Forested wetland, riparian forest; mature/young forest, open midstory |

| SPECIES | Refuge Purpose | Biological Integrity, Diversity Health [a] | Federally Listed | Washington Listed | Partners in Flight [b] | Birds of Conservation Concern [c] | Bird Focal Species [d] | State Wildlife Plan [e] | Shorebird Plan [f] (score 1-5)[2] | N.A. Waterbird Conservation Plan [g] | Pacific Flyway Management Plans [h] | WDFW 2006 [i] | NAWMP [j] | WA NHP [k] | Seabird Cons. Plan [l] | HABITAT TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pacific-slope flycatcher | | | | | ✓ | | | ✓ | | | | | | S4/S5[3] | | Forested wetland, riparian forest; mature/young forest, deciduous canopy |
| Streaked horned lark (*strigata*) | | ✓ | FC[1] | E[1] | ✓ | ✓ | | ✓ | | | | | | S1[3] | | Grassland (sparse), sparsely vegetated coastal dunes |
| Tree swallow | | | | | ✓ | | | | | | | | | S5[3] | | Forested wetlands, riparian forest, open water, snags |
| Purple martin | | | | SC[1] | ✓ | | | ✓ | | | | | | S3[3] | | Riparian forest, snags, open water |
| Brown creeper | | | | | ✓ | | | ✓ | | | | | | S4/S5[3] | | Old-growth/mature forest, multilayered |
| Winter wren | | | | | ✓ | | | ✓ | | | | | | S5[3] | | Mature/young forest, forest floor complexity |
| Western bluebird | | | | SM[1] | ✓ | | | ✓ | | | | | | S3[3] | | Riparian forest/grassland mosaic, snags |
| Swainson's thrush | | | | | ✓ | | | ✓ | | | | | | S5[3] | | Riparian forest, dense shrub understory |
| Varied thrush | | | | | ✓ | | | | | | | | | S5[3] | | Mature forest, midstory tree layer |
| Hermit warbler | | | | | ✓ | | | ✓ | | | | | | S4[3] | | Mature/young forest, closed canopy |
| Yellow warbler | | | | | ✓ | | | ✓ | | | | | | S4/S5[3] | | Riparian forest, scrub-shrub |
| Wilson's warbler | | | | | ✓ | | | ✓ | | | | | | S5[3] | | Mature/young forested, deciduous understory |
| Western meadowlark | | | | | ✓ | | | | | | | | | S4[3] | | Grassland with perch sites, large patches |
| Red crossbill | | | | | ✓ | | | | | | | | | S4[3] | | Old-growth/mature forest, conifer cones |

| SPECIES | Refuge Purpose | Biological Integrity, Diversity Health [a] | Federally Listed | Washington Listed | Partners in Flight [b] | Birds of Conservation Concern [c] | Bird Focal Species [d] | State Wildlife Plan [e] | Shorebird Plan [f] (score 1-5)[2] | N.A. Waterbird Conservation Plan [g] | Pacific Flyway Management Plans [h] | WDFW 2006 [i] | NAWMP [j] | WA NHP [k] | Seabird Cons. Plan [l] | HABITAT TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fish** | | | | | | | | | | | | | | | | |
| Chinook salmon | | ✓ | | SC[1] | | | | ✓ | | | | ✓ | | S3/S4[3] | | Riverine, estuary, marsh, open water |
| Chum salmon | | ✓ | | SC[1] | | | | ✓ | | | | ✓ | | S3[3] | | Riverine, estuary, marsh, open water |
| Coho salmon | | ✓ | | | | | | ✓ | | | | ✓ | | S3[3] | | Riverine, estuary, marsh, open water |
| Steelhead | | ✓ | | SC[1] | | | | ✓ | | | | ✓ | | S5[3] | | Riverine, estuary, marsh, open water |
| Coastal cutthroat trout | | ✓ | SoC[1] | | | | | ✓ | | | | ✓ | | S4[3] | | Riverine, estuary, marsh, open water |
| Bull trout* | | | T[1] | SC[1] | | | | ✓ | | | | | | S3[3] | | Riverine, estuary, marsh, open water |
| Green sturgeon* | | | T[1] | SM[1] | | | | ✓ | | | | | | S2[3] | | Open ocean, bay, river |
| Pacific lamprey* | | | SoC[1] | SM[1] | | | | ✓ | | | | | | S3/S4[3] | | Open ocean, bay, river |
| River lamprey* | | | SoC[1] | SC[1] | | | | ✓ | | | | | | S2[3] | | Open ocean, bay, river |
| Western brook lamprey | | ✓ | | SM[1] | | | | | | | | | | S3/S4[3] | | Freshwater streams and rivers |
| Eulachon* | | | T[1] | SC[1] | | | | ✓ | | | | | | S4[3] | | Open ocean, bay, river |
| **Amphibians and Reptiles** | | | | | | | | | | | | | | | | |
| Tailed frog | | ✓ | SoC[1] | SM[1] | | | | | | | | | | S4[3] | | Riverine, riparian |
| Columbia torrent salamander | | ✓ | SoC[1] | SC[1] | | | | ✓ | | | | | | S3[3] | | Riverine, riparian |
| Cope's giant salamander | | ✓ | | SM[1] | | | | ✓ | | | | | | S3/S4[3] | | Freshwater streams |
| Dunn's salamander | | ✓ | | SC[1] | | | | ✓ | | | | | | S3[3] | | Freshwater streams, riparian areas |
| Van Dyke's salamander | | ✓ | SoC[1] | SC[1] | | | | ✓ | | | | | | S3[3] | | Freshwater streams, riparian areas, moist forests |

| SPECIES | Refuge Purpose | Biological Integrity, Diversity Health [a] | Federally Listed | Washington Listed | Partners in Flight [b] | Birds of Conservation Concern [c] | Bird Focal Species [d] | State Wildlife Plan [e] | Shorebird Plan [f] (score 1-5)[2] | N.A. Waterbird Conservation Plan [g] | Pacific Flyway Management Plans [h] | WDFW 2006 [i] | NAWMP [j] | WA NHP [k] | Seabird Cons. Plan [l] | HABITAT TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Red-legged frog | | ✓ | SoC[1] | | | | | | | | | | | S4[3] | | Forested wetland, riparian forest |
| Western toad | | ✓ | SoC[1] | SC[1] | | | | ✓ | | | | | | S3[3] | | Riparian forest, grassland, marsh |
| Green sea turtle | | | T[1] | T[1] | | | | | | | | | | | | Open ocean and bay |
| Leatherback sea turtle* | | | E[1] | E[1] | | | | | | | | | | | | Open ocean and bay |
| Loggerhead sea turtle* | | | T[1] | T[1] | | | | | | | | | | | | Open ocean and bay |
| Olive ridley sea turtle* | | | T[1] | | | | | | | | | | | | | Open ocean and bay |
| **Invertebrates** | | | | | | | | | | | | | | | | |
| Makah's copper butterfly* | | | SoC[1] | SC[1] | | | | ✓ | | | | | | S2[3] | | Coastal bogs and meadows |
| Oregon silverspot butterfly | | ✓ | T[1] | E[1] | | | | ✓ | | | | ✓ | | SX[3] | | Coastal salt-spray meadows, back-dune troughs, forest glades |
| Newcomb's littorine snail* | | | SoC[1] | SC[1] | | | | | | | | | | S1[3] | | Mudflats and *Salicornia* salt marsh |
| Olympia oyster | | | | SC[1] | | | | | | | | | | | | Bay |
| Western pearlshell mussel | | ✓ | | SM[1] | | | | ✓ | | | | | | S3[3] | | Freshwater streams |
| **Plants** | | | | | | | | | | | | | | | | |
| Pink sandverbena | | ✓ | SoC[1] | E[1] | | | | | | | | | | S1[3] | | Sparsely vegetated coastal dunes and beaches |
| Footsteps of spring | | | SoC[1] | E[1] | | | | | | | | | | S1[3] | | Coastal dunes and meadows |
| Frigid shooting star* | | | SC[1] | E[1] | | | | | | | | | | S1[3] | | Riparian areas |
| Henderson's checkermallow | | ✓ | SoC[1] | | | | | | | | | | | watch | | Salt marsh |
| Queen of the forest* | | | SoC[1] | T[1] | | | | | | | | | | S2/S3[3] | | Forest and river |

| SPECIES | Refuge Purpose | Biological Integrity, Diversity Health [a] | Federally Listed | Washington Listed | Partners in Flight [b] | Birds of Conservation Concern [c] | Bird Focal Species [d] | State Wildlife Plan [e] | Shorebird Plan [f] (score 1-5)[2] | N.A. Waterbird Conservation Plan [g] | Pacific Flyway Management Plans [h] | WDFW 2006 [i] | NAWMP [j] | WA NHP [k] | Seabird Cons. Plan [l] | HABITAT TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water howellia* | | | T[1] | T[1] | | | | | | | | | | S2/S3[3] | | Wetland |
| Water pennywort | | ✓ | | SS[1] | | | | | | | | | | | | Wetland |
| **Habitats** | | | | | | | | | | | | | | | | |
| Upland forest | | ✓ | | | ✓ | | | ✓ | | ✓ | | ✓ | | | | |
| Short-grass field | | | | | ✓ | | | | ✓ | | ✓ | | | | | |
| Riparian | | ✓ | | | ✓ | | | ✓ | ✓ | | | ✓ | | | | |
| Riverine | | ✓ | | | | | | ✓ | ✓ | ✓ | | | | | | |
| Palustrine–wetland | | ✓ | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | |
| Palustrine—freshwater marsh | | ✓ | | | | | | ✓ | ✓ | ✓ | ✓ | | | | | |
| Estuarine | | ✓ | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | |
| Salt marsh | | ✓ | | | | | | ✓ | ✓ | ✓ | | | | | ✓ | |
| Coastal dunes and beaches | | ✓ | | | | | | ✓ | ✓ | ✓ | | | | | ✓ | |
| Grassland—OSB habitat | | ✓ | | | | | | ✓ | | | | ✓ | | | | |

* = Not documented on Refuge. Species occupies habitat adjacent to Refuge or potential suitable habitat exists on Refuge.
** = Historically nested on Refuge; not documented since 1986.
[1] T = threatened; E = endangered; FC = Federal candidate; SoC = species of concern; SC = State candidate; SS = State sensitive; SM = State monitor.
[2] Regional score. Category codes: 5 = highly imperiled; 4 = high concern; 3 = moderate concern; 2 = low concern; 1 = no risk.
[3] S1 = critically imperiled; S2 = imperiled; S3 = rare, uncommon; S4 = apparently secure; S5 = demonstrably secure; SX = apparently extirpated; SH = historical occurrences, but still expected to occur.
[4] HI = highly imperiled, HC = high concern, MC = moderate concern, LC = low concern, NAR = not currently at risk, ✓ = included in plan.
[5] Long-term trend code: D = decreasing; I = increasing; NT = no trend; U = undetermined.
[a] USFWS 2001b.
[b] Altman 1999, 2000.
[c] USFWS 2002a.
[d] USFWS 2005b.
[e] WDFW 2005.
[f] Drut and Buchanan 2000.

[g] Kushlan et al. 2002.
[h] Pacific Flyway Council 1983, 1991, 1998, 1999a, 199b, 2001, 2002, 2003, 2005, 2006a, 2006b, 2006c, 2007.
[i] WDFW 2006.
[j] NAWMP 2004.
[k] WDNR 2005, 2007.
[l] USFWS 2005a.

**Table 4-2. BIDEH: Natural Plant Communities at Willapa Refuge: Characteristics, Natural Processes Involved in Sustaining Community and Limiting Factors.**

| Characteristics of the Community (Structure, Seral Stage, Species Composition) | Natural Processes Responsible for Sustaining Community Structure/ Composition | Limiting Factors |
|---|---|---|
| **Upland Forest–Sitka Spruce Zone Forest** | | |
| Refuge forests consist of a small amount of late-successional forest with presence of large diameter downed logs and snags within forest habitat matrix of even-aged stands, previously managed for timber production.<br>Two major low elevation coastal rainforest habitat types:<br>1) Sitka spruce dominant or co-dominant. Western hemlock often co-dominant, and western red cedar. Understory includes salal, oxalis, and sword fern. High diversity of mosses and lichens.<br>2) Western red cedar–western hemlock forests often contain nearly pure stands of hemlock and thrive in this environment where they are exposed to intense windstorms. Low abundance of Douglas fir and Sitka spruce.<br>Potential resources of concern: marbled murrelet, bald eagle, Vaux's swift, pileated woodpecker, bats. | Climate characterized by hypermaritime (cool summers, very wet winters), abundant fog, no major snowpack. Natural disturbance windthrow, occasional intense windstorms. Catastrophic fires and extended droughts infrequent. | Loss of old-growth and mature forests due to commercial timber harvest. Loss of species diversity and forest complexity due to planting of monotypic stands for timber production. Conversion of habitat to residential areas. Forest fragmentation. |
| **Riparian–Sitka Spruce Zone Forest** | | |
| Highly variable structure. High density of edges contributes to habitat and species diversity and productivity.<br>1) Early seral stage deciduous trees, such as red alder, typically younger forests or frequently disturbed areas.<br>2) Late seral stage Sitka spruce, western red cedar, western hemlock. Bottomland forest with dense shrub understory; forested streambanks.<br>Potential resources of concern: Dunn's salamander, Van Dyke's salamander. | Functioning floodplain: high-flow events shape stream channels and riparian vegetation (pulse disturbances). Wind and climate cycles (variable and cyclic). | Dike construction, land clearing for agricultural and urbanization. Timber harvest and roads. Sediment input, loss of large woody debris. |
| **Riverine** | | |
| River and stream channels provide migration pathways for adult anadromous fish traveling to spawning grounds and juveniles traveling to the estuary and/or Pacific Ocean. Riverine habitat supports amphibians and invertebrates. Perennial and intermittent streams.<br>Potential resources of concern: chum, coho, steelhead, cutthroat trout, western brook lamprey, Columbia torrent salamander, tailed frog, western pearlshell mussel. | Periodic flooding with flooding energy variable depending on location of stream/river in landscape; perennial water flows. | Loss of connectivity to estuary due to highway and dike construction. Hydrologic regime alteration, passage barriers, water quality issues (temperature and sedimentation), exotic species. |

| Characteristics of the Community (Structure, Seral Stage, Species Composition) | Natural Processes Responsible for Sustaining Community Structure/ Composition | Limiting Factors |
|---|---|---|
| **Palustrine Freshwater Wetlands** | | |
| Nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses and lichens, and all such wetlands that occur in tidal areas where salinity is low (<0.5 parts per thousand).<br>Wetlands with permanent to semipermanent standing water, often with fluctuating water table. Can support submerged, floating, rooted aquatic and emergent plants.<br>Varying according to depth and contour of basin, duration of inundation, soil texture and permeability.<br>Potential resources of concern: waterfowl, trumpeter swan, water pennywort, native amphibians. | Maintain freshwater inputs. Functioning floodplain: frequent but not prolonged flooding. | Habitat loss from dike construction/drainage. Land clearing for industrial, agricultural and residential development. Dam construction that reduced flooding and altered water regimes. Invasive species such as reed canarygrass, purple loosestrife, bullfrogs, and nutria. |
| **Estuarine** | | |
| Vast areas of eelgrass beds provide shelter for fish and invertebrates; food source for brant, waterfowl and waterbirds; fish spawning and nursery habitat; and shellfish habitat.<br>Vegetated and unvegetated sand and mudflats provide foraging areas for shorebirds. Intertidal sand bars and bay islands provide roost sites for seabirds and haul-outs for marine mammals.<br>Potential resources of concern: eelgrass beds, brant, brown pelican, shorebirds, waterfowl, marine mammals. | Tidal cycles. Eelgrass requires habitat where erosion and sedimentation are in equilibrium. Sediment transport and deposition. | Destruction of tidelands by diking, construction of bulkheads and piers. Dredging activity. Contaminants. Aquaculture. Exotic species: *Spartina*, Japanese eelgrass. |
| **Salt Marsh** | | |
| Salt marsh grasses, algae and phytoplankton are major producers in estuaries. Pickleweed, seashore salt grass, jaumea, alkali grass, sea arrow grass, sandspurry, seaside plantain, salt marsh wort. Low to high marsh zones.<br>Potential resources of concern: migratory waterfowl, dabbling ducks, Henderson's checkermallow, elk. | Sun, tides, salinity gradients. | Invasive species: *Spartina*, potentially New Zealand mudsnail. Diking, filling, conversion for agriculture. Logging of watershed. |
| **Coastal Dunes and Beach** | | |
| Historically low hummock sand dune formations characterized by large areas of open sand; formed by sparsely vegetated native dune plant species.<br>Invasive, non-native *Ammophila* beachgrasses planted to stabilize dune community have changed dune morphology and native plant communities. Mild climate allows vegetation to establish easily and rapidly. Herbaceous beachgrass to shrub to permanent lodgepole pine forest.<br>Potential resources of concern: western snowy plover, streaked horned lark, pink sandverbena, other rare native dune plants. | Coastal marine and wind processes. Sediment transport and deposition by ocean currents. High rainfall maintains high water table favorable for plant growth. | Dams on Columbia River have altered sediment loads. Jetties have altered sediment transport. Invasive non-native *Ammophila* beachgrasses, Scotch broom, gorse. Rapid succession to shrub, then climax lodgepole pine forest. |

| Characteristics of the Community (Structure, Seral Stage, Species Composition) | Natural Processes Responsible for Sustaining Community Structure/ Composition | Limiting Factors |
|---|---|---|
| **Grasslands** | | |
| Native grasslands occurred historically on the Long Beach Peninsula. Current habitat restoration on Refuge to create early successional, coastally influenced grassland habitat for the Oregon silverspot butterfly.<br>Potential resources of concern: Oregon silverspot butterfly, early blue violet. | Proximity to ocean, mild temperatures, high rainfall, fog. Maintain low, open grasslands by suppressing encroaching trees and shrubs. Wind transport of sand, small mammal activity, herbivory, fire. | Loss of habitat. Dune stabilization caused by the introduction and spread of nonnative beachgrass has encouraged rapid succession to forested habitats. Early blue violet out-competed by introduced grasses and herbs. |

**Table 4-3. Priority Resources of Concern for Willapa National Wildlife Refuge.**

| Focal Species | Habitat Type [13, 16, 17, 22, 25] | Habitat Structure | Life History Requirement | Other Benefiting Species |
|---|---|---|---|---|
| Marbled murrelet | Late-successional forest | Mature forest: dominant trees 100-200 years with average tree diameters exceeding 21 inches.<br>Old-growth forest: dominant overstory >200 years with a multilayered, multispecies canopy; Largest tree diameters range from 32 to >39 inches; Many large fallen trees and snags, trees of all ages, heavy ground cover, <80% dominant tree canopy cover.<br>In mature and old-growth forests large diameter trees (western hemlock, Sitka spruce, western red cedar, Douglas fir) with large flat moss-covered branches at least 7 inches in diameter that form a platform (for nesting). Branches at least 50 feet above the ground. Mean nest branch height of 120 feet. High canopy closure over nest branches.[2, 7, 8, 9, 10, 11] | Breeding (April–September) | Vaux's swift, pileated woodpecker, spotted owl, brown creeper, red crossbill, Pacific-slope flycatcher, northern saw-whet owl, northern goshawk, bald eagle, band-tailed pigeon, winter wren, pine marten, long-legged myotis, long-eared myotis, tailed frog, Columbia torrent salamander, Cope's giant salamander, Dunn's salamander, Van Dyke's salamander |
| Canada goose | Short-grass fields | Short grasses (< 4 inch) preferred forage. Green forage, various grasses and grass-legume mixes make up majority of diet. Other essential habitat elements include water and sanctuary to sustain birds from fall arrival to departure in spring.[23] | Wintering, foraging | greater white-fronted goose, western meadowlark, northern harrier, red-tailed hawk, American kestrel, western screech owl, killdeer, Wilson's snipe |

| Focal Species | Habitat Type [13, 16, 17, 22, 25] | Habitat Structure | Life History Requirement | Other Benefiting Species |
|---|---|---|---|---|
| Yellow warbler | Riparian | Early seral-stage deciduous red alder riparian forest.<br>>70% cover in shrub layers with subcanopy layer contributing >40% of total.<br>Shrub layer cover 30%-60% (includes shrubs and saplings). Shrub layer height > 6.6 feet. Shrubs include willow and salmonberry. | Breeding, foraging | song sparrow, common yellowthroat, downy woodpecker, great blue heron, belted kingfisher, olive-sided flycatcher, Swainson's thrush, Wilson's warbler, willow flycatcher Roosevelt elk, red-legged frog |
| Pacific wren | Riparian | Mid-late successional bottomland forest with complex vegetative structure and habitat attributes unique to older forests, such as large down logs and root wads. Large forest blocks with average of four downed logs per acre with dbh >24 inches and 50 feet long. Shrub cover > 60% within 9 feet of ground. Tree trunk surface area for foraging with a mean dbh >16 inches. Shrub species include evergreen huckleberry, red huckleberry, and sword fern. | Year-round, breeding, foraging | |
| Van Dyke's salamander | Riparian | Forested, shaded streambanks, seeps or moist, north-facing rocky habitats in forested areas. Splash zones of streams and moist, well-shaded substrates with stable microclimates.<br>Native species including western red cedar, Sitka spruce, western hemlock, red alder, salal, salmonberry, huckleberry, red elderberry, sword fern, oxalis.[4, 5, 7, 24] | Year-round, breeding, foraging | |
| Coastal cutthroat trout | Riverine | Passage barrier free, gravelly coastal streams and small rivers with large woody debris, and estuaries. Stream and off-channel habitats. Cool, well-oxygenated water, temperature <73˚F, intact riparian corridor. Fine to coarse gravel for spawning.[6, 7] | Resident and anadromous fish spawning, rearing, and foraging | Chum salmon, coho salmon, Chinook salmon,steelhead, Cope's giant salamander, red-legged frog, western brook lamprey, western pearlshell mussel |
| Columbia torrent salamander | Riverine | Very cold, clear springs, shady seeps, headwater streams with large woody debris, and waterfall splash zones. May forage in moist forests adjacent to these areas. Loose rock or gravel substrates that are sediment free. Stable microclimates. Water temperatures cannot exceed 81.0˚F to 82.4˚F.[4, 5] | Lay eggs in rock crevices in seeps. Larvae and adults live in gravel or under small cobbles in silt free water that is flowing or seeping. Slow maturing. | tailed frog, red-legged frog, Cope's giant salamander, invertebrates |

| Focal Species | Habitat Type [13, 16, 17, 22, 25] | Habitat Structure | Life History Requirement | Other Benefiting Species |
|---|---|---|---|---|
| Northern pintail | Palustrine | Emergent wetland. Also estuarine habitat. Seasonally flooded with medium depths (>3 feet) and shallow areas (<4-18 inches in depth), flooded from approx. October though June. 30%-70% cover of emergent vegetation, floating and submergent vegetation, native seed-bearing plants such as spike rushes, sedges, bulrushes, manna grass, sparganium, cattail and smartweeds.[12] | Foraging, wintering | mallard, wood duck, American wigeon, greater scaup, lesser scaup, northern harrier, great blue heron, Canada geese, trumpeter swan, Wilson's snipe, red-necked phalarope, belted kingfisher, rufous hummingbird, coho salmon, coastal cutthroat trout, northwestern salamander, water pennywort |
| Wood duck | Palustrine | Forested wetland.<br>Shallow water wetlands, flooded beds of maturing moist-soil plants, and overflow floodplains. Cavities needed for nesting, trees or snags >12 inches in diameter. Also uses nest boxes.[3] | Year-round, breeding, foraging | |
| Red-legged frog | Palustrine | Freshwater marsh vegetation characterized by tall reeds, grasses, sedges, and floating aquatics. Shallow to medium water (1.5-6.5 feet) with emergent and/or submergent vegetation.[4] | Breeding, foraging | |
| Willow flycatcher | Palustrine | Scrub shrub wetland.<br>Patchy shrub layer; woody vegetation 3 to 12 feet tall with 80% cover and scattered herbaceous openings.<br>Canopy tree (woody vegetation > 12 feet tall) covers < 20%. Native shrubs include: Hooker's willow, Pacific willow, Scouler's willow, Douglas' spirea.[1] | Breeding, foraging | |
| Brant | Estuarine | Vegetated aquatic beds consisting of intertidal and shallow subtidal shores colonized by eelgrass. Tidal cycle variation changes habitat from open water to vegetated mudflat.<br>No *Spartina*.[15] | Foraging. Wintering and spring staging (October-April). | juvenile salmonids, Pacific herring, Dungeness crab, softshell clams, shorebirds, waterfowl, benthic invertebrates |
| Dunlin | Estuarine | Intertidal mudflats, both vegetated (eelgrass) and unvegetated. No *Spartina*. | Foraging, migrating, wintering | western sandpiper, sanderling, short-billed dowitcher, red knot, benthic invertebrates |
| Western grebe | Estuarine | Open water channel habitats used by surface and diving waterbirds. | Foraging and roosting, migrating | waterfowl, common loon, double-crested cormorant |
| Brown pelican | Estuarine | Dynamic intertidal sandbars within estuary used as roost sites. Sensitive to disturbance. | Nonbreeding roost sites | harbor seal (major haul-out sites), seabirds, brant, western snowy plover, shorebirds, benthic invertebrates |

| Focal Species | Habitat Type [13, 16, 17, 22, 25] | Habitat Structure | Life History Requirement | Other Benefiting Species |
|---|---|---|---|---|
| Newcomb's littorine snail | Salt marsh | Lives on stems of pickleweed and on the substrate beneath the vegetation. Occurs just above high tide line, immersed by seawater only a few hours each year during flood tides.<br>Habitat characterized by pickleweed, silverweed, yarrow, tufted hairgrass, seashore saltgrass, seacoast angelica, gumweed, seaside plantain, small spike-rush, seaside arrowgrass, Lyngby's sedge.[14] | Year-round | Henderson's checkermallow, great blue heron, waterbirds, migratory waterfowl |
| Western snowy plover | Coastal dune and beach | Sparsely vegetated beach or dune habitat, free of contiguous stands of introduced beachgrasses (*Ammophila* spp.) Large areas of open sand with native beach plants and shell patches/tidal debris for nest and chick concealment<br>Nesting areas free of disturbance and excessive numbers of nest predators, particularly crows and ravens.<br>Foraging areas, year-round that are free of frequent or prolonged disturbance.[19] | Breeding (March-September), foraging, wintering | dunlin, sanderlings, least sandpipers, western sandpipers, short-billed dowitcher, black-bellied plovers, pink sandverbena, yellow sandverbena, beach morning glory, footsteps of spring, gray beach pea, and other locally rare native plants[21] |
| Streaked horned lark | Coastal dune and beach | Sparsely vegetated expanses of sand adjacent to the ocean; approximately 35% of area with no vegetation<br>Ground layer dominated by sand (~68%) with little thatch<br>Areas dominated by grasses (short annual grasses 0.6-8.7 inches) and forbs with few or no trees or shrubs.[20] | Breeding (March-September), foraging. Possibly year-round. | |
| Oregon silverspot butterfly | Coastal prairie | Stabilized dune habitat has low relief, highly porous soils, less exposure to winds, than other habitat types.<br>Habitat restoration and control of exotic vegetation critical.<br>Caterpillar host plant (early blue violet) and adult nectar sources two key components of habitat. Nectar species include: pearly everlasting, yarrow, California aster, dune goldenrod, dune thistle.<br>Native nectar plants maintained at a density $\geq$ 5 flowering stems/$m^2$.[18] | Breeding, foraging, year-round | early blue violet, red fescue, Douglas' aster, dune goldenrod, pearly everlasting, sedge |

**Notes**
[1] Altman 2000.
[2] Altman 1999.
[3] Bellrose and Holm 1994
[4] Corkran andThoms 1996.
[5] Larsen 1997.
[6] NatureServe 2007.
[7] Rodrick and Milner 1991.
[8] Ritchie 2003.
[9] USDA Forest Service 2003.

[10] USDA Forest Service 2002.
[11] USFWS 1997a.
[12] Fredrickson and Heitmeyer 1991.
[13] Cassidy et al. 1997a. The Washington GAP analysis (Cassidy 1997b) lists the most important Refuge habitats as: sandy beaches; late-seral low-elevation, westside forest; freshwater and estuarine marsh.
[14] Larsen et al. 1995.
[15] Phillips 1984.
[16] Simenstad 1983.
[17] Washington's Comprehensive Wildlife Conservation Strategy (WDFW 2005) classifies the top 20 habitat types for conservation. Priority 1 habitats include: bays and estuaries, herbaceous wetlands, marine nearshore, westside lowland conifer–hardwood mature forest, westside riparian-wetlands. Priority 2 habitats: Coastal dunes and beaches. Other habitats: Agriculture, Pasture and mixed environs; Open Water (lakes, rivers, streams).
[18] USFWS 2001a.
[19] USFWS 2007a.
[20] Pearson and Altman 2005.
[21] Kaye 2003.
[22] Deithier 1990.
[23] Pacific Flyway Council 1998.
[24] Knutson and Naef 1997.
[25] Churchill et al. 2007 (see this document's Appendix K).

# 4.3 Habitats and Vegetation

The Willapa National Wildlife Refuge is located within the Sitka spruce vegetation zone (Franklin and Dyrness1988). Prior to Euro-American settlement and development, the landscape was a mixture of coastal beaches and dunes, saltwater and freshwater marshes, freshwater wetlands, native grasslands and upland forests, including old-growth forests. These habitats remain, although their acreage has been reduced. Diking, draining, land clearing, and timber harvest have affected the natural landscape.

The current refuge habitats were mapped using GIS based on the interpretation and analysis of 2006 color infrared and true color ortho-corrected aerial photography. These habitats are depicted in Map 3, and the acreages of each are shown in Table 4-4.

**Table 4-4. Habitat Types and Acreages within the Willapa National Wildlife Refuge.**

| Habitat | Number of Acres |
|---|---|
| Sitka spruce zone forest | 6,128 |
| Estuarine open water | 878 |
| Intertidal flats | 4,178 |
| Salt marsh | 1,636 |
| Riverine | 27 |
| Seasonal, managed freshwater wetlands | 317 |
| Permanent/semipermanent natural freshwater wetlands | 545 |
| Coastal dunes | 1,581 |
| Short-grass fields | 250 |
| Grasslands | 97 |

The following are summaries of habitats and vegetative communities. The plant and animal species listed in this section are examples of common and priority species found on the Refuge, but should not be considered a comprehensive list of all species present. Refer to Appendix Q for Willapa NWR wildlife and plant lists.

Willapa Bay is a major estuary on the Pacific Coast and at mean higher high tide encompasses approximately 70,400 acres (USFWS 1970). An estuary is defined as the area near the mouth of a river, or rivers, in the case of Willapa Bay, where oceanic tidal waters and freshwater currents collide and mix. Biologically, estuaries are among the most productive environments on earth and provide important habitat for a large variety of organisms. This high productivity is due basically to physical and biological processes unique to estuaries. Dissolved organic nutrients from detrital material enter the estuary from inflowing rivers. The saltwater wedge, pushed along the estuary bottom by the incoming tide, brings in other nutrients of marine origin. Currents and tides circulate fresh and salt water, distributing and, to a certain extent, trapping dissolved and suspended matter. Deposition of these substances fertilizes the estuary and plant life flourishes. This plant life includes vascular vegetation of estuarine marshes (grasses, rushes, sedges), benthic algae (diatoms), epibenthic algae, and eelgrass on intertidal sediments (USFWS 1986).

Some plants are fed upon directly by fish and wildlife but most die and enter the food chain in the form of detritus or partly decomposed plant material. This detritus, suspended in the water and deposited on the bottom, is a high-quality food for consumers because of its high nutritional value. A number of studies have shown that many species of fish and invertebrates feed wholly or partially on detritus. Therefore, detritus feeders are the critical link between plant production and the production of higher consumers. Consequently, the ultimate ecological value of primary production in marshes occurs when detritus of marsh plant origin enters the food web of the estuary (USFWS 1977).

Habitat components of estuaries include open water, intertidal mudflats, and salt marshes. These habitats are discussed separately below.

## 4.3.1 Upland Forest–Sitka Spruce Zone

The Sitka spruce forest zone, also known as the coastal temperate rain forest, occurs in a relatively narrow band extending along the North America coast from southeast Alaska to northern California. The maritime weather in the region is influenced by moist Pacific Ocean air and the coastal mountain ranges. Coastal weather is characterized by cool summers and warm, very wet winters. Fog occurs frequently along the outer coast year-round but is notable for the significant amount of summer precipitation it creates in the form of tree drip. The low elevation coastal rivers and forests of southwest Washington receive most of their annual water budget in the form of rain, since the region has no major winter snowpack. The relatively mild seasonal temperatures and plentiful moisture create a unique climate that is highly productive for plant and animal species. The abundant annual precipitation, relatively rich soils, and low rate of catastrophic fire disturbance allow late seral forests to develop (Franklin and Dyrness 1988). Summer drought is infrequent or of short duration. The main natural disturbance is windthrow, frequently occurring during winter storms. Historically, occasional intense winter windstorms occurred with a frequency of once or twice every few decades, although their frequency has increased during this decade.

Sitka spruce is the major dominant climax tree species of this forest zone and is most commonly associated with dominant and co-dominant western hemlock. Many western hemlocks in these old-growth forests are infected with western hemlock dwarf mistletoe (*Arceuthobium tsugense* subsp. *tsugense*), a parasite that affects their growth but also provides important ecological functions, such as serving as a nesting platform for marbled murrelets (Hamer and Nelson 1995). Understory trees include a diverse mix of common overstory conifer species and hardwoods, primarily composed of red alder. Late-seral forests of this forest zone are characterized by overstory trees of large stature, exhibiting very large diameter boles, large limbs, and tall, deep crowns, often with broken and

reiterated tops. The forests typically develop vertically and horizontally diverse canopies from multiple crown layers created by uneven aged stands, streams, gaps, or similar features that result in a complex spatial orientation. Sitka spruce is susceptible to windthrow, which can account for up to 80 percent of the mortality within stands. Regeneration from gap phase replacement, however, is rapid (Franklin 1988). Taylor (1990) found that Sitka spruce can persist at a stand scale if moderate to large gaps (equal to 800-1,000 $m^2$) are created every few decades as seen with the natural disturbance regime. Because Sitka spruce grow more quickly and have a longer life span that hemlock, they can remain the climax species.

Western red cedar and, less frequently, Douglas fir, are found as common overstory tree associates at more inland and slightly drier sites, along with western hemlock. Douglas fir tends to occur sporadically in old-growth forest remnants of the Willapa Hills, likely due to climatic conditions such as increased fog and precipitation and subsequent decreases in solar radiation along the coast that are not optimal for Douglas fir growth (Davis et al. 2009). In addition, Hansen et al. (2000) state that Douglas fir growth can be severely limited in this area due to infection by Swiss needle cast (*Phaeocryptopus gaeumannii*). Red alder is found as an overstory tree in some forests where clearcut harvest formerly occurred, along riparian areas, and as an understory tree in younger conifer forests and areas of recent disturbance. Pacific yew (*Taxus brevifolia*), a conifer species associated with old-growth forests elsewhere (Busing et al. 1995), occur in low densities in these forests. Due to their natural rot resistance and robust architecture, cedar trees can persist for extremely long periods of time, even surviving as trees from a previous forest stand cohort.

In the Willapa Hills of southwestern Washington, these coastal forests have also been extensively managed for timber production; today, less than 1 percent of the original old-growth forests remain as scattered remnant patches across the landscape (Davis et al. 2009). Managed forests are typically 20 to 60 years old and are made up of native tree species, primarily Douglas fir and western hemlock. Harvest of old-growth and mature forests for commercial timber and paper production has resulted in loss of species diversity and forest complexity on most of this landscape due to planting of even-aged, monotypic stands, and short harvest rotations. Conversion of habitat to residential and nonforest uses has accelerated forest fragmentation.

The structural complexity of these forests is a key to its importance as wildlife habitat. Sitka spruce provides good nesting and roosting habitat for avifauna (Smith 1980; Wiens 1975). Snags and live trees with broken tops provide nesting habitat for primary and secondary cavity nesters such as Vaux's swift, pileated woodpecker, and bats (Hemstrom and Logan 1986). The bald eagle uses primarily (greater than 90 percent) Sitka spruce for nesting trees on Admiralty Island (Meehan 1974) and also uses them as roosting trees to survey the incoming breakers for food (Arno and Hammerly 1977). The peregrine falcon in coastal British Columbia uses Sitka spruce for platform nesting and secondary cavity nesting (Campbell et al. 1978). Marbled murrelets find the large diameter, often moss-covered limbs of mature spruce trees suitable platforms for nesting.

Refuge forests consist of a small amount of late-successional forest with presence of large-diameter downed logs and snags within forest habitat matrix of even-aged stands, previously managed for timber production. Two primary low elevation coastal rainforest habitat types exist at Willapa NWR: Sitka spruce forest and western hemlock–western red cedar.

#### 4.3.1.1 Sitka Spruce Forest

This forest type has dominant and co-dominant Sitka spruce and western hemlock. Western red cedar and red alder may be found at low to moderate densities but are always present. Minor amounts of Douglas fir and grand fir (*Abies grandis*) can be present in some stands at mesic sites.

Diamond Point RNA is an 88-acre forested area at the northern tip of Long Island that was designated a research natural area in 1976. Diamond Point RNA preserves an example of second-growth Sitka spruce–western hemlock forest growing on an island in a coastal estuary. The natural area includes 48 acres of mature red alder and 40 acres of mature Sitka spruce/sword fern forest and Sitka spruce/salal forest. This area was logged near the turn of the century (Dyrness 1972).

#### 4.3.1.2 Western Hemlock–Western Red Cedar

This forest type has dominant and co-dominant western red cedar and western hemlock. Minor amounts of Sitka spruce, Douglas fir, red alder, grand fir, and Pacific yew also occur. Mature western red cedar can average 8 to 11 feet dbh and reach 150 to 165 feet in height. Individual cedars may be up to 1,000 years old. Old-growth western hemlock may reach 5 to 6 feet dbh. The western hemlock has a higher mortality rate and shorter life span than cedar; therefore the hemlock is believed to cycle through old-growth stands four to five times more rapidly than the cedar does.

Understory shrub and herbaceous vegetation in these forest types typically include salal, evergreen huckleberry, red huckleberry, oxalis, and sword fern. There is a high diversity and abundance of mosses and macrolichens from the canopy to the forest floor.

The 274-acre Cedar Grove RNA on the Long Island Unit is one of several late-successional forests at Willapa NWR. It hosts an extremely rare plant community: western hemlock–western red cedar/evergreen huckleberry–salal. The western red cedar forest is in a climax condition, with some of the ancient cedar trees estimated to be 900 to over 1,000 years old. The stand's size, its island location in an estuarine bay, and its persistence make it one of the most unique forest habitats in the Pacific Northwest (Franklin 1984). The stand structure of the Cedar Grove RNA is also unusual in that it is quite uniform. This uniform condition is attributed to the absence of catastrophic fire. Although individual trees show signs of fire, the wet climate and island setting have apparently protected the area from a stand-destroying fire. The origin of its forest may date to the last major change in climate 4,000 years ago. Surrounding trees and topography have likely protected the stand from major wind events. This area was difficult to access by water and was therefore spared from logging in the early days. The remainder of Long Island has been logged one or more times in the last 100+ years (USFWS 1987).

### 4.3.2 Forested Wetland and Riparian Forest–Sitka Spruce Zone

Riparian and wetland forests are highly variable in their composition, size, and structure (Kauffman et al. 2001). Functioning floodplains are influenced by high-flow events that shape stream channels and riparian vegetation through a process of pulse disturbances. The high density of edges contributes to habitat and species diversity and productivity. Sitka spruce is the major dominant climax tree species of this forest type. It is most commonly associated with dominant and co-dominant western hemlock and understory red alder. Early seral stage deciduous trees, such as red alder, typically make up younger forests or frequently disturbed areas along stream bottom lands. Unlike similar coastal and riparian habitats found to the north on the Olympic Peninsula, Davis et al.

(2009) found that big-leaf maple (*Acer macrophylla*), often the most common hardwood species, is essentially absent from this area.

The streamside forest is often dense with a shrubby understory and surrounded by a forest matrix. Forested wetlands are found along sloughs and coastal areas on the Refuge. Common understory vegetation includes vine maple (*Acer circinatum*), cascara buckhorn (*Rhamnus purshiana*), devil's club (*Oplopanax horridus*), salmonberry (*Rubus spectabilis*), skunk cabbage (*Lysichiton americanum*), sword fern, and lady fern (*Athyrium filix-femina*). There is typically a high diversity and abundance of mosses and macrolichens from the canopy to the forest floor.

Most riparian forests have been impacted directly and indirectly by adjacent timber harvests and road construction. Harvest of large-diameter trees or windthrow, resulting from high winds during severe winter storms crashing into trees after removal of adjacent forests, have created increases in sediment input and loss of large woody debris. Dike construction, land clearing for agricultural purposes, and urbanization has reduced the amount of coastal forested wetlands.

### 4.3.3 Estuarine Open Water

Open water refers to those areas that are continuously submerged. These habitats are referred to as deepwater habitats by Cowardin et al. (1979). Water is present in the channels even at low tide, and these channels serve as a link between the ocean and tidal rivers and streams. Channel depths in Willapa Bay range from 30 to 50 feet with maximum depths of 75 to 77 feet below mean low water (Hedgpeth and Obrebski 1981). The open-water channels provide habitat for fish and a variety of invertebrate animals and aquatic plants. Many of the fish species in the estuary are confined to open-water channels as the tide falls. During high tide they disperse to the flooded mudflats and lower portions of salt marshes. Channels serve as migration pathways for adult salmon, lamprey, steelhead, coastal cutthroat trout, and other fish species on their way to rivers and streams to spawn, as well as for juveniles. Many fish species that spend their adult life in the ocean spend time as juveniles in the estuary. Deeper channels and holes are preferred habitat for white sturgeon. Clams, mussels, aquatic worms, and other small organisms are found on the bottom. Rooted aquatic plants are scarce in the main channels because of water depth and strong, erosive currents but are found in backwaters.

### 4.3.4 Intertidal Flats

Intertidal flats are those areas of mud or sandy mud that are affected by the rising and falling of the tides. Intertidal flats are often submerged, but are gradually exposed as the tide lowers. At low tide much of Willapa Bay is drained, exposing extensive mudflats. More than 50 percent of the total high tide surface area is exposed at low tide (Hedgpeth and Obrebski 1981; Sayce 1988). The intertidal zone is defined as the area above MLLW and below MHHW. Based on 2003 data, 84 square miles of the bay are intertidal (Coastal Resources Alliance 2007). These mudflats tend to be very soft in many locations due to the deposition of fine sediments combined with organic matter, water saturation, and bacterial influence (McConnaughey and McConnaughey 1985). The substrate characteristics vary from being sandy in the northern region of the bay to silty clay in the southern region (O'Connell 2002). Typically, vegetation is scarce, but beds of eelgrass are present within Willapa Bay. Intertidal flats support an abundance of invertebrates including oysters, clams, mussels, amphipods, polychaete and oligochaete worms, insect larvae, and nematodes. Foraging shorebirds follow the receding tide across the flats, and fish and waterbirds frequent the flats when they are flooded. Organisms of intertidal flats must cope with the stress of currents, varied wave action, and tides. Intertidal life is

also be affected by light level, temperature change, amounts of oxygen, salinity, and exposure to air and wind (McConnaughey and McConnaughey 1985).

Native eelgrass (*Zostera marina*) is a seed-producing marine plant that provides food and habitat for a variety of organisms. Vast beds of eelgrass occur at the lower levels of the intertidal zone and are a staple food for brant, a sea goose that migrates through or winters in Willapa Bay. American wigeon, mallard, northern pintail (*Anas acuta*), and canvasback (*Aythya valisineria*) also feed on eelgrass (Phillips 1984). Roots and stems of eelgrass assist in stabilization of mudflats. Blades of eelgrass are grazed and also support the growth of diatoms and small invertebrates that accumulate on the blades. Eelgrass also supplies detritus, which contributes to the food cycle (McConnaughey and McConnaughey 1985). Eelgrass provides habitat for numerous species of mollusks and crustaceans, and serves as a nursery ground for juvenile, resident, and migrating fish (Kikuchi 1980). It is used for refuge and feeding by salmon species and Pacific herring (*Clupea pallasii*) (Simenstad 1994). An exotic eelgrass, Japanese eelgrass (*Zostera japonica*), is also present in Willapa Bay. At the current time it is unknown whether this eelgrass species poses any threat to the Willapa Bay ecosystem. However, evidence exists that the expansion of *Z. japonica* has provided a major food source for migratory waterfowl (Boersma et al. 2006; Phillips 1984).

The upper edges of the intertidal flats are ringed by salt-tolerant plants called halopytes which serve as sediment traps and add much organic matter to the estuarine system (McConnaughey and McConnaughey 1985).

A recent major ecological concern involved the substantial loss of high intertidal flats and native salt marsh vegetation due to invasion by *Spartina alterniflora* (smooth cordgrass). *Spartina*, a non-native cordgrass that was accidently introduced to the Willapa Bay ecosystem from the East Coast in the late 1800s, formerly covered a large portion (>14,000 acres) of Willapa Bay's intertidal mudflats (Boersma et al. 2006). *Spartina* forms dense monotypic stands, traps sediment, and alters natural hydrologic processes. The loss of most of Willapa Bay's intertidal mudflats and native salt marsh communities was imminent. *Spartina* had, and would have continued to have, a devastating effect on use of the bay by shorebirds, brant and other waterfowl species, anadromous fish, and Willapa Bay's oyster and hardshell clam aquaculture industry. However, due to eradication efforts by Federal, State, and county agencies as well as the efforts of the oyster industry and private landowners, and additional support by Washington State University, the University of Washington, and nongovernmental organizations, including TNC, *Spartina* is now nearly absent from Willapa Bay. The major portion of the intensive eradication effort took place from 2003 through 2008. Use of areas within the bay by shorebirds and waterfowl dramatically increased after removal of *Spartina* from tidal mudflats (Patten and O'Casey 2007).

## 4.3.5 Salt Marsh

Salt marsh occurs in the estuary where the ground is high enough (not flooded too deeply for too long) to support emergent herbaceous plants, but too low and wet to support shrubs or trees. Salt marshes are generally found from elevations of about MLLW to MHHW.

Salt marsh grasses, algae, and phytoplankton are major producers in estuaries. Halophytes, plants that are adapted to salty conditions, including pickleweed, seashore salt grass, jaumea, alkali grass (*Puccinellia* spp.), seaside arrow grass, sandspurry (*Spergularia* spp.), seaside plantain, and salt marsh wort, are found in the low to high marsh zones. Low marshes are those nearest the low-tide line which may be covered with each high tide. High marshes are generally only covered by the tide

on very few occasions. Tufted hairgrass, Pacific silverweed (*Potentilla pacifica*), saltmarsh bulrush, and Lyngby's sedge are found in high salt marshes.

Salt marshes provide an abundance of food for the invertebrates, fish, birds, and mammals of the estuary. The vegetation filters pollutants from the water. The plant seeds, roots, tubers, and leaves feed many thousands of ducks and geese. Plant matter from the marshes breaks down and is transported by tidal action into the bay. Decaying remains of plants are fed upon by larger organisms, including filter feeders, and so on up the food chain. Juvenile salmon and other fish find an abundance of food in the marshes, as well as shelter from strong currents and predators. Bald eagles, great blue herons, and other predators are attracted to the abundance of life. The productivity of the marshes is critical to the health of the estuary.

According to ONRC calculations, Willapa Bay originally contained approximately 14,620 acres of saltwater wetlands. Now there are 5,277 acres. This represents a 64 percent loss of estuarine wetlands (Coastal Resources Alliance 2007).

The Refuge desires to undertake a program of estuarine restoration (Appendix O) in select portions of the Refuge. This action will maximize and enhance the estuarine open water, intertidal flats, and salt marsh habitats.

## 4.3.6 Riverine

Willapa National Wildlife Refuge has the responsibility for approximately 20 streams with fish populations. Both permanent and intermittent streams are represented on the Refuge and are classified as low- to medium-gradient streams and high-gradient streams, which are found on steep slopes.

Land use activities and previous land management practices have impacted wildlife habitat values in and along rivers and streams in the Willapa Bay watershed and contributed to the decline of fish runs. Stream processes in many areas have been altered. Degradation of streams, including those on the Refuge, has occurred historically. Problems include loss of connectivity to the estuary due to highway and dike construction, hydrologic regime alteration, presence of fish passage barriers, water quality issues (i.e., temperature and sedimentation), and presence of exotic species.

Refuge streams and rivers support runs of anadromous fish such as chum, coho and Chinook salmon, as well as cutthroat trout. Western brook lamprey (*Lampetra richardsoni*) are resident in some of the streams as are rare amphibians such as the Columbia torrent salamander and tailed frog (*Ascaphus truei*). Transplanted populations of western pearlshell mussels are also present in several refuge streams.

Historically, streams contained large amounts of woody debris that created a complex aquatic environment of riffles, pools, glides, runs and side channels. Habitat features of healthy riverine systems include:

- Large woody debris: The presence of large woody debris (LWD) in a stream/river system is an important component that impacts channel formation and channel stability. LWD in a stream or river bed will cause changes in morphology of channels by slowing water velocity. This will trap sediments and create pools while causing riffles to form downstream. In high-energy streams, LWD will assist in the retention of spawning gravel as well as provide

thermal and physical cover for fish and other species. Another benefit of LWD is providing habitat as well as nutrient sources for macroinvertebrates and microorganisms (Schuett-Hames et al. 1999).

- Pool/riffle ratio: Healthy streams should have a pool/riffle ratio of at least 1:1 (Cheo and Murdoch 1991). This ratio is the number of pools and the number of riffles observed visually within a stream reach.

Another important component of a healthy riverine system is an intact and diverse riparian vegetation zone. Positive effects of a healthy riparian zone include (Applied Environmental Services 2002):

- Stabilization of streambanks, which reduces sedimentation and the effects of flooding.
- Reduction of the addition of pollutants into the stream from runoff.
- Control of stream temperatures by providing canopy shade.
- Providing refuge for wildlife.
- Addition of organic matter from leaf litter and fallen branches.
- Addition of LWD from dead vegetation that falls and enters the stream.

Restoration of riverine habitat is a priority for the Refuge. The initial restoration project on the Refuge was at Headquarters Stream, with the goal of re-establishing chum and coho salmon and sea-run cutthroat trout, which were extirpated from this stream in the late 1940s. Restoration activities were initiated in 1997. Physical improvements consisted of removing fish passage barriers (which included a tidegate, flash board risers, culverts, and a check dam), incorporation of LWD and root wads within the stream, rehabilitating spawning beds, and re-establishing a chum salmon run as well as cutthroat trout. Coho salmon recolonized the stream when passage barriers were removed.

Stream and estuarine restoration is undertaken as a management action to restore historic ecological processes and functions to refuge streams and estuarine habitats to benefit anadromous fish populations and other stream-dependent wildlife. Refuge lands where stream and estuarine restoration is feasible stretch from the Naselle River, near the base of the Stanley Peninsula, to Tarlatt Slough, at the southern end of Willapa Bay and include Long Island. The Refuge restores stream habitat by re-establishing LWD complexes in a fashion that mimics natural LWD presumed to have been historically present in the stream. LWD complexes are placed in the existing stream channels by high-line cabling or other heavy equipment where feasible, keeping impacts to streamside habitat to a minimum. Complexes that contain root wads are preferred as this is a more natural condition. Channel structure sometimes needs to be modified, fish barriers may need to be removed, and portions of the riparian zone may need to be restored by plantings. The Refuge has an environmental assessment for stream restoration that was signed in 2003.

As a management tool the Willapa NWR has had a reintroduction program for salmonids, including chum and coho salmon as well as sea-run cutthroat trout, since 1996. Wild sea-run cutthroat trout have been introduced to several refuge streams, starting in December 2000 and continuing on an annual basis as fish have been available. The fish are trapped incidental to salmon hatchery operations at the Naselle and Nemah River hatcheries, transported to the Refuge, and released in refuge streams. A small piece of caudal or adipose fin is clipped by WDFW personnel for DNA analysis. During the relocation process, fish are released in small groups along a length of the target stream, primarily in pools. Fish are placed in buckets and hand-carried to the stream site. On occasion, fresh or frozen salmon eggs are also placed in pools or broadcast as a food source for the

cutthroat trout. Salmon carcasses are also received from local fish hatcheries and are placed along streams to enhance nutrient levels.

In addition, the Refuge maintains fish egg trays for egg reintroduction efforts for chum and coho salmon and conducts release of chum and coho fry. A chum restoration project was initiated in 1998 in cooperation with the Willapa Bay Regional Fisheries Enhancement Group and the WDFW.

## 4.3.7 Seasonal, Managed Freshwater Wetlands

The Lewis and Porter Point Units, located on the southwestern shore of Willapa Bay, contain diked freshwater marshes and are managed for migrating and wintering waterfowl, primarily duck use. Since the 1980s, these units have been converted to freshwater marsh from poorly drained pastures. Marsh plants include bulrush, cattail, sedges, spike-rush, bur-reed, beggarticks (*Bidens* spp.), juncus, smartweed, mannagrass (*Glyceria* spp.), water pennywort, several species of pondweed, and duckweed (*Callitrichaceae heterophylla*). Native emergent and submerged aquatic plants are present as are non-native invasive species including reed canarygrass, tussock, and bog loosestrife. Marshes on the Lewis and Porter Point Units are drawn down through water control structures on a rotational basis. Draw-downs are conducted to accomplish a variety objectives including providing mudflat areas for moist soil vegetation to proliferate for waterfowl food sources; exposing impoundment beds to drying action in order to control reed canarygrass, tussock, and bog loosestrife infestations; and controlling non-native bullfrog populations. In addition to vegetation management via water manipulation, chemical control, mowing, and/or disking are used to control reed canarygrass and tussock. Water level manipulation is used to encourage seed set and proliferation of smartweed, beggarticks, and bur-reed. Exposed mudflats also provide foraging areas for shorebirds. Draw-downs are also timed to maximize the period for native amphibian development before the impoundment is completely dried out. Natural flooding in the fall provides access to smartweed and other waterfowl foods for migrating and wintering waterfowl. The Lewis and Porter Point impoundments are also fed by small streams originating in timber company properties. Water levels are maintained at approximately 11.7 feet, except during draw-down. Fish ladders are incorporated into these systems to allow ingress and egress of fish species, which include coho salmon, sea-run cutthroat trout, and other native fish species. Small seasonal freshwater wetlands are maintained at the Riekkola and Tarlatt Units. Use of refuge impoundments by waterbirds other than waterfowl, such as grebes, herons, bitterns, and rails, occurs. These shallow, vegetated wetlands provide breeding habitat for red-legged frogs, Pacific treefrogs, roughskin newts (*Taricha granulosa*), and northwestern salamanders (*Ambystoma gracile*). River otters (*Lutra canadensis*) and non-native nutria also use impoundments.

## 4.3.8 Permanent/Semipermanent Natural Freshwater Wetlands

Permanent and semipermanent natural freshwater wetlands on the Refuge are diverse habitats and include swamps, marshes, seeps, springs, and seasonal wetlands. Also included in this category are beaver ponds, which have been constructed through dam building and maintained by these mammals in various refuge streams, creating open ponds and marshes which provide important ecological benefits to a variety of wildlife species.

Beavers are an important source of disturbance in natural ecosystems. By constructing dams and impounding streams, beavers considerably alter stream hydrology in a way that provides extensive benefits to fish as well as other organisms, resulting in a high species diversity supported by these systems (Rossell et al. 2005). Cutthroat trout make extensive use of beaver ponds for overwintering

and feeding (Johnson et al. 1999), and coho often use these areas as winter habitat (Narver 1978 *in* McMahon 1983). Beaver ponds on Willapa NWR streams provide winter habitat for both juvenile cutthroat and coho. Maintaining beaver ponds on these streams will benefit cutthroat and coho by providing winter habitat as well as rearing and feeding areas (Pollock et al. 2004; USFWS 2004b).

Beaver ponds create habitat complexity and an abundance of woody debris, and they often contain snags standing in open water. These snags are important nesting habitat for wood ducks, tree swallows, and woodpeckers. They are also used as hunting perches by a variety of raptors.

There are a few small freshwater ponds on Long Island. Extensive sloughs have developed on the eastern shore of the island and penetrate westerly for a considerable distance into the interior. Lewis Slough at the north end has almost bisected the island.

Freshwater marsh and bog communities scattered throughout Long Island's drainages make up about 0.2 percent of the land surface. Plant species associated with these wetlands include skunk cabbage, yellow pond lily (*Nuphar polysepalum*), pondweeds, bladderworts, grasses, sedges, and rushes.

Freshwater wetlands and surrounding vegetation support a variety of birds such as great blue herons, marsh wrens (*Cistothorus palustris*), common yellowthroats (*Geothlypis trichas*), and song sparrows (*Melospiza melodia*).

Interdunal freshwater wetlands are found at the Leadbetter Point Unit of the Refuge on the north end of the Long Beach Peninsula and are of relatively high ecological integrity when compared to what remains of these habitats in Washington. The deflation plain and dune troughs that contain this habitat are composed of five recognized plant communities and occur in relationship to a moisture gradient from seasonally wet and seasonally dry to permanently flooded. These include areas which remain moist, areas which flood through the spring, and areas that are flooded year-round (Caicco 1989). Slough sedge and Pacific silverweed are found in the moister zones of these habitats. These interdunal freshwater wetlands provide habitat for waterfowl, waterbirds, songbirds, amphibians, and invertebrates.

#### 4.3.8.1 Visitor/Administrative and Maintenance Site

Two types of wetlands have been delineated on the property: one large estuarine wetland along Tarlatt Slough, and several depressional emergent wetlands are found in a central and narrow strip generally running north and south through western portion of the site near Sandridge Road. The depressional wetlands on-site appear to coincide with the Yaquina loamy fine sand soil mapping unit, which is somewhat poorly drained and appears to have a water table closer to the surface. Vegetation characteristic of wetlands and evidence of wet soils can be readily observed on the site in the designated wetland areas.

Dominant species within the estuarine wetland include slough sedge, skunk cabbage, common cattail (*Typha latifolia*), duckweed, Nootka rose (*Rosa nutkana*), Hooker willow (*Salix hookeriana*), soft rush (*Juncus effusus*), reed canarygrass, red alder, water parsley (*Oenanthe sarmentosa*), western red cedar, small-fruited bulrush (*Scirpus microcarpus*), salmonberry, and creeping buttercup (*Ranunculus repens*). The large estuarine wetland meets the criteria for Category I rating, according to WDOE standards described in the Wetland Rating Form for Western Washington (WDOE 2004). Category I wetlands represent the highest quality wetlands in the State of Washington. They provide life support

function for threatened or endangered species, they are nurseries of the ocean, and they provide shelter and food for fish, birds, and wildlife (Key Environmental Solutions 2010).

Dominant species within the depressional emergent wetlands include soft rush, other rushes (*Juncus* sp.), slough sedge, tussock sedge (*Carex stricta*), reed canarygrass, common velvet grass (*Holcus lanatus*), and creeping buttercup. The depressional wetlands are one-stratum emergent wetlands and generally appear to be degraded, probably due to past land use practices, such as agriculture, including pasturing. These wetlands meet the basic criteria for a Category IV wetland rating (Key Environmental Solutions 2010).

Pacific County Critical Areas and Resources Land Ordinance No. 147 (CARL) will require the issuance of a development permit for work within or adjacent to all wetlands on-site. CARL establishes buffers around all wetlands, using the WDOE Washington State Wetlands Rating System for Western Washington (WDOE 2004). Buffer widths are determined by the wetland quality rating, with higher quality wetlands requiring greater buffer protection zones. The Category I wetlands will have a designated 100-foot buffer zone, whereas a Category IV wetlands will have a 25-foot buffer protection zone. The wetlands found on the site will also be subject to Federal and State removal/fill wetland regulations if impacted.

### 4.3.9 Coastal Dunes and Beaches

Sand beaches with associated dunes dominate the southern Washington Pacific coastline, while the northern coast is more rugged and rocky with steep headlands and numerous offshore islands and rocks. Willapa Bay and Grays Harbor are two large bays located along the outer coast in the southern half of the state. Historically, low hummock sand dune formations, which were characterized by large areas of open sand, were formed by sparsely vegetated native dune plant species. Coastal marine and wind processes worked to maintain native plant communities in early successional stages on the outer prism of many of these beaches. Where dunes were more stable and blowouts less frequent, a mosaic of native prairie and dune grasslands, freshwater lakes, swamps, bogs, and spruce-dominated forests developed. High rainfall maintained high water tables favorable for plant growth.

Invasive, non-native beachgrasses (*Ammophila* spp.) planted to stabilize dune communities have change dune morphology and native plant communities. Mild climate allows vegetation to establish easily and rapidly. Accelerated succession due to fire suppression progresses from herbaceous beachgrass, to shrub (often invasive non-natives such as Scotch broom [*Cytisus scoparius*] and common gorse [*Ulex europaeus*]), to pioneer lodgepole pine or climax Sitka spruce forest. The Columbia River once created extensive sediment transport and ocean currents influenced by a log-shore drift deposited sediment continually nourishing the coastal sand beaches. Dams on the Columbia River have altered sediment loads, and jetties at the river mouth and entrances to the bays have altered sediment transport.

The endangered pink sandverbena and other rare native dune plants like yellow sandverbena (*Abronia latifolia*), gray beach pea, and beach morning glory are found along the sparsely vegetated sand beaches and coastal dunes within the Refuge where the spread of non-native beachgrass is controlled or kept in low densities due to the influence of naturally occurring erosion processes.

The Leadbetter Point Unit lies at the northern tip of the Long Beach Peninsula, at the mouth of Willapa Bay, in Pacific County, Washington. The Long Beach Peninsula separates the Pacific Ocean

from Willapa Bay. The west side of the area is characterized by open windswept beaches backed by low vegetated dunes. The tip of the peninsula was largely barren sand, and the east side consists of a narrow beach with a few small, sheltered openings cut into the beachgrass by high water in winter. A small, isolated portion of beach exists to the east, on Willapa Bay, and is referred to as Grassy Island, although it is attached to the peninsula.

The northern end of the Long Beach Peninsula was in a state of gradual northward accretion from at least 1965 to 1999. Invasion of American beachgrass and European beachgrass has followed accretion, progressively filling in the dunes behind the sand spit. In conjunction with slowed accretion in more recent years, the vegetation line has moved westward and the vegetation-to-water distance has decreased (Phipps 1990) resulting in a narrower beach and probably less suitable plover habitat. Recent maps from the Washington State Department of Transportation show that the tip of Leadbetter Point has been gradually eroding since mapping efforts began in 1999. As the tip has eroded, the peninsula to the southwest has gotten wider. Leadbetter Point is one of the northernmost breeding sites for the western snowy plover on the Pacific Coast (Jaques 2001).

The unique natural elements protected at Leadbetter Point include salt marsh, native dunegrass, lodgepole pine (shore pine) forest, shrub/lodgepole pine (shore pine), and open beach habitats. Leadbetter Point contains high-quality examples of high-salinity Virginia glasswort (*Salicornia depressa*)/inland saltgrass marsh, low salinity marsh, and transition zone wetlands. Flora associated with the marshes are of primary significance, as are the dune grassland and deflation plain communities. Pockets of native plants within the secondary dunes, deflation plains, and dune troughs are also significant ecological features and are of high quality compared to these remaining plant communities in Washington. The open beach and dune grassland communities of Leadbetter Point have been significantly impacted by the invasion and naturalization of two non-native beachgrasses. The salt marsh has been invaded by smooth cordgrass (*Spartina alterniflora*), an eastern salt marsh species, although efforts to control cordgrass in recent years have essentially eliminated it from Leadbetter Point. Selective removal or control of plant species not native to Leadbetter Point, including *Spartina*, Scotch broom, and common gorse, was an approved management activity at the time the RNA was established. Removal and control of the non-native beachgrasses has been approved and work has been done as part of the management of habitat for the federally threatened/State endangered western snowy plover (Caicco 1989; Willapa NWR files).

## 4.3.10 Grasslands and Short-grass Fields

Native grasslands occurred historically on the Long Beach Peninsula. Currently there are very few of these native plant communities remaining. Where grasslands still exist they are often pastures of introduced grasses and, in wetter areas, sedges, managed as livestock rangeland, golf courses, and residential lawns. Willapa NWR is planning to develop a habitat restoration project to create early successional, coastally influenced grassland habitat for the Oregon silverspot butterfly. WDFW has already implemented a similar project at two small sites on State land on the Long Beach Peninsula.

Proximity to the salt spray from the ocean, mild temperatures, high rainfall, and fog have maintained the low-growing, open natural grasslands by suppressing encroaching trees and shrubs. Natural processes responsible for sustaining the community structure and composition are wind transport of sand, small mammal activity, herbivory, and fire.

Habitat loss has resulted from dune stabilization caused by the introduction and spread of non-native beachgrass that encourages rapid succession to forested habitats. The early blue violet, a host plant

of the Oregon silverspot butterfly larvae, and other native grasses and forbs, are out-competed by the introduced grasses and herbs and shaded out by weedy shrubs and expanding pioneer lodgepole pine forests. As coastal areas become stabilized and developed, the influence of natural processes that sustain native habitats is reduced or eliminated.

The Refuge currently has several managed short-grass pastures in the South Bay Units. Together, these pastures total 250.5 acres.

## 4.4 Fish

Coastal rivers and streams within the Refuge provide habitat for several anadromous salmon species, including chum, coho, and Chinook salmon; steelhead; and sea-run cutthroat trout. The Bear River estuary provides rearing habitat for juvenile fish, as well as a staging area for adult anadromous fish preparing to move into and out of Bear River. Chum, coho, and Chinook salmon, as well as steelhead and cutthroat trout, are all found in the Bear River. The small unnamed stream near the current headquarters, often referred to as the Headquarters Stream, has during a numbers of years, experienced a fall run of chum salmon. This stream also contains rearing habitat for coho and Chinook salmon and coastal cutthroat trout and contains resident sculpin (*Cottus* spp.). Other streams on the Refuge currently support chum and coho runs. The unnamed streams in the Lewis and Porter Point Units support sculpin and coastal cutthroat trout. A small coho run has been documented in Lewis Stream. Fish ladders at the Lewis and Porter Point water control structures allow anadromous fish passage.

Federal species of concern found on the Refuge include coastal cutthroat trout, Pacific lamprey (*Lampetra tridentata*), and river lamprey (*L. ayresi*). Healthy populations of both cutthroat and coho as well as other fish species have been documented in several refuge streams. Fish surveys are conducted either by trapping, walking along a stream, or conducting snorkel surveys. Electrofishing of streams is also conducted by trained individuals. Reproductive surveys have also been conducted. Spawning by cutthroat trout, coho salmon, and chum salmon and production of fry have been documented. Sticklebacks (Family Gasterosteidae) are found in refuge freshwater impoundments and streams.

### 4.4.1 Salmonids

Chum, coho, and Chinook salmon; steelhead; and sea-run cutthroat trout use the Willapa Bay estuary as a feeding and nursery area, as well as a migration route to spawning areas in tributary streams. Occasionally pink salmon (*Oncorhynchus gorbuscha*) occur in the bay.

Salmon often account for 80 to 90 percent of the finfish caught in the Willapa Bay area; however, their numbers are declining (The Willapa Alliance 1998a). Along the Washington coast, the largest chum populations are found within the rivers of Grays Harbor and Willapa Bay (WDFW 2000). Willapa Bay historically supported large chum runs and contained excellent chum habitat (Stewart and Associates 2007). However, currently chum runs are critically low (Applied Environmental Services 2001; Craig 2009; The Willapa Alliance 1998b). Since 1960 the average return of chum salmon is approximately one-third of that recorded prior to that year. The majority of the salmon commercially caught in Willapa Bay were chum, historically averaging 50 percent of the total salmon catch. Recently chum have accounted for less than 1 percent of the total commercial catch in Willapa Bay. Returns of Chinook and coho salmon have also fallen to approximately one-half of the catch levels recorded in the early 1900s (The Willapa Alliance 1998a).

Although life histories vary considerably among and within species of Pacific salmon (see Groot and Margolis 1991), the general life cycle for Pacific salmon consists of adult spawning in fresh water and subsequent death of adults, egg development and juvenile rearing, juvenile migration to salt water, growth and maturation in salt water, and adult migration to freshwater spawning habitats (NRC 1996). Adult salmon primarily spawn in the fall, however, the season that Chinook salmon return to fresh water prior to spawning is used to describe specific "runs" (e.g., fall-, spring-, summer-run). Most Chinook in Willapa Bay return in the fall. Two life histories of Chinook salmon, stream- and ocean-type, are also distinguished by the residency of juveniles in fresh water (Bottom et al. 2005; Fresh et al. 2003; Healey 1991; NRC 1996). Stream-type fish spend one to two years in streams and rivers prior to migrating to salt water, whereas ocean-type fish migrate in their first year after spending up to a few months in streams or rivers. Ocean-type fish also rear in lower reaches of rivers and estuaries much more than stream-type fish. Juvenile chum salmon migrate to salt water either immediately or within a few weeks after emergence, and coho salmon generally spend a year rearing in fresh water before migrating (NRC 1996).

Steelhead and coastal cutthroat trout exhibit substantial variability in their life histories (Behnke 1992; Burgner et al. 1992; Hall et al. 1997). Both species spawn during late winter through the spring. Adult steelhead that return to fresh water fully mature during late fall through spring are considered winter-run fish, whereas those that are sexually undeveloped and return during late spring through early fall are considered summer-run fish (Withler 1966). Anadromous individuals of both species may spend one to six years in fresh water with most migrating after at least two years (Burgner et al. 1992; Trotter 1997). Steelhead migrate to the open ocean and spend one to four years before returning to spawn, whereas coastal cutthroat trout migrate to estuaries and nearshore areas for a matter of months before returning to fresh water. Unlike salmon, steelhead and coastal cutthroat trout may survive after spawning and return to salt water to forage and make multiple spawning runs. In addition, coastal cutthroat trout exhibiting resident, fluvial (i.e., migrating to larger rivers only), and anadromous life histories are thought to occur in some streams. Although sea-run cutthroat can spawn several times, resident cutthroat appear to spawn only once (The Willapa Alliance 1998a).

Although the presence of salmonids in the Willapa Bay estuary has seasonal patterns (e.g., peak juvenile abundance in spring and early summer), adults and juveniles consisting of various species, runs, and life history strategies may be present throughout the year. Habitats used directly by salmonids at the Refuge consist of tidally influenced sloughs, marshes, and floodplains, as well as tidally influenced and nontidally influenced portions of streams and rivers for spawning and rearing. These habitats also indirectly provide benefits to salmonids through production and export of nutrients, organic matter, and invertebrates, which contribute to the estuary's food web.

The various species and their periods of adult migration are: Chinook salmon (July-October), coho salmon (July-November), chum salmon (October-November), steelhead (November-March), and sea-run cutthroat trout (July-December).

Young fish of varied species pass to or through the bay when only a few days to a couple of years old. Migration of Chinook salmon occurs during May-July, coho salmon during April-June, chum salmon during January-May, steelhead during April-June, and sea-run cutthroat trout during April-June. Migration of coho yearling salmon, steelhead, and cutthroat trout also occurs during early fall freshets. Salmon and steelhead juveniles can be found in the bay throughout the year (USFWS 1970).

Stream restoration activities have occurred on the Refuge, specifically for salmonid species. The Refuge has had success in reintroducing and enhancing salmonid populations in various streams on the Refuge and restoring physical attributes of streams that have been destroyed or severely impacted by historical land use in the past. Most of the Refuge streams have been affected by historic blocks to fish passage and logging impacts. Restoration methods such elimination of fish passage barriers, placement of large woody debris, nutrient enhancement and restoration of extirpated or reduced salmonid populations via the use of egg trays, remote incubation, fry introduction of chum and coho salmon, and adult transplantation of cutthroat trout have occurred. Restoration activities started in 1997 at Headquarters Stream. This project was aimed at re-establishing chum, coho, and sea-run cutthroat trout, which were extirpated in the late 1940s. After physical restoration of the stream bed occurred, chum eggs were received and hatched in a remote site incubator. Returning adult chum spawners were documented in 2001, 2002, and 2003. Chum fry emergence was also documented in 2004 in Headquarters Stream although adult spawners were not observed.

Stream restoration activities have since occurred in numerous other refuge streams with additional streams targeted for these activities in the future. Reintroduction/enhancement efforts for salmonid species have occurred in the Cedar Grove Stream on Long Island and on the mainland, including Porter Point and Lewis Impoundments/Streams, North Creek, Chum Creek, Lost Creek, North Headquarters, South Headquarters, and Teal Slough Streams. Major partners in these endeavors include the Willapa Bay Regional Fisheries Enhancement Group and the WDFW.

Fish ladder installation at Lewis and Porter Point has facilitated fish access to two spawning streams. Two small coho runs were documented in 2009 in the Lewis Stream, and coho fry were also observed in this stream.

### 4.4.2 Forage Fishes

This group includes anchovies, herring, and smelt, all of which are important forage species in Willapa Bay for other fish.

Pacific herring use Willapa Bay as a spawning and nursery ground. The eggs are adhesive and can be found on rocks, piling, seaweed, and eelgrass during January and February, where they remain until hatching. Immature herring are found in the bay during the spring, summer, and fall months.

Northern anchovies (*Engraulis mordax*), although spawning in the ocean, are plentiful in the bay during the period June through September.

Longfin smelt (*Spirinchus thaleichthys*) and silver smelt occur in the area. In general, the longfin smelt are in deeper water, while silver smelt inhabit the plankton-rich tidal flats. Longfin smelt spawn in the brackish and lower freshwater reaches of tributary streams, while silver smelt spawn on coarse sandy beaches. Eulachon (Pacific smelt) occur in the bay and were listed as a threatened species under the Endangered Species Act in 2010.

American shad (*Alosa sapidissima*) adults migrate through the bay during the late spring and early summer on their way to upstream spawning areas (USFWS 1970).

### 4.4.3 Sturgeon

Sturgeon are found in Willapa Bay. White sturgeon (*Acipenser transmontanus*) are primarily limited to the Willapa and Naselle River areas. It is believed that adults of this species move upstream in late winter and early spring to spawn (USFWS 1970). The green sturgeon (*A. medirostris*) is also found in Willapa Bay and was listed as a threatened species under the Endangered Species Act in 2006.

### 4.4.4 Other Fishes

Starry flounder (*Platichthys stellatus*), sanddab (*Citharichthys* spp.), several species of sole, sea and surf perches, rock and bottom fishes (black cod, flounder, lingcod [*Ophiodon elongatus*], rockfish, true cod), and related species use the bay as a nursery area. Starry flounder are abundant throughout the tideflat and shallow water areas.

Young of the numerous species of rock and bottom fishes, sole, sea perch, etc., use the bay as a nursery area. As these fish mature, they migrate to deep water areas and the ocean front (USFWS 1970).

Lamprey species found in Willapa Bay include the two anadromous species, Pacific lamprey and river lamprey. These lamprey species spawn in fresh water. An entirely freshwater species, the western brook lamprey has been documented in freshwater streams/rivers on the Refuge including the Bear River, Teal Slough stream, South Creek, North Creek, Chum Creek, and Lost Creek. River lamprey and Pacific lamprey have been documented in the Bear River (Johnson 2010).

## 4.5 Birds

The diverse habitats found at Willapa NWR support a large number of resident and migratory birds. Over 200 bird species have been documented on the Refuge. At the northern tip of the Long Beach Peninsula at Leadbetter Point, shorebirds, including plovers, sandpipers, dunlin, sanderlings, and others, exceed 100,000 annually during the peak spring migration. This site and the estuarine habitats within Willapa Bay make up one of the most significant shorebird areas in North America. Willapa Bay is also an important migration stopover and wintering ground for geese and ducks, many of which breed in Alaska and northern Canada. Great blue heron and several gull species are also common along the coast at Willapa Bay. Coniferous forests on Long Island and in the Refuge along the eastern shores of the bay provide food, shelter, and nesting structure for the marbled murrelet, neotropical songbirds, woodpeckers, owls, and raptors. The upland and estuarine grasslands and early successional, coastally influenced grasslands also support a number of resident and seasonal birds. Pelagic seabirds such as shearwaters (*Puffinus* spp.), fulmars (*Fulmarus* spp.), jaegers (*Stercorarius* spp.), and albatrosses occur in the adjacent coastal Pacific waters but rarely make landfall within the Refuge. Key focal species that breed, overwinter, or regularly use the Refuge as a stopover during migration are discussed in more detail in the following section.

### 4.5.1 Waterbirds

#### 4.5.1.1 Common Loon (*Gavia immer*)

The NAWCP classifies the common loon as a species of moderate concern, meaning populations are either declining with moderate threats or distributions, stable with known or potential threats and

moderate to restricted distributions, or relatively small with relatively restricted distributions. The common loon is not classified as a federally listed species at this time, because there is no evidence of a declining population or a substantial change in distribution. The WDFW classifies the common loon as a sensitive species because it is "vulnerable or declining and is likely to become endangered or threatened throughout a significant portion of its range within the state without cooperative management or removal of threats" (WAC 232-12-297, Section 2.6).

Because historical records are somewhat unreliable and surveys have not been comprehensive, it is not known if the population is currently stable, increasing, or decreasing (Richardson et al. 2000). Evers (2004) describes the overall population as "healthy and robust" and states the "results from winter counts indicate a steady increasing trend in the number of loons and long-term recovery in the overall breeding population since the mid-1900s." However, a finding of the Marshbird Workshop held in 2005 estimated significant potential threats exist to common loons that have not actually occurred to a majority of populations. Although threats such as shoreline development, human disturbance, predation, oil spills, harmful algal blooms, bycatch from commercial gillnetting, lead poisoning, and overfishing of forage fish have been identified, the severity of these threats to the breeding population is not well understood (Evers 2004; Marshbird Workshop 2005; McIntyre and Barr 1997; Richardson et al. 2000). Numbers of known nests have increased over the past 15 years, but this increase may be a result of increased survey efforts (Richardson et al. 2000). New information on these and other issues affecting common loons will be needed to better understand their current status.

Suitable nesting habitat for common loons does not exist at Willapa NWR, and migrating loons rarely make landfall within the Refuge, although they are regular inhabitants of the surrounding marine waters.

#### 4.5.1.2 Aleutian Cackling Goose (*Branta hutchinsii leucopareia*)

The Aleutian cackling goose was classified as an endangered species in 1967, primarily due to a declining population caused by predation on their nesting grounds from introduced arctic and red foxes. The species listing status was changed to threatened in 1991. A revised Federal recovery plan outlined three major delisting criteria: 1) maintain a wild population of at least 7,500 animals, 2) re-establish self-sustaining populations of geese on three former breeding areas, and 3) maintain adequate migration and wintering habitats. In 2001 the Aleutian cackling goose was removed from the Federal endangered and threatened species list, because all the major delisting criteria had been exceeded. Since that time the population has continued to increase and now numbers over 70,000 based on winter surveys conducted in 2003-2004 (Pacific Flyway Council 2005).

Willapa NWR and the fields and farm pastures adjoining Willapa Bay provide foraging habitat for Aleutian cackling geese during the fall migration from September to late November. Peak counts at Willapa during the mid-1990s averaged from 300 to 400 birds (Hays 1997; Kraege 2005). Winter goose survey numbers in Willapa Bay were much lower, representing less than 1 percent of the geese examined, from 2000 until 2004, when surveys were curtailed. Low numbers are typically seen during the northern migration in February and March each year. The highest number of spring migrating Aleutian cackling geese in Washington through the mid-1990s was 52 birds recorded in Willapa Bay by Pitkin and Lowe (1995). The 2008 calculated population index for Aleutian cackling geese in the Pacific Flyway was 193,321. The most recent three-year average population equals about 179,000, below the Flyway objective of 250,000 birds set by the Pacific Flyway Council.

The increase of cackling geese, which are recovering from historic population lows, has complicated management in the wintering area for dusky Canada geese. Cacklers wintered mainly in California prior to the 1980s, but as the population recovered, its wintering range shifted northward to overlap the range of the dusky. With increasing goose numbers, complaints of crop depredation by all Canada geese have increased significantly.

#### 4.5.1.3 Brant, Pacific population (*Branta bernicla nigricans*)

A primary rationale for creating Willapa NWR in 1937 was conservation of migratory and wintering populations of brant. Brant are one of the most abundant waterbird species passing through Willapa Bay during annual migrations. Brant use eelgrass (*Zostera marina*) beds as a primary food source while in Willapa Bay, often numbering in the thousands of birds. Use of the bay is greatest during the northern spring migration, with peak bird numbers observed from March through May, with use typically highest in April (Figure 4-1). Brant also winter in the area from late October to early May. Total numbers of wintering birds are lower than in the spring, averaging several thousand, but overall there is a lesser degree of interannual variation (Wilson and Atkinson 1995). Historically the brant population was much higher than at present.

The total area in Willapa Bay vegetated by eelgrass has also declined since the mid-1980s, partly due to the spread of *Spartina alterniflora*. With the success of recent *Spartina* control efforts, eelgrass is expected to return to some areas of the bay. Recent winter use has been primarily confined to the northern Bay, but extensive eelgrass beds exist along the western side of Long Island within the Presidential Proclamation Boundary.

Brant harvest in the Pacific Flyway states for 2007 was estimated at 2,800 birds, with Washington State making up slightly less than 20 percent of the total rate of harvest. The 2008 population estimate based on an index derived from midwinter surveys totals 24,972 (Pacific Flyway Council 2008).

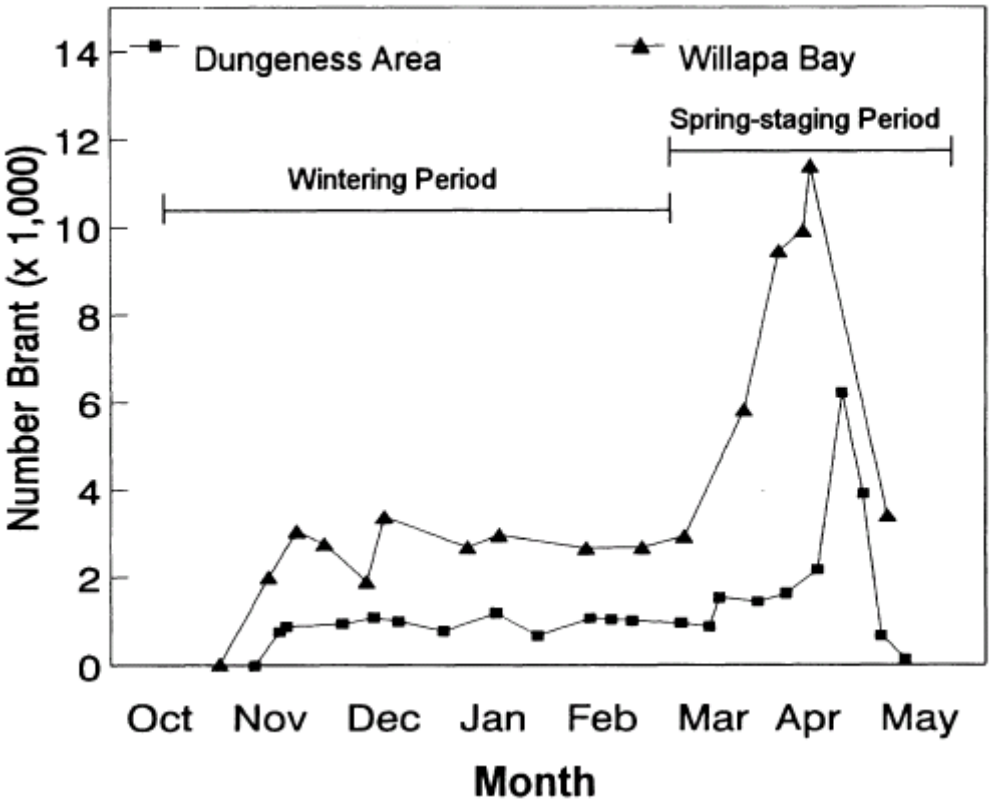


**Figure 4-1. Typical brant use in Willapa Bay and Dungeness Bay, Washington (data from surveys conducted during the 1989-1990 season).**

### 4.5.1.4 Dusky Canada Goose (*Branta canadensis occidentalis*)

A goal of the Pacific Flyway Management Plan is to maintain and enhance the dusky Canada goose population for all of its values to society (USFWS 1992b). The objectives of the plan include achieving and maintaining a wintering population of between 10,000 to 20,000; maintaining wintering habitats in sufficient quantity and quality; and managing wintering habitat to provide optimum food, water, and sanctuary conditions and to provide optimum geographical distribution. On the wintering grounds, the dusky population has declined from historical levels while the total number of Canada geese has reached record highs (Pacific Flyway Council 2008).

The primary wintering area is in the Willamette Valley of western Oregon and on the floodplain of the lower Columbia River in western Oregon and Washington. Although used to a lesser degree, Willapa Bay is considered to be part of the primary dusky wintering range. A limited number of dusky wintering surveys are conducted in Willapa Bay. Surveys totaling approximately 200 to 1,200 dusky Canada geese are typical on the bay during the fall, winter, and early spring. Recent surveys conducted by State and academic biologists at Willapa Bay foraging sites found Dusky goose numbers to be highest early and late in the season. Although the samples sizes were small, no re-sightings of collared dusky geese were made that could indicate birds were spending extended periods of time locally. These data appear to support the belief that a majority of these dusky Canada geese are migrants, briefly stopping in Willapa Bay to feed en route between their Alaska breeding grounds and primary wintering habitats in the Willamette Valley and in the vicinity of Vancouver, Washington, on the Columbia River.

Enumeration and comparison to prior survey results is complicated by resident western Canada geese that have hybridized with introduced dusky geese. These geese are not Alaska-breeding birds. They are descendants of a captive breeding program initiated at Willapa NWR in 1958, when 40 dusky goslings were relocated from the Copper River Delta to the Refuge. The flock grew to about 400 by the mid-1970s, when the program was discontinued. Although recent estimates of flock size are not available, each year on Miller Sands Island in Oregon approximately 40 nests of dark Canada geese are recorded. Since 1999, approximately 1,200 dark Canada geese have been banded and collared on Miller Sands Island (Pacific Flyway Council 2008). Harvest of unmarked hybridized form of western Canada–dusky geese are tallied as dusky geese at check stations and counted toward unit closure thresholds. Continued marking of this small population would reduce the unintended inclusion of these birds in permit zone harvest quotas for dusky geese. However, implementing strategies that allow harvest of abundant subspecies of Canada geese, while protecting dusky geese, is very time-consuming, controversial, and expensive. Dusky geese are more vulnerable to hunting, apparently due to their behavior and habitat use patterns, making control of their harvest difficult (Pacific Flyway Council 2008). Hunting and harvest management is discussed in further detail in Chapter 5.

#### 4.5.1.5 Brown Pelican (*Pelecanus occidentalis*)

In 1970 brown pelicans were added to the Federal list of endangered and threatened wildlife as an endangered species in all but the U.S. Atlantic coast states, Florida, and Alabama. On November 17, 2009, the USFWS published a rule to remove the brown pelican from this list due to recovery (USFWS 2009). The delisting became effective within 30 days of the rule date. The Service concluded that the primary reason for severe declines in the brown pelican population in the United States and for designating the species as endangered was DDT contamination in the 1960s and early 1970s. Banning of DDT, along with other recovery actions, has resulted in increased population numbers and reproductive success. Information now indicates that major threats to brown pelicans have been reduced, managed, or eliminated. A draft post-delisting monitoring plan has been developed and will be put into effect in the Gulf of Mexico and coastal California.

Brown pelicans typically begin to arrive locally in June. They are seen numbering in the thousands along the outer coast of the Leadbetter Point Unit in August and September. Brown pelicans primarily use the Refuge for day roosting or loafing and resting, while feeding on northern anchovy and other small nearshore fishes. Pelicans can also be found on pilings and on sandbars and seasonally inundated sandy islands in estuaries and at the mouths of rivers and large streams. The Columbia River estuary and the northeastern coastal Pacific waters may serve as an important feeding area during years when prey is less abundant in the southern reaches of the California Current System. Over 22,000 pelicans were documented using the East Sand Island night roost on the lower Columbia River in July 2009 (Jaques 2009) This number is about twice that observed in previous summers and is a new high record for that site overall. Pelicans were also observed by refuge staff occurring in larger than normal numbers along the Pacific coast beaches during summer 2009 (Ritchie 2009) Additional data suggest that pelicans bypassed many of their usual California breeding and foraging sites on the way north during the spring and summer of 2009. This pattern is most often observed during El Niño years when food resources become scarce at accustomed foraging areas adjacent to breeding sites.

Recommendations and recovery actions identified in the California Brown Pelican Recovery Plan (USFWS 1983) were considered in the development of this CCP and are described in further detail in Section 4.9.2.

## 4.5.2 Raptors

### 4.5.2.1 Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle is classified in the BCC list and represents one of the Service's highest conservation priorities. The bald eagle was formerly listed under the ESA, primarily due to population declines caused by reproductive failures linked to DDT, and nesting and roosting habitat loss resulting from timber harvest and urban development. Productivity levels are high and the population continues to increase. With observed population growth, the bald eagle was delisted in 2008 but is still protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. A monitoring plan has been prepared to track recovery efficacy (USFWS 2007b).

Bald eagles are found year-round at Willapa NWR. Four known bald eagle territories encompass coastal portions of the Refuge in south Willapa Bay. Nests of two of these territories occur on the Long Island Unit of Willapa NWR. Adult and subadult bald eagles, including a resident pair, can be seen along the outer coast at Leadbetter Point any month of the year. Bald eagles are opportunistic foragers. Eagles in the Willapa Bay region feed on waterbirds, marine mammals, salmonids, and marine fish and invertebrates. Eagles also scavenge fish and animal carcasses in upland areas, along rivers and larger creeks, and on the coast.

### 4.5.2.2 Northern Goshawk (*Accipiter gentilis*)

Northern goshawks can occur in all forested regions of Washington. Northern goshawks are considered opportunistic foragers (Beebe 1974), feeding on a variety of small mammals, gallinaceous birds, and forest birds. As of 2003, there were 338 documented breeding territories in the state (WDFW, unpublished data). The exact number of northern goshawks is not known, because monitoring is not currently being conducted. The number of historical breeding sites lost due to habitat alteration and the number of new territories in suitable habitat are also unknown. Less than 1 percent of recent breeding records have been recorded from the Puget Trough area and southwest Washington (Desimone and Hays 2004). The northern goshawk is a species identified on the BCC list. It is also listed as a Washington State candidate species.

Harvest and fragmentation of forestland have been identified as factors limiting goshawk populations. Although the effects of timber harvesting on goshawks in the United States are not fully understood, there is evidence to suggest that harvest impacts nest site selection (Crocker-Bedford 1990; Desimone 1997; Finn et al. 2002a, 2002b; Reynolds 1989; Ward et al. 1992; Woodbridge and Detrich 1994), and potentially nesting rates (Crocker-Bedford 1990, 1995). In addition, nesting goshawks appear to be largely absent from some extensive forested landscapes in western Washington that have been intensively managed on shorter rotations (WDFW, unpublished data). Fragmentation of suitable habitat potentially increases interaction with competing raptors (e.g., red-tailed hawks, great horned owls [*Bubo virginianus*]) (Crocker-Bedford 1990; Crocker-Bedford and Chaney 1988; Kenward 1996; Moore and Henny 1983).

Northern goshawks are not known to occur on the Refuge. However, some current forestlands contain suitable habitat, and much of the restored upland forests would also support suitable habitat for northern goshawks. The existing Willapa NWR forest management plan uses thinning prescriptions that reflect a balance of different forest age classes to promote forest growth and the development of habitat complexity. A principal objective is restoring ecological function to refuge

forests by creating a natural distribution of stand structure, composition, and successional stages while promoting old-growth/late successional characteristics to benefit forest dependent wildlife.

#### 4.5.2.3 Peregrine Falcon (*Falco peregrinus pealei*)

In Washington, peregrine falcons reached a low of four pairs in 1980. Similar to the bald eagle, a decline in the North American peregrine falcon population was primarily caused by reproductive failures linked to the effects of DDT. In 2000, 56 pairs were counted, doubling the number counted just seven years prior. Peregrine falcons can now be found in most parts of the state where there are cliffs or structures for nesting and sufficient prey. Peregrines feed on a variety of smaller birds that are usually captured on the wing. Hunting territories may extend to a radius of 19-24 km (12-15 miles) from nest sites (Towry 1987). The population is still small and is highly vulnerable to disturbance and environmental contaminants, but productivity levels are high and the population continues to increase. As a result of this recovery, the Federal government down-listed them in August 1999 from endangered to sensitive.

The peregrine falcon is classified in the BCC list and represents one of the Service's highest conservation priorities. Peregrines are found year-round at Willapa NWR but occur more regularly from October through April. In winter and fall, peregrines spend much of their time foraging in areas with large shorebird or waterfowl concentrations, especially in coastal areas (Dekker 1995). They are only known to use the Leadbetter Point Unit but may use other coastal areas within Willapa Bay. Suitable peregrine falcon nesting habitat does not occur within the Refuge.

### 4.5.3 Shorebirds

#### 4.5.3.1 Red Knot (*Calidris canutus roselaari*)

Red knots migrate from the Arctic to as far as the southern tip of South America and back each year. A one-way trip can be about 9,000 miles and involves stops at accustomed staging areas along the way for feeding and resting. There is concern that their population has decreased substantially in recent years, especially the eastern North American (Atlantic) subspecies *C. c. rufa*, which has been designated as a Federal candidate species. The western North American subspecies of red knot (*C. c. roselaari*) is thought to breed in northwest Alaska and Wrangel Island, Russia, and winters along the west coast of North America, including coastal Mexico (Niles et al. 2008). However, the extent of the winter range and important wintering areas of this subspecies are virtually unknown (Buchanan 2006).

Although *C. c. roselaari* is not as much at risk, it is considered a species of concern due to dramatically declining numbers (Buchanan 2006; Morrison et al. 2006). Niles et al. (2008) estimate the *C. c. roselaari* population to be <10,000 and therefore vulnerable. They recommend that both subspecies be listed because of their small, declining populations and the threats they currently face. A recently derived estimate of the size of the *roselaari* subspecies of red knot that migrate through coastal Washington is about 17,000 birds (Buchanan 2011), substantially lower than previous estimates (Drut and Buchanan 2000; Morrison et al. 2006). This estimate likely represents a majority of the total subspecies population, although some birds may not migrate from coastal Mexico. It is possible that *roselaari* has a population perhaps less than half that of the *C. c. rufa* population of red knot, and thus may be vulnerable to a variety of risks, including habitat loss and degradation due to *Spartina* invasion at key sites in Washington.

The Northern Pacific Coast Regional Shorebird Management Plan classifies Willapa Bay and Grays Harbor as sites of international significance. *C. c. roselaari* regularly uses the estuarine habitats in Willapa Bay and Grays Harbor during their spring migration, but it is not currently known how significant these habitats are to migrating red knots during autumn. It is assumed but as yet unproven that they substantially use these estuaries during their fall migration. During spring migration red knots can be seen along the eastern shores of Leadbetter Point.

#### 4.5.3.2 Western Snowy Plover, Pacific coast population (*Charadrius alexandrinus nivosus*)

At the time this document was published, genetic differences between Eurasian and American populations of snowy plovers appeared to be substantial (Küpper et al. 2009). This has prompted the North American Classification Committee of the American Ornithologists' Union to consider whether to split the American snowy plover from the Eurasian (Kentish) plover. If this action is undertaken, the American snowy plover would be represented by three subspecies. The western snowy plover would be given the scientific name *C. nivosus occidentalis*.

On March 5, 1993, the Pacific coast population of the western snowy plover was listed as threatened under provisions of the ESA. The Pacific coast population is defined as those individuals that nest within 50 miles of the Pacific Ocean on the mainland coast, peninsulas, offshore islands, bays, estuaries, or rivers of the United States and Baja California, Mexico (USFWS 2007a). Prior to Federal listing, the WDFW designated the western snowy plover as endangered in 1981. The western snowy plover population has shown an overall declining trend during the last century. Reasons for this decline and the severity of threats vary by region and location but are primarily due to habitat loss and degradation.

Western snowy plover are year-round residents on the Refuge, although most birds migrate south after the breeding season. Adults typically begin breeding in Washington in late March, while most young have fledged by mid-August. Of the six Washington locations identified in the recovery plan as breeding areas, only two are currently occupied. The largest breeding area in Washington is located at the Leadbetter Point Unit of Willapa NWR. Disturbance of nesting plovers at Leadbetter Point occurs to a lesser degree than elsewhere along the southern Washington coast. The spatial extent of suitable habitat and relative isolation of the Leadbetter Point site make it of paramount importance to snowy plover recovery in Washington State. Current western snowy plover population and productivity continue to be below thresholds set as recovery objectives.

Recommendations and recovery actions identified in the western snowy plover recovery plan were considered in the development of this CCP and are described in further detail in Section 4.9.3.

### 4.5.4 Seabirds

#### 4.5.4.1 Marbled Murrelet (*Brachyramphus marmoratus*)

The marbled murrelet is federally listed as a threatened species in California, Oregon, and Washington. The State of Washington has also designated the marbled murrelet as a threatened species. The marbled murrelet is a year-round resident on Washington marine coastal waters within several kilometers of the shoreline. The majority of nesting stands in Washington have been discovered within 63 km (39 miles) of marine waters. Marbled murrelets require suitable canopy structures for nesting that are primarily found in the mature and old-growth coniferous and mixed species forest stands of western Washington. Removal of these forests, primarily by timber

harvesting and urbanization, is the principal factor contributing to the decline of the marbled murrelet and is the most significant impediment to recovery of the species (USFWS 1997a). Habitat fragmentation resulting in increased densities of nest predators and decreased prey availability are also probable limits to long-term productivity and survival. Adult mortality caused by predation, impacts from the effects of oil spills, mortality due to entanglement in fishing gear, chronic water pollution, aquaculture, and disturbance at nesting and foraging sites have also been identified as potential limiting factors. The current overall estimate for the listed population (California, Oregon, and Washington) is >18,000. Trend data indicate an annual decline of between 2.4 and 4.3 percent (Falxa et al. 2009).

Coniferous forests at Willapa NWR support several stands known to be used for nesting by marbled murrelets. Suitable nesting habitats occur on the Long Island, Headquarters, and Teal Slough Units, including two of the RNAs on the Refuge, the 274-acre Cedar Grove RNA and the 88-acre Diamond Point RNA. These low elevation coastal forestlands consist of old-growth and mature western red cedar, Sitka spruce, western hemlock, and Douglas fir trees with large-diameter limbs, abundant canopy epiphytes, and open crowns. These structurally complex stands are formed where a diversity of tree sizes create multilayered canopies with small naturally occurring gaps and stand-level crown defects (e.g., wind breakage and dwarf mistletoe deformation) that develop preferred nesting conditions for the marbled murrelet. Forests with suitable marbled murrelet habitat are very limited in southwestern Washington and northwestern Oregon. The Refuge represents the most significant habitat on Federal land within the Western Washington Lowland Province.

Recommendations and recovery actions identified in the marbled murrelet recovery plan (USFWS 1997a) were considered in the development of this CCP and are described in further detail in Section 4.9.4.

## 4.5.5 Landbirds

### 4.5.5.1 Streaked Horned Lark (*Eremophila alpestris strigata*)

The streaked horned lark subspecies represents a small endemic population that breeds and winters in only a few locations in Oregon and Washington. It is perhaps the most endangered bird in Washington State (Rogers 2000). Historically its range extended further north into southwestern British Columbia and as far south as the Rogue River Valley in Oregon. The population has declined dramatically, and the range contracted significantly. This is primarily attributed to the loss of native prairies, coastal grasslands, and sparsely vegetated beaches as a result of general development, agricultural conversion, and encroachment by forests and introduced beachgrasses. Although systematic range-wide surveys are incomplete, it is estimated that fewer than 1,000 birds remain in the entire population (Pearson and Altman 2005).

Streaked horned lark have been found at Leadbetter Point during surveys conducted during the breeding seasons in 1999 and 2000 (MacLaren and Cummins 2000; Rogers 1999). Breeding surveys have been conducted in collaboration with WDFW after the Refuge began habitat restoration efforts in 2001. Several nests have been found each year. Three nests were found in 2009, but up to 10 territories were estimated to be occupied. Currently the streaked horned lark population and productivity continues to be below thresholds indentified in the range-wide assessment. Nest predation has implemented in this reduced productivity. Pearson et al. (2005) noted that most wintering birds (72 percent) were in the Willamette Valley, with 20 percent along the lower Columbia, 8 percent on the Washington coast, and 1 percent on south Puget Sound sites. Based on

re-sightings of color-banded individuals, many birds on the Washington coast and lower Columbia seem to be resident or move between these two areas (Pearson et al. 2005).

Recommendations and proposed conservation strategies identified in the Species Assessment Form and the Candidate Notice of Review for the streaked horned lark (USFWS 2001c) and the Range-wide Streaked Horned Lark Assessment (Pearson and Altman 2005) were considered in the development of this CCP and are described in further detail in Section 4.9.5.

## 4.5.6 Rare or Extirpated Species

### 4.5.6.1 Northern Spotted Owl (*Strix occidentalis caurina*)

The northern spotted owl was listed under the ESA as threatened on June 26, 1990 (USFWS 1990) because of widespread loss of suitable habitat across the spotted owl's range and the inadequacy of existing regulatory mechanisms to conserve the spotted owl (USFWS 2008a). The final northern spotted owl recovery plan was subsequently published in May 2008. Since the subspecies was listed, the northern spotted owl population has continued to decline, especially in the northern portions of its range. Spotted owls have become rare in certain areas of their historical range, such as British Columbia, southwestern Washington, and the northern coastal ranges of Oregon (USFWS 2008a).

The spotted owl inhabits structurally complex, late seral and old-growth coniferous forests in the Pacific Northwest and northern California. Historically much of the lowland coastal forests and mid-elevation forests of the Cascade and coastal mountain ranges provided spotted owl habitat. Much of that forestland was harvested for lumber and paper production. "Ideally, blocks of habitat should be dispersed in a pattern corresponding to a species' full geographic distribution. This distribution is the key hedge against major catastrophes that could otherwise extinguish the sole remaining population of a once wide-spread species" (Thomas et al. 1990). However, the spotted owl recovery plan excludes the Western Washington Lowland Province from the managed owl conservation area approach because it is assumed that low population numbers are not essential to the species recovery.

Spotted owls historically inhabited forests located within the present day boundaries of the Refuge. A spotted owl pair that nested in the Cedar Grove RNA forest was last observed there in 1985. The following year barred owls (*Strix varia*) were observed occupying the nest. An established spotted owl management circle also encompasses the Teal Slough Unit and most of the Headquarters Unit of the Refuge. This territory was most recently known to be occupied in 1998 when a survey documented a pair of adults and one juvenile spotted owl. Despite the de-emphasis on spotted owl recovery in southwestern Washington, applicable recommendations and recovery actions identified in the northern spotted owl recovery plan (USFWS 2008a) were considered in the development of this CCP. These actions are described in further detail in Section 4.9.6.

### 4.5.6.2 California Condor (*Gymnogyps californianus*)

California condors are listed as endangered in California, but those occurring outside of California are listed as a nonessential experimental population under Section 10 (j) of the ESA. For purposes of this subsection, the term "experimental population" means any population (including any offspring arising solely there from) authorized by the Secretary of the Interior for release under paragraph (2), but only when, and at such times as, the population is wholly separate geographically from nonexperimental populations of the same species. In 1996 a nonessential experimental population of California condors was established in northern Arizona. Since that time condors released in northern

Arizona have exceeded the nonessential experimental area by flying to Wyoming, several points in central and western Utah, Colorado, and elsewhere in Arizona. The current 10 (j) area was expanded to include parts of Arizona, Nevada, and Utah.

Willapa NWR does not and probably never did provide suitable condor nesting habitat. But because condors have wide-ranging foraging patterns, they may have scavenged large mammal carcasses within the area that now includes the Refuge. This is especially true for the Pacific coast portion of the Leadbetter Point Unit, where dead and dying marine mammals regularly wash ashore. During the winter of 1805-1806 Meriwether Lewis documented and captured California condors along the Columbia River. A condor was observed feeding on a whale carcass along the Pacific Coast near the mouth of the river by the exploration party. The last credible sighting of condors in the Pacific Northwest was in Oregon in the early 1900s. In the future, wide-ranging condor flights resulting from an increasing population may find birds moving into areas not currently used. However, expansion of the nonessential experimental area into the Pacific Northwest is not being considered at this time.

## 4.6 Mammals

Forty-five species of native mammals have been documented on the Willapa NWR. Mammals that inhabit the various habitats on the Refuge include Roosevelt elk, black-tailed deer, bobcat (*Lynx rufus*), black bear, mountain lion (*Felis concolor*), coyote (*Canis latrans*), Virginia opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), porcupine (*Erethizon dorsatum*), striped skunk (*Mephitis mephitis*), snowshoe hare (*Lepus americanus*), mink (*Mustela vison*), river otter, beaver (*Castor canadensis*), mountain beaver (*Aplodontia rufa*), Pacific jumping mouse (*Zapus trinotatus*), long-tailed weasel (*Mustela frenata*), northern flying squirrel (*Glaucomys sabrinus*), Townsend's chipmunk (*Eutamias townsendi*), bushy-tailed wood rat (*Neotoma cinerea*), and various species of shrews, moles, mice, and voles. Harbor seals are seen in the bay and the Bear River. The nutria is a non-native mammal that inhabits wetland areas on the Refuge.

The Roosevelt elk is a subspecies that is darker and larger than the Rocky Mountain elk. Habitat on the Refuge includes open fields, fresh and salt water marshes, forested areas, and clearings in forests. An estimate of the elk population in the late 1970s on Long Island was 40 to 45 animals. Refuge staff have documented a herd of approximately 70 animals at Leadbetter Point. Approximately 25 elk have been seen in the Riekkola Unit. Populations of elk in western Washington are variable, ranging from less than one elk per square mile to 12 elk per square mile (USFWS 1978).

Although a population estimate does not exist for the entire Refuge, a study in 1973-1975 estimated the bear population on Long Island to be approximately 30 animals (Lindzey 1976).

Willapa NWR is in an area of high species richness for bats, which tend to have their greatest species numbers in low-elevation forests. The Refuge's combination of late-seral, low-elevation forests combined with wetlands create ideal habitat for a number of bat species (Cassidy et al. 1997). Eight bat species are known to occur on the Refuge, consisting of the little brown myotis (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), Yuma myotis (*M. yumanensis*), long-eared myotis (*M. evotis*), long-legged myotis (*M. volans*), California myotis (*M. californicus*), silver-haired bat (*Lasionycteris noctivagans*), and the hoary bat (*Lasiurus cinereus*). Many of these bat species roost and forage in forested areas and several frequently use snags, stumps and downed logs as day roosts or maternity roosts. The Yuma myotis, long-eared myotis, and long-legged myotis are Federal species of concern.

## 4.7 Reptiles and Amphibians

The cool, wet climate of the Willapa Hills makes the area a "hotspot" of amphibian diversity in Washington. Willapa NWR is particularly noteworthy for the number of amphibian species it supports. It has more amphibians than any other NWR in Washington (14 of 24 native species).

Federal species of concern found on the Refuge include the tailed frog, Columbia torrent salamander, and Van Dyke's salamander. The Refuge supports the greatest number of State-listed amphibians (three of the six) of any NWR in Washington: the Columbia torrent Salamander, Dunn's salamander, and Van Dyke's salamander, all of which are State candidate species. Willapa NWR is the only NWR in Washington on which they occur (Cassidy et al. 1997). The Columbia torrent salamander has a limited range in both Washington and Oregon and relies on mid- and late-seral conifer forest. Dunn's salamander, although it apparently has less stringent habitat requirements, also has a limited range in Washington, and Willapa NWR supplies most of its protected area. The Van Dyke's salamander and the tailed frog occur on the Refuge and are associated with late-seral forests, but with less limited distribution (Cassidy et al. 1997).

Long Island and wet areas amid similar forested areas on the Refuge's mainland are rich in amphibian species. Eighty percent of the amphibian species in Washington are considered obligates of stream- or wetland-related riparian habitat (Knutson and Naef 1997). Eight species of salamander have been found on Long Island: ensatina (*Ensatina eschscholtzii*), Pacific giant salamander (*Dicamptodon tenebrosus*), northwestern salamander, Columbia torrent salamander, western red-backed salamander (*Plethodon vehiculum*), Van Dyke's salamander, Dunn's salamander, and rough-skinned newt (*Taricha granulosa*). Cope's giant salamander (*D. copei*) may occur on the island as well. Many of the species found on Long Island also occur on the mainland within the Refuge and surrounding lands. Some of these amphibian species spend a large part of their life near streams and wet environments within the forest uplands. The Refuge has red-legged frog, Pacific treefrog, and tailed frog in wet habitats, such as marshes, streams, ponds, and seeps. Bullfrogs are an introduced species in the Pacific Northwest, and a control program is in place for this species because they compete with the native frog species and consume native amphibians and young waterfowl. Bullfrogs breed in the managed seasonal wetlands. Because bullfrog tadpoles require two years to mature, the seasonal wetlands are drawn down at least every two years and screens are put in place at the outlet to strand bullfrog tadpoles. The draw-downs are also targeted for mid-July to give the native amphibians, which mature earlier than bullfrogs, time to metamorphose.

Willapa NWR is less of a haven for reptiles than amphibians. Northwestern garter snakes (*Thamnophis ordinoides*) are found in meadows, along forest edges, and in disturbed areas. Common garter snakes (*T. sirtalis*) are common in pastures, forests, and freshwater marshes and near riparian areas. The high number of amphibian species and low number of reptile species on the Refuge is a direct reflection of the relative amphibian and reptile composition of the wet, cold Sitka Spruce zone (Cassidy et al. 1997).

Marine turtles have been observed offshore and mortalities have occasionally washed on shore. The following species may rarely occur in the ocean adjacent to the Refuge: green sea turtle (*Chelonia mydas*), loggerhead sea turtle (*Caretta caretta*), leatherback sea turtle (*Dermochelys coriacea*), and olive ridley sea turtle (*Lepidochelys olivacea*).

# 4.8 Invertebrates

## 4.8.1 Shellfish

The Pacific (Japanese) oyster (*Crassostrea gigas*) and, to a lesser extent, the native Olympic oyster (*Ostrea conchaphila*) are found in the intertidal waters of Willapa Bay, mostly in private oyster beds. The Japanese oyster was introduced into Willapa Bay in 1928 and is the foundation of the bay's most important commercial fishery (USFWS 1978).

Hardshell clams, including the native littleneck (*Protothaca staminea*), butter (*Saxidomus nuttali*), gaper (*Tresus* sp.), cockle, and exotic Manila (*Tapes semidecussata*) clams are present in a porous mixture of sand, gravel, and mud within the tidal zone. The softshell clam (*Mya arenaria*) occurs throughout the bay tidelands and is most frequently found in muddy or sandy bottoms in the upper tidal areas and in the brackish water areas of tributary streams. Razor clams (*Siliqua patula*), mainly thought of as inhabiting the open coast sandy beaches, are found in Willapa Bay. They occur where environmental characteristics resemble those of the coastal sandy beaches (USFWS 1970).

Dungeness crabs (*Cancer magister*) occur throughout Willapa Bay. Immature crabs can be found in abundance on most of the flats year-round, suggesting that Willapa Bay is an important nursery area for this species. These crabs occur further up the bay with the summer intrusion of salt water (USFWS 1970). The red crab is also found in the bay as well as a non-native species, the European green crab (*Carcinus maenas*). Other exotic invertebrate species found within the waters of Willapa Bay include Atlantic oyster drills (*Urosalpinx cinerea*), Japanese oyster drills (*Ocinebrellus inornatus*), Japanese nestling crab, Japanese anemone, Atlantic mudsnail, Atlantic sponge, Atlantic barnacle, the Black and Caspian Sea hydroid (*Cordylophora caspia*), a terebellid worm, and several exotic amphipods and botryllid tunicates (Cohen et al. 2001).

Burrowing and free-swimming species of shrimp are found in the bay. The free-swimming species move into shallow waters and tide flats with the incoming tide and return to deeper channels at low tide. These detritus feeders are an important diet element to all fish large enough to consume them (USFWS 1970).

## 4.8.2 Gastropods

Freshwater snails of the genus *Juga* have been documented on the Refuge.

The Newcomb's littorine snail (*Algamorda newcombiana*) is a Federal species of concern and a State candidate species. This particular species has not been documented on the Refuge but does occur in other salt marsh habitat in Willapa Bay similar to that on the Refuge. The Newcomb's littorine snail lives on the stems of pickleweed and on the substrate beneath the vegetation. This snail occurs just above the high tide line, immersed by seawater only a few hours each year during flood tides.

Habitat for this species is characterized by pickleweed, silverweed, yarrow, tufted hairgrass, seashore saltgrass, seacoast angelica, gumweed, seaside plantain, small spike-rush, seaside arrowgrass, and Lyngby's sedge.

## 4.8.3 Native Freshwater Mussels

Native freshwater mussels have been declining in North America. Nearly three-quarters of the 297 known species are imperiled and 35 are thought to have gone extinct in the last century (Nedeau et al. 2009; Stein et al. 2000).

The western pearlshell mussel is found in Pacific drainages from California to British Columbia and southern Alaska (Nedeau et al. 2009). This freshwater bivalve requires cold, well-oxygenated, low-gradient streams. The western pearlshell is capable of living over 100 years. This mussel species has been documented in the Naselle and Bear rivers and some tributaries of these systems. Several small streams on the Refuge contain suitable habitat for this mussel and may have contained some small populations historically that were more than likely affected by land uses which altered stream processes and increased sedimentation, including timber harvest, road building, and stream cleaning efforts. Also, reproduction of this species requires salmonid hosts (temporarily used by the mussel's parasitic larvae), which were eliminated or reduced due to degraded habitat and previous fish passage barriers (usually associated with dikes and road building) on some streams on the Refuge. After the restoration of physical attributes of streams that had been destroyed or severely impacted by historical land use in the past, removal of fish passage barriers, and the reintroduction or enhancement of extirpated or reduced salmonid populations, the Refuge embarked on a mussel transfer program.

Populations of western pearlshell mussel have been transferred to four small streams on the Refuge in 2007, 2008, 2009, and 2010. These transfers were done under permits from the WDFW, because the donor population was located off of the Refuge. The western pearlshell mussel is a State-monitored species.

## 4.8.4 Other Invertebrates

The tidal flats and shallows support abundant populations of other invertebrates that are an important part of the estuary's food chain. Intertidal flats support an abundance of other invertebrates, including amphipods, polychaete and oligochaete worms, insect larvae, and nematodes. The amphipod *Corophium salmonis* is a major food item of juvenile salmon and other small fish (Arvai et al. 2002; Bottom et al. 1984). *Cororphium* and other amphipods, along with a wide variety of benthic worms and other invertebrates, are an essential food source for migrating western sandpipers and other shorebirds (Wilson 1994).

In a 2002 study, a density of 288,538 invertebrates/$m^2$ were surveyed in an unvegetated mudflat transect. Unvegetated transects had a species richness of up to 26 invertebrate species (O'Connell 2002).

Mosquito sampling was conducted at various refuge locations in 2005, 2006, and 2007, as part of the Washington Department of Health's statewide West Nile virus surveillance. Twelve species were identified. At least eight of the species found on the Refuge are potential vectors of West Nile virus. However, the virus itself has not been detected in the local area.

A survey of forest arthropods was conducted as part of a larger study of both old-growth and regrowth forests on the Refuge (Davis et al. 2009).

A survey of stream macroinvertebrates was completed on several Refuge streams. The highest number of taxa recorded in a single stream on this survey was 41 (Conklin 2003). Mayflies, stoneflies, and caddisflies are common aquatic macroinvertebrates in refuge streams.

The federally threatened Oregon silverspot butterfly is currently extirpated from Washington. The Refuge is actively involved in restoring habitat for this species (see Sections 4.3 and 4.9)

# 4.9 Federally Threatened and Endangered Species

The Service has prepared recovery plans that are intended to serve as guidance documents for agencies, landowners, and the public. Each plan includes recommendations for actions considered necessary to satisfy the biological needs and ensure the recovery of the listed species. These plans also emphasize opportunities for improved management of listed species on Federal and State lands. Recommended actions generally include protection, enhancement, and restoration of those habitats deemed important for recovery, monitoring, research, and public outreach. Recovery plans for federally listed species that occur at Willapa include:

- Recovery Plan for the California Brown Pelican (USFWS 1983)
- Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (USFWS 2007a)
- Recovery Plan for the Marbled Murrelet (USFWS 1997a)
- Range-wide Streaked Horned Lark Assessment and Preliminary Conservation Strategy (Pearson and Altman 2005)
- Revised Recovery Plan for the Northern Spotted Owl (USFWS 2008a)
- Revised Recovery Plan for the Oregon Silverspot Butterfly (USFWS 2001a)

The recommendations provided in the recovery plans for these listed species considered during the development of this CCP are described here. Species known to currently breed on lands administered by the Refuge are denoted with an asterisk (*). Reference to specific recovery action sections in the species recovery plans appear within parenthesis in the sections on recovery actions toward the end of each species account.

## 4.9.1 Fish

Two species of fish found in Willapa Bay are listed as threatened under the Endangered Species Act. Eulachon is a species of smelt. Eulachon are anadromous and return to rivers and streams along the Pacific Coast to spawn. In the 1990s there was a decline in numbers of this fish along the Pacific Coast. The eulachon was listed as a federally threatened species in 2010 (NMFS 2010).

Green sturgeon are believed to spend the majority of their lives in nearshore areas of oceans, bays, and estuaries. They use both saltwater and freshwater habitats. A major reason for decline is the loss of spawning habitat. Green sturgeon enter Washington estuaries during the summer. This species was listed as federally threatened in 2006 (NMFS 2006).

## 4.9.2 Brown Pelican (*Pelecanus occidentalis*)

On November 17, 2009, the USFWS published a rule to remove the brown pelican from the Federal list of endangered and threatened wildlife due to recovery (USFWS 2009). A draft post-delisting

monitoring plan has been developed and will be put into effect in the Gulf of Mexico and coastal California. Although no new management and monitoring plans are proposed under this CCP, the Refuge will continue to provide pelicans a protected, undisturbed area for day roosting, loafing, resting, and feeding in nearshore waters at Leadbetter Point and Willapa Bay.

### 4.9.3 Western Snowy Plover, Pacific Coast Population* (*Charadrius alexandrinus nivosus*)

The western snowy plover is a small (15-17 cm long, 34-58 g) shorebird with pale brown upperparts, white underparts, and gray to blackish legs. They have bilateral upper breast patches and breeding males have dark facial markings. On March 5, 1993, the Pacific coast population of the western snowy plover was listed as threatened under provisions of the ESA (USFWS 1993). The Pacific coast population is defined as those individuals that nest within 50 miles of the Pacific Ocean on the mainland coast, peninsulas, offshore islands, bays, estuaries, or rivers of the United States and Baja California, Mexico (USFWS 2007a). The current Pacific coast breeding population extends from Midway Beach, Washington, to Bahia Magdalena, Baja California, Mexico. The snowy plover winters mainly in coastal areas from southern Washington to Central America. This coastal population nests primarily above the high tide line on a variety of beach and dune types including coastal beaches, sand spits, dune-backed beaches, sparsely vegetated dunes, beaches at creek and river mouths, and bluff-backed beaches (USFWS 2007a). In addition, it also nests on sandy river bars, salt pans at lagoons and estuaries, salt pond levees, dry salt ponds, and on dredge spoils (USFWS 2007a). In winter, snowy plovers are found on many of the beaches used for nesting as well as on beaches where they do not nest (USFWS 2007a). Prior to Federal listing, the WDFW designated the snowy plover as endangered in 1981.

Western snowy plover are year-round residents on the Refuge, although most birds migrate south after the breeding season. Adults typically begin breeding in Washington in late March, while most young have fledged by mid-August. Of the six Washington locations identified in the recovery plan as breeding areas, only two are currently occupied; the largest is located at the Leadbetter Point Unit of Willapa NWR. Disturbance of nesting plovers at Leadbetter Point occurs to a lesser degree than elsewhere along the southern Washington coast. The spatial extent of suitable habitat and relative isolation of the Leadbetter Point site make it of paramount importance to snowy plover recovery in Washington State.

The Federal Recovery Plan for the Western Snowy Plover designates Washington and Oregon as Recovery Unit 1. The primary recovery criteria for this unit are maintaining 250 breeding adults for 10 years, and a five-year average productivity of at least 1.0 fledged chick per adult male (USFWS 2007a). Deriving this metric for Washington requires an estimate of both the number of breeding adult males and the number of chicks fledged. Pearson et al. (2009) estimated that the number of young fledged per adult male was 0.71 (95 percent confidence interval = 0.55-0.96; Figure 4-2). This estimate suggests that the plover population in Washington should be declining and is not being maintained by local production (Nur et al. 1999). The recovery plan calls for development and implementation of mechanisms that ensure long-term protection and management of breeding, wintering, and migration areas in Recovery Unit 1 (USFWS 2007a). Current population and productivity levels continue to be below thresholds set as recovery objectives.

According to the Washington State Recovery Plan for the Snowy Plover (WDFW 1995), the plover will be considered for down-listing to threatened status when the State supports a four-year average of at least 25 breeding pairs and fledges at least one young per pair per year at two or more nesting

areas with secure habitat. State delisting will be considered when the average population reaches 40 breeding pairs at three or more secure nesting areas. Currently there are only 35 known snowy plover breeding pairs at two occupied nesting sites in Washington. Pearson et al. (2009) report that adult population counts declined for the 2006-2009 period.

Both Federal and State recovery plans require monitoring of breeding adults and monitoring of fledging success to assess progress toward these recovery goals. Monitoring is also necessary to evaluate the impact of conservation actions on plover populations such as the use of wire nest exclosures to exclude potential predators and the effectiveness of habitat restoration efforts. To provide the information needed to assess recovery progress and to assess the effectiveness of conservation actions, the Refuge is coordinating its monitoring efforts with WDFW, Oregon Department of Fish and Wildlife, and Washington State Parks and Recreation Commission.

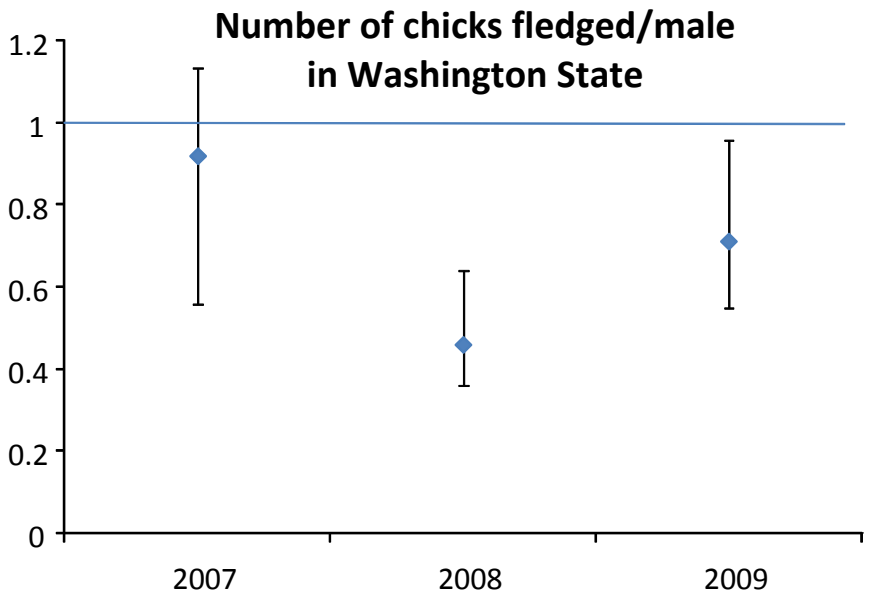


**Figure 4-2. Number of snowy plover chicks fledged per adult male from 2007-2009 for all Washington nesting sites combined. Population modeling indicates that one chick fledged per male is needed on average to maintain a stable population (from Pearson et al. 2009).**

### 4.9.3.1 Limiting Factors

According to the USFWS (2007a), "Habitat degradation caused by human disturbance, urban development, introduced beachgrass (*Ammophila* spp.), and expanding predator populations have resulted in a decline in active nesting areas and in the size of the breeding and wintering populations." In Washington, predator consumption of plover eggs, inclement weather, shoreline modification, dune stabilization, and recreational activities have been attributed to reduced nest success and have been cited as the causes of local population declines (WDFW 1995).

The western snowy plover population has shown an overall declining trend during the last century. Reasons for this decline and the severity of threats vary by region and location but are primarily due to habitat loss and degradation. The principal cause of habitat loss in Washington is from previous

efforts to stabilize the naturally shifting sand along coastal beaches. Introduction of invasive beachgrasses has been used as an effective means of dune stabilization that preceded development of coastal beachfront areas. The invasive, non-native beachgrasses planted to stabilize dune community have changed dune morphology and native plant communities. Mild climate allows vegetation to establish easily and rapidly. Once established the grass forms a thick root mat and dense canopy that crowds out native vegetation. Accelerated succession due to fire suppression progresses from herbaceous beachgrass, to shrub (often invasive non-natives such as Scotch broom and common gorse), to pioneer lodgepole pine or climax Sitka spruce forest.

The northern end of the Long Beach Peninsula was in a state of gradual northward accretion from at least 1965 to 1999. Invasion of beachgrass has followed accretion, progressively filling in the dunes behind the sand spit. In conjunction with slowed accretion in more recent years, the vegetation line has moved westward and the vegetation-to-water distance has decreased (Phipps 1990) resulting in a narrower beach and probably less suitable plover habitat. Recent maps from the Washington State Department of Transportation show that the tip of Leadbetter Point has been gradually eroding since mapping efforts began in 1999. As the tip has eroded, the peninsula to the southwest has gotten wider. Leadbetter Point is one of the northernmost breeding sites for the western snowy plover on the Pacific Coast (Jaques 2001).

The habitat restoration area at Leadbetter Point was initiated in 2002. It now encompasses 121 acres, where oystershell has been added to 54 acres of total area. Ongoing restoration and maintenance activities conducted included:

- Maintaining the 121-acre restoration area mechanically and through the use of herbicide. In September 2009, an additional 63 acres were treated with an aerial herbicide application including the primary foredune and a portion of the outer beach west of the foredune.
- Widening cuts in the high foredune to least 24 feet. Alleyways are cleared to the bare sand beach and disked and compacted in an attempt to better control non-native beachgrass.
- Annually adding between 5 to 10 acres of additional oystershell to the restoration area to provide camouflage for ground-nesting birds and to reduce blowing sand.

Treating and maintaining the restoration area is necessary to stop the advancement and narrowing of the outer beach by the colonization of non-native beachgrass. This activity will widen the bare sand potion of the outer beach, allowing additional habitat for nesting. The Leadbetter Point habitat restoration area also supports the only known population of pink sandverbena in Washington State; this plant species was thought to be extirpated in the state until its rediscovery in 2006. Pink sandverbena seed was collected and broadcast in transects within the restoration area and on the outer beach. Pink sandverbena seeds will be collected and broadcast and/or propagated, and additional seed will be placed in long-term seed storage at the Berry Botanical Garden for conservation. A collaborative partnership has begun with the Shoalwater Bay Tribe to propagate additional pink sandverbena plants.

Disturbance at nesting sites and increasing rates of predation often follow in areas with expanding developments and increased human use. Studies have shown that human-related disturbance has negative effects on hatching success of snowy plovers (Schulz and Stock 1993; Warriner et al. 1986) and has reduced snowy plover chick survival by as much as 72 percent (Ruhlen et al. 2003). Disturbances to wintering snowy plovers are 16 times higher at a public beach than at a protected beach; humans, dogs, American crows, and other birds are the main sources of disturbance (Lafferty 2001). In addition, snowy plover feeding rates declined in response to disturbance (Lafferty 2001).

Human disturbance has also been shown to negatively affect hatching rates and chick survival for various plover species (Buick and Paton 1989; Dowling and Weston 1999; Flemming et al. 1988).

Because human activities in and around plover breeding areas can impact nest success and have been cited as the causes of local population declines, the Refuge and Washington State Parks have restricted beach access through the use of:

- Complete motorized vehicle driving closures, except during razor clam seasons.
- Signs that are seasonally placed along the upper portion of the beach demarcating nesting areas closed to public entry.
- Symbolic fencing placed seasonally along beach access trails on Refuge lands at Leadbetter Point to direct people toward the wet sand and away from plover nesting habitat.
- Restrictions prohibiting dogs on Refuge lands.

Prohibitions also include restricting removal of native plants, driftwood, and alteration of other habitat features; fireworks; and certain recreational activities such as kite flying. These prohibitions also aid the Refuge in minimizing disturbance in plover habitat.

Predation by native and introduced species has been identified as a leading cause of reproductive failure of the western snowy plover (USFWS 2007a). Pearson et al. (2009) reported that predation was the primary source (58 percent) of plover nest failure in Washington in 2009. Crows and ravens are recognized as important predators of eggs and juvenile plovers and larks (Liebezeit and George 2002; Powell et al. 2002; USFWS 2002b; Wilson-Jacobs and Dorsey 1985). Based on studies in Oregon between 1990 and 2000, corvids (ravens and crows) caused at least 64 plover nest failures (USDA APHIS 2002). Predation was also the most frequent cause of streaked horned lark nest failure (69 percent) in Washington at sites in south Puget Sound in 2002-2004, while causing 46 percent of failures at two coastal and one river island sites in 2004 (Pearson and Hopey 2005). Liebezeit and George (2002) provide a detailed review of corvids importance as predators. The Western Snowy Plover Recovery Plan and annual survey and population monitoring reports offer additional data on plover predation (Lauten et al. 2009; Pearson et al. 2009; USFWS 2007a).

Development of a predator management strategy will maximize adult survival and juvenile recruitment of western snowy plover to achieve population objectives for species recovery by reducing the threat posed by certain problem avian and mammalian predators. This plan will be a comprehensive conservation strategy that addresses a range of management actions, from vegetation control and nesting habitat enhancement to nonlethal and lethal control, when necessary. The most effective, selective, and humane techniques available to deter or remove individual predators or species that threaten nesting, breeding, or foraging snowy plovers or horned larks will be implemented. Predator management is identified in Section 2.4.6.1, Section 2.5, and Appendix L as one of several actions to be implemented in support of listed species occurring on the Refuge.

#### 4.9.3.2 Recovery Actions

The following recovery actions are being implemented locally to help achieve the desired target population levels for western snowy plover within the Oregon/Washington Recovery Unit.

- Monitor breeding and wintering population and habitats to determine efficacy of recovery actions and to maximize survival and productivity (1.1, 1.2, and 1.3).

- Manage breeding and wintering habitat to ameliorate or eliminate threats and to maximize survival and productivity (2.1, 2.2, 2.3, and 2.4). These actions include maintaining and enhancing existing breeding and wintering habitat, preventing sources of disturbance at nesting sites, enforcement of regulations designed to protect areas used by breeding plovers, and prevention of excessive predation through an integrated predator management strategy.
- Develop and implement a management plan to protect western snowy plovers and their habitat on Federal lands (3.3.1).
- Develop cooperative program and partnership with the Washington State Parks and Recreation Commission (3.6).
- Undertake scientific investigations that facilitate recovery efforts (4.1.1, 4.2, 4.4, and 4.6).
- Undertake public information and education programs (5).

### 4.9.4 Marbled Murrelet* (*Brachyramphus marmoratus*)

The marbled murrelet is federally listed as a threatened species in California, Oregon, and Washington. The State of Washington has also designated the marbled murrelet as a threatened species. The marbled murrelet is a year-round resident on Washington marine coastal waters within several kilometers of the shoreline. The majority of nesting stands in Washington have been discovered within 63 km (39 mi) of marine waters. Marbled murrelets require suitable canopy structures for nesting that are primarily found in the mature and old-growth coniferous and mixed species forest stands of western Washington. Removal of these forests, primarily by timber harvesting and urbanization, is the principal factor contributing to the decline of the marbled murrelet, and is the most significant impediment to recovery of the species (USFWS 1997a). Habitat fragmentation resulting in increased densities of nest predators, and prey availability, are also probable limits to long-term productivity and survival. Adult mortality caused by predation, impacts from the effects of oil spills, mortality due to entanglement in fishing gear, chronic water pollution, aquaculture, and disturbance at nesting and foraging sites have also been identified as potential limiting factors.

In Washington State nesting habitat is found in the Sitka spruce and western hemlock forest zones. Douglas fir also contributes to the likelihood that habitat will be suitable for murrelet nesting, although there have been no nesting sites found within the coastal Douglas fir zone in Washington. The Sitka spruce and western hemlock forest zones in Washington include lower elevation forests comprising western hemlock, Douglas fir, Sitka spruce, and western red cedar. The availability of nesting structures in a forest canopy is the principal determining factor in stands with high levels of murrelet activity. Nest selection is highly dependent upon the availability of potential nesting surfaces, or platforms (Nelson 1997). Kuletz et al. (1995) and Hamer (1995) found that in Alaska and Washington, respectively, the number of potential nest platforms was an important attribute in murrelet forest habitats. The suitability of a stand is enhanced by processes that contribute to the number of potential nesting platforms. Suitable forest stands can consist of trees exhibiting potential nesting platforms in the form of large lateral limbs; large or moderate sized limbs with an abundance of epiphytes (especially mosses); branches creating a fork with the space between bridged by canopy litter or accumulated moss; a high incidence of dwarf mistletoe (*Arceuthobium* spp.) infestation; or an abundance of canopy defects due to damage caused by environmental conditions (ice, lightning, wind), insects, or other processes that create growth abnormalities.

Trees typically require 200 to 250 years or more to attain attributes necessary for marbled murrelet nesting (USFWS 1996). This is generally the time needed to develop limbs of a sufficient diameter

to support a nest. Marbled murrelet nests are often located in the largest trees in the stand (Jordan and Hughes 1995; Singer et al. 1995). In a sample of 47 nests, Hamer and Nelson (1995) found all to be in trees larger than 88 cm (35 inches) dbh. However, younger stands of coastal redwood (*Sequoia sempervirens*), western hemlock stands with an abundance of dwarf mistletoe, or stands with numerous older legacy trees remaining from a previous stand can develop characteristics of nesting habitat at a younger age. A nesting stand consisting of predominantly 80- to 120-year-old western hemlock trees was found in 1995 in the Tillamook State Forest, Oregon. This stand originated following a large-scale fire but contains scattered pockets of older trees that survived the fire. This stand also has a high incidence of mistletoe in the younger trees. In 1996 a nest was found in western Oregon in a 65-year-old western hemlock tree severely infected with dwarf mistletoe. An analysis of unpublished data collected in southwestern Washington and the west Olympic Peninsula by the WDFW indicate a significant number of occupied stands have at least one tree of 90 cm (36 inches) dbh or greater per acre, and with a minimum of two platforms.

Moss enhances the suitability of a stand by increasing the potential nesting surface area on tree limbs, thus providing murrelets with more nesting opportunities. A majority of the known nests are found on moss-covered limbs (Nelson 1997; Ritchie 1998). Burger (1995) found that high murrelet activity in British Columbia was often associated with forest sites exhibiting well-developed epiphytic mosses. Nests are also located on larger limbs with little or no moss. In these cases canopy litter of conifer needles, bark, twigs, detritus, and dust constitutes the nesting substrate. No nesting materials are brought to the nest by the adult murrelets (Nelson 1997).

Dwarf mistletoe can enhance the suitability of a stand by promoting the development of platforms and cover in the form of enlarged diameter limbs and witches brooms. This can be a particularly significant factor in mature stands with low density of large diameter trees. There are seven taxa of dwarf mistletoe occurring in Washington; however, the western hemlock dwarf mistletoe and the mountain hemlock dwarf mistletoe (*Arceuthobium tsugense* subsp. *mertensianae*) are the only identified taxa occurring west of the Cascade Mountains in Washington (Hawksworth and Wiens 1996). Western hemlock dwarf mistletoe occurs from sea level to about 1,250 m (4,100 feet), the common principal host being western hemlock. Silver (*Abies amabilis*) and grand fir are considered occasional hosts. Rare hosts are Douglas fir, Engelmann spruce (*Picea engelmannii*), and mountain hemlock (*Tsuga mertensiana*). Principal hosts of the mountain hemlock dwarf mistletoe are mountain hemlock and silver fir. The distributional range is thought to be limited to elevations greater than 1,200 m (3,900 feet) and thus beyond the elevational range of most known marbled murrelet nest stands. Nine percent of 37 marbled murrelet nests examined in the Pacific Northwest were on mistletoe-infected limbs (Hamer and Nelson 1995).

A sample of 41 nests in the Pacific Northwest by Hamer and Nelson (1995) found a mean limb diameter of 32 cm (13 inches). They also report a mean nest height of 45 m (148 feet) in a sample of 45 nests. The majority of these nests have been located in the upper half of the tree crown. Nest limb diameters in Washington range from 14 to 50 cm (5-20 inches); limb heights from 20 to 53 m (66-174 feet). Nests have been located on limbs as small as 10 cm (4 inches) in Oregon.

Other factors which appear to contribute to the suitability of habitat for marbled murrelet nesting are cover, access to the canopy, stand size, and location on the landscape. Cover at an overstory canopy level may be important but has been shown to be highly variable. Cover directly above and adjacent to the nest, however, appears to be an important attribute. Occupied stands in Washington have a mean canopy cover of 81 percent (Hamer 1995), and 87 percent of all nests in the Pacific Northwest

had greater than 74 percent immediate overhead cover (Hamer and Nelson 1995). Canopy cover of stands elsewhere is highly variable, ranging from 15 to 100 percent in Oregon (Nelson 1998).

Stand access by marbled murrelets can be influenced by stem density of dominant trees; total stem density; natural and artificial openings and flight corridors created by multiple crown layers in uneven aged stands, streams, trails, or similar features; canopy integrity and spatial orientation; and slope. In a sample of 30 nest trees, Hamer and Nelson (1995) found the mean distance from a nest to an opening to be 92 m (302 feet). Singer et al. (1995) identified flight corridors in gaps beneath the dominant canopy used by murrelets to enter and exit their nests. The crowns of trees on steep slopes may be more accessible to murrelets than those on flatter terrain; however, there currently are no statistically significant data to show that more secondary or subdominant trees may be accessible in these circumstances.

Stand size may influence the quality of the stand by affecting the amount of available interior habitat, nest predation, and disturbance levels. Marbled murrelets are considered to be one of the bird species in the Pacific Northwest most sensitive to forest fragmentation (Hansen and Urban 1992). Bryant (1994), Rudnicky and Hunter (1993), Small and Hunter (1988), and Wilcove (1985) have demonstrated that avian nests are adversely impacted by fragmentation and the associated edge effects. A critical review by Paton (1994) concluded that sufficient data show predation rates decrease as habitat patch size and distance from edge increases. In contrast, Vander Haegen and DeGraaf (1996) did not find that fragmentation resulted in higher predation rates on nests of ground- and shrub-nesting passerines in Maine. They did, however, conclude that proximity to a forest edge coincides with greater nest predation rates. An avifauna nest predation study by Naef (1996) conducted in Washington also found no clear relationship between nest predation and stand size. She suggests that vegetation structural factors in interior coniferous forests may have more of an influence than stand size alone. Reduced levels of predation were shown to occur where nests were higher in a tree, further from a recently disturbed edge, and in mature stands with higher and deeper canopies. Chen et al. (1992) found several microclimatic differences between forest interiors and edges. Interior forest habitats experience reduced daily temperature fluctuations, lower daily high temperatures, and lower wind speeds than forest edges. Interior forests may also provide better visual and sound screening from adjacent sources of human disturbance than forest edges.

Predation rates at marbled murrelet nests have been found to be extremely high in some areas. Nelson and Hamer (1995) noted that 57 percent of the marbled murrelet nests examined (n=8) in Washington, Oregon, and California failed as a result of predation. They also found that reproductive success was correlated to distance from an edge. They report that all but one successful nest was greater than 55 m (180 feet) from an edge. Marzluff et al. (1997), in a preliminary report, indicate that landscape fragmentation and proximity to human activity may influence predation by corvids on marbled murrelet nests. Naef (1996) also found that stand context in relation to the disturbance of the surrounding matrix was an important influencing factor in avian nest predation, especially at stand edges. Small and Hunter (1988) found that nest predation of songbirds was highest in small forest patches completely surrounded by clearings.

Distance from marine waters and the location of nearby habitats may also affect suitability. Stands that lie further from feeding areas probably require the adults to expend more energy to provision the nest. Newly fledged chicks may have a greater likelihood of successfully reaching the marine waters if their nest is closer to the coast. Suitable nesting habitat adjacent to or near an occupied stand possibly offers more opportunities for recruitment as the population expands. This condition may

also help maintain localized breeding productivity if a catastrophic event such as a wildfire or wind storm destroys a nesting stand.

#### 4.9.4.1 Limiting Factors

Marbled murrelets require suitable canopy structures primarily found in mature and old-growth forest stands for nesting. Elimination of these forests, primarily by timber harvesting and urbanization, is the principal factor contributing to the decline of the marbled murrelet and the most significant impediment to recovery of the species (USFWS 1997a). Habitat fragmentation resulting in increased densities of nest predators, and prey availability also probably limits long-term productivity and survival of the marbled murrelet. Adult mortality caused by predation, impacts from the effects of oil spills, mortality due to entanglement in fishing gear, chronic water pollution, aquaculture, and disturbance at nesting and foraging sites have also been identified as potential limiting factors.

The life span of marbled murrelets is unknown, but other members of the Alcid family have been shown to live from five to 32 years (De Santo and Nelson 1995). A marbled murrelet banded in British Columbia in 1991 was recaptured in 1997 (Lougheed and Lougheed 1998). Adult and first-year juvenile survivorship based on data from other alcids is estimated to be 81 to 88 percent and 70 percent, respectively (Beissinger 1995). Marbled murrelets are thought to reach breeding maturity in two to four years (De Santo and Nelson 1995). Marbled murrelets have a low rate of reproductive success. Breeding pairs produce a single offspring during reproductive years. Murrelets may not nest every year, especially when food resources are limited (Nelson 1997). Beissinger (1995) reports surveys to determine productivity have found adult to juvenile ratios from 4 to 5 percent in British Columbia and Oregon. Stein and Nysewander (1995) found adult to juvenile ratios from 8 to 9 percent in Puget Sound. In the western Straits of Juan de Fuca along the Washington coast, Thompson (1997) found that juveniles made up 17 percent of the murrelets observed. Corrections for possible environmental factors and biases in survey methodology will likely lead to refined estimates in the near future.

Population trend modeling suggests an annual decline of 4 to 7 percent in the total North American population, but the potential rate of decline could be twice as large (Beissinger 1995). The combination of low demographic potential, small population size, and increased risk resulting from anthropogenic factors could lead to extirpation of the marbled murrelet in portions of its current range. The current overall estimate for the listed population (California, Oregon, and Washington) is less than 18,000. Trend data indicate an annual decline of between 2.4 and 4.3 percent (Falxa et al. 2009).

The Federal Recovery Plan for the Marbled Murrelet (USFWS 1997a) identifies the primary cause of population decline as loss of older forests and associated nest sites. It states that protection of suitable nesting habitat and nest sites on Federal, State, and private lands are essential toward maintaining a well-dispersed population across the landscape. Management of some mature age class forest stands to provide replacement habitat for increasing the population and contributing additional potential nesting sites is also critical to recovery of the species. The importance of surveys to locate nest sites and identify suitable habitats is recognized at both the Federal and State level. To allow for protection of unsurveyed potential nesting sites, the Washington Forest Practices Board (1997) requires landowners with greater than 200 ha (500 acres) of land within 80 km (50 miles) of salt water to survey suitable habitats prior to harvest. Several land management approaches are also available to protect habitat such as Federal habitat conservation plans and State landscape and site management plans.

Habitat fragmentation appears to result in increased densities of nest predators. Predation rates at marbled murrelet nests have been found to be extremely high in some areas. Fragmentation of conifer and mixed-species forests may contribute to these predation rates (Nelson and Hamer 1995). Forests with increasingly complex structural architecture are desirable features that should be retained or enhanced in forest ecosystems (Naef 1996). Corvids are thought to forage using visual cues and have been identified as a primary marbled murrelet nest predator. A more complex forest has larger canopy mass in multiple dimensions that can help to conceal the location of nests from such visual predators (Rudnicky and Hunter 1993; Wilcove 1985; Yahner and Cypher 1987). Interior portions of forests mitigate the effects of surrounding ambient and severe environmental conditions and may provide better visual and sound screening from adjacent sources of human disturbance than forest edges.

Human disturbance of marbled murrelets is not well documented but has been shown to elicit differing levels of response from foraging and nesting birds. Kuletz (1996) reported numbers of murrelets counted on the water in Alaska were negatively correlated to the number of boats and low-flying aircraft in the area. Response to boats and low flying traffic has also been reported by others. Strong (1995) felt that birds were very sensitive to his vessel while passing within 50 m (164 feet). A literature review by Long and Ralph (1998) found that human activities can impact nesting success of seabirds and waterfowl, especially during the period when a nest site is chosen and during incubation. Henson and Grant (1991) report that passing vehicles caused the most observable response when they had loud engines, such as motorcycles, or were stopped along a road. Washington State and Federal regulations restrict heavy equipment, and Federal regulations also apply to small power equipment used during the breeding season adjacent to nesting stands. Long and Ralph (1998) cite unpublished data that indicate murrelets did not appear to respond to aircraft or helicopters flying overhead, except when they were at an altitude below 152 m (500 feet). However, based on recommendations from a panel of wildlife biologists and resource specialists, the Washington Forest Practices Board adopted rules (WFPB 1997) that restricts aircraft flight below 400 m (1,300 feet) over known marbled murrelet nest sites any time during the breeding season or within 0.4 km (0.3 mile) during periods of daily peak activity. Federal restrictions applied in California limit aircraft flight below 152 m (500 feet). The effects of rotor-wash should also be considered when assessing the potential impacts from helicopter operations. Factors to consider whenever addressing concerns of potential disturbance to nesting marbled murrelets are the changes in noise or visual activity levels above ambient conditions, the timing of source activities in relation to nesting chronology, type of disturbance, and the duration and frequency of the disturbance. Studies of predation and disturbance in the Pacific Northwest with direct applications to marbled murrelets are ongoing, so the measurable effects of timber harvests and other human activities remain undetermined.

#### 4.9.4.2 Recovery Actions

Recovery actions identified for the marbled murrelet and addressed through management activities at Willapa NWR are:

- Protect terrestrial habitat essential for marbled murrelet recovery (2.1).
- Incorporate management recommendations for protected areas. These include short-term actions to stabilize and increase the population, such as maintaining and enhancing occupied nesting habitat and surround buffer areas, protecting unoccupied suitable habitat in larger contiguous blocks, and minimizing disturbance and activities that could elevate nest

predation (3.1). Implementation of long-term actions having consequential effects on population growth is identified in Section 3.2.

- Increasing the amount and quality of suitable nesting habitat by decreasing fragmentation, protecting recruitment habitat to buffer existing habitat and provide future replacement habitat, and using silvicultural techniques to accelerate development of new habitats are means indentified to improve the amount and quality of available habitat, especially in regions and landscapes with a scarcity of suitable habitat, such as found in southwestern Washington.

## 4.9.5 Streaked Horned Lark* (*Eremophila alpestris strigata*)

The endemic subspecies of the Pacific coastal form of horned lark is found only in western Oregon and Washington. Rogers (2000) proposes that the streaked horned lark may be the most endangered bird in Washington. Horned larks are small ground-dwelling passerines with black occipital feather tuffs, or horns. Their plumage is also marked with a black breast band, lores, and cheek patches that contrast with a yellow eyebrow stripe, ear coverts, and chin. The nape, back, rump, and upper tail are brown streaked with dusky brown to black (Beason 1995).

Larks inhabit native prairies but have also adapted to nesting in low-growing and sparsely vegetated grasslands at airports, coastal sand dune habitats, and dredge spoil islands. The streaked horned lark was once abundant on Puget Sound prairies. As its population and distribution has decreased significantly with the decline in habitat, it is now restricted to a few large open grassland sites and islands in Washington (Stinson 2005) and several sites in Oregon. The streaked horned lark is currently a candidate for listing under the ESA. Candidate species will be listed at some point in the future, unless adequate conservation measures preclude the need for listing.

### 4.9.5.1 Limiting Factors

As with the western snowy plover, loss and fragmentation of prairie habitats to urban development; introduced beachgrass (*Ammophila* spp.); invasion by turf-forming grasses, shrubs, and taller vegetation; and expanding predator populations have resulted in a decline in active nesting areas and in the size of the breeding and wintering populations. Habitat succession and invasion of non-native plants at prairies have accelerated with the suppression of wildfires. Nearly all the remaining prairie sites in western Washington are degraded to some extent by exotic forbs, grasses, and woody plants, creating unfavorable conditions for lark use (Stinson 2005). Aircraft strikes at airport breeding sites and disturbance and habitat destruction from recreational vehicles at beach sites have also been implicated as causes leading to the population decline.

### 4.9.5.2 Recovery Actions

The streaked horned lark preliminary conservation strategy (Pearson and Altman 2005) outlines regional priorities for developing recovery actions aimed at avoiding continued population declines and potential future listing. The following actions identified for the Washington coast are currently implemented at Willapa NWR, or will be under the management direction.

- Control invasive beachgrass at known breeding sites.
- Limit human and vehicle access to nesting sites and activities that disturb breeding larks, such as off-leash dogs, fireworks, and kite flying.
- Reduce the amount of food available to known nest predators like crows and ravens.

- Investigate methods for reducing nest predation rates.
- Develop and implement a population monitoring strategy that includes a direct or indirect measure of fitness (reproduction and survival).
- Develop educational signs along beach access points informing the public about the sensitivity of nesting larks and plovers to specific recreational activities.

## 4.9.6 Northern Spotted Owl (*Strix occidentalis caurina*)

The northern spotted owl was listed under the ESA as threatened on June 26, 1990 (USFWS 1990) because of widespread loss of suitable habitat across the spotted owl's range and the inadequacy of existing regulatory mechanisms to conserve the spotted owl (USFWS 2008a). The final northern spotted owl recovery plan was subsequently published in May 2008. Since the subspecies was listed, the northern spotted owl population has continued to decline, especially in the northern portions of its range. Spotted owls have become rare in certain areas of their historical range, such as British Columbia, southwestern Washington, and the northern coastal ranges of Oregon (USFWS 2008a). Spotted owls, along with marbled murrelets and Vaux's swifts, are the avian species most closely associated with old-growth coniferous forests in the Pacific Northwest (Ruggiero et al. 1991).

Spotted owls historically inhabited forests located within the present day boundaries of the Refuge. A spotted owl pair that nested in the Cedar Grove RNA forest was last observed there in 1985. The following year barred owls were observed occupying the nest. An established spotted owl management circle also encompasses the Teal Slough Unit and most of the Headquarters Unit of the Refuge. This territory was most recently known to be occupied in 1998 when a survey documented a pair of adults and one juvenile spotted owl. Despite the de-emphasis on spotted owl recovery in southwestern Washington, applicable recommendations and recovery actions identified in the northern spotted owl recovery plan were considered in the development of this CCP.

### 4.9.6.1 Limiting Factors

The spotted owl inhabits structurally complex, late-seral and old-growth coniferous forests in the Pacific Northwest and northern California. Trees typically require 200 to 250 years or more to grow to a size large enough for spotted owls to use. Unless the tree bole or treetop has been damaged, it may take at least that long or longer for the tree to die and become a snag or develop enough heart rot to produce a suitable nest cavity. Late-seral forests used by northern spotted owls are characterized by overstory trees of large stature, exhibiting very large diameter boles, large limbs, and tall, deep crowns, often with broken and reiterated tops. The forests typically develop vertically and horizontally diverse canopies from multiple crown layers created by uneven aged stands, streams, gaps, or similar features that result in a complex spatial orientation. Standing dead trees, or snags, and downed trees decaying on the forest floor provide shelter and breeding habitat for owls and their prey.

Historically much of the lowland coastal forests and mid-elevation forests of the Cascade and coastal mountain ranges provided spotted owl habitat. Much of that forestland was harvested for lumber and paper production. Many of the remaining suitable forest patches in southwestern and coastal Washington are too small and fragmented to provide functional habitat for spotted owls. "Ideally, blocks of habitat should be dispersed in a pattern corresponding to a species' full geographic distribution. This distribution is the key hedge against major catastrophes that could otherwise extinguish the sole remaining population of a once wide-spread species" (Thomas et al. 1990).

However, the spotted owl recovery plan excludes the Western Washington Lowland Province from the managed owl conservation area approach because it is assumed that low population numbers are not essential to the species recovery.

#### 4.9.6.2 Recovery Actions

Despite the de-emphasis on spotted owl recovery in southwestern Washington, applicable recommendations and recovery actions identified in the northern spotted owl recovery plan are being considered in the management activities at Willapa NWR.

- Maintain all older and more structurally complex multilayered confer forests on Federal lands in the western biogeographical provinces.
- Restore ecological function to westside forests by creating a natural distribution of stand structure, composition, and successional stages while promoting old-growth/late successional characteristics to benefit forest dependent wildlife. Carey (2003a, 2003b, 2007) provides a comprehensive review of westside coniferous forest restoration and results of experimental application of these concepts. Important considerations mentioned in the northern spotted owl recovery plan (USFWS 2008a) include 1) retention of biological legacies, 2) ensuring regeneration and management of multiple tree species through precommercial thinning, 3) managing for spatial heterogeneity in canopies and understory vegetation site types through commercial thinning or application of fire, 4) management of decadence processes, including maintaining dead and decadent trees, coarse woody debris, creating cavity trees, and maintenance of large old trees with significant decay, etc., 5) management of forests on long to indefinite rotations, and other methods.

### 4.9.7 Oregon Silverspot Butterfly (*Speyeria zerene hippolyta*)

The Oregon silverspot butterfly is a medium-sized, orange and brown butterfly with black veins and spots on the upper wing surface. The namesake bright metallic silver spots are found on the underside of the wings. The historic range of the Oregon silverspot butterfly extended along the Oregon and Washington coasts from Westport, Washington, south to around Heceta Head in Oregon, and in a separate coastal area north of Crescent City in Del Norte County, California.

Two types of coastal dune habitat inhabited by the Oregon silverspot butterfly are referred to as salt spray meadows, such as those found on the central Oregon coast, and stabilized coastal dunes that are found on the Long Beach Peninsula, Clatsop Plains, and at Lake Earl in Del Norte County, California. All suitable habitats are coastal meadow or prairies that support native forbs (used by the adults as a source of nectar) and the early blue violet (which provides food for the larvae). The Oregon silverspot butterfly was listed as a threatened species on October 15, 1980, because of the small population, limited distribution, and continued loss of habitat. Critical habitat was also designated in coastal Oregon at the time of listing ( USFWS 1980). Subsequently a revised recovery plan was published in August of 2001 (USFWS 2001a).

#### 4.9.7.1 Limiting Factors

By the early 1980s most historical populations of the Oregon silverspot butterfly were extirpated (USFWS 2001a). The last Oregon silverspot butterfly found in Washington was in 1990 on the Long Beach Peninsula (WDFW 1993). The primary cause of its decline is habitat loss and degradation as a result of urban development, agricultural conversion, invasive non-native vegetation, recreational

off-road vehicle use, and natural succession. Direct mortality from collisions with vehicles and pesticide use are also a factors implemented in the reduction of populations. Loss of early successional meadows that support suitable conditions for the larval host plant, the early blue violet, has severely limited the amount of butterfly habitat to a handful of sites on the central Oregon coast and one site in Del Norte County, California. In Washington most violet habitats are threatened by the presence of heavy grass thatch and invasion by woody vegetation that shade out or restrict violet growth (Pyle 1985).

#### 4.9.7.2 Recovery Actions

Recovery actions identified for the Oregon silverspot butterfly and addressed through management activities at Willapa NWR are:

- Design habitat areas for the Long Beach population (1.1).
- Develop a management plan for protected habitats in the Long Beach Habitat Conservation Area (1.1.5).
- As habitat rehabilitation efforts proceed, contribute to the understanding of factors that affect population dynamics and persistence. These factors include control of exotic grasses, trees, and brush, establishment of early blue violets and nectaring plants, and refining habitat requirements at sites managed as butterfly habitat (2.2).

# 4.10 Special Designation Areas

## 4.10.1 Formally Designated Natural Areas

The Refuge has three State-registered natural areas that are in the RNA category. These RNAs are administered by the Service to 1) preserve examples of all significant natural ecosystems for comparison with those influenced by humans; 2) to provide educational and research areas for ecological and environmental studies; and 3) to preserve the genetic and behavioral diversity of native and endangered plants and animals. As directed in this program, RNAs must be reasonably protected from any influence that could alter or disrupt the characteristic phenomena for which the area was established. Management practices, such as prescribed burning and chemical control of plants, may be conducted only where necessary to preserve vegetation and as directed in a plan approved by the regional director.

#### 4.10.1.1 Diamond Point Research Natural Area

Diamond Point RNA is an 88-acre forested area at the northern tip of Long Island that was designated an RNA in 1976. Diamond Point RNA preserves an example of second-growth Sitka spruce–western hemlock forest growing on an island in a coastal estuary. The natural area includes 48 acres of mature red alder and 40 acres of mature Sitka spruce/sword fern forest and Sitka spruce/salal forest. This area was logged around the beginning of the twentieth century (Dyrness 1972).

### 4.10.1.2 Cedar Grove Research Natural Area

Cedar Grove RNA encompasses 264 acres and is located in the southern portion of Long Island. This RNA is an example of an old-growth western red cedar–western hemlock/evergreen huckleberry–salal forest.

The Cedar Grove is unique, representing a forest association that has not been identified anywhere else in the Pacific Northwest. Other forests with similar composition have been destroyed by logging, fire, or windthrow (Franklin 1984).

The structure of the Cedar Grove is unusual in that it is quite uniform. Western red cedars average 8 to 11 feet dbh (diameter at breast height) and reach 150 to 165 feet in height. Individual cedars may be up to 1,000 years old. Old-growth western hemlock may reach 5 to 6 feet dbh. All sizes and age classes of western red cedar and western hemlock indicate that these two species are continuing to reproduce and maintain their positions in the stand, possibly representing a climax condition. The western hemlock has a higher mortality rate and shorter life span than the cedar, therefore the hemlock is believed to cycle through the stand four to five times more rapidly than the cedar.

The uniform structure of the Cedar Grove has been attributed to the absence of catastrophic fire in the stand. Individual trees show signs of fire, but the wet climate and island setting have apparently protected the area from a stand-destroying fire. This forest may have developed unscathed since the last major change in climate 4,000 years ago. The trees surrounding the Cedar Grove and its topography have probably protected it from major wind events. This area was difficult to access by water and was therefore spared from logging in the early days. The rest of Long Island has been logged one or more times in the last 100+ years (USFWS 1987).

The three-quarter-mile Trail of Ancient Cedars loops through the northern edge of the Cedar Grove RNA.

### 4.10.1.3 Leadbetter Point Research Natural Area

Leadbetter Point RNA, located at the northern tip of the Long Beach Peninsula, was put on the Washington Register of Natural Areas in 1989. The original designation included 1,705 acres of the peninsula tip, Grassy Island, and the marsh between the island and peninsula tip; however, the Leadbetter Point Unit is now approximately 1,742 acres due to sand accretion at the peninsula tip. This area represents the largest, highest quality coastal sand dune ecosystem in Washington State. The unique natural elements protected at Leadbetter Point include salt marsh, native dunegrass, lodgepole pine (shore pine) forest, shrub/lodgepole pine (shore pine), and open beach habitats. Leadbetter Point contains high-quality examples of high salinity Virginia glasswort/inland saltgrass marsh, low salinity marsh, and transition zone wetlands. Flora associated with the marshes are of primary significance, as are the dune grassland and deflation plain communities. Pockets of native plants within the secondary dune, deflation plains, and dune troughs are also significant ecological features and are of high quality compared to these remaining plant communities in Washington. The open beach and dune grassland communities of Leadbetter Point have been significantly impacted by the invasion and naturalization of two non-native beachgrasses. The salt marsh has been invaded by smooth cordgrass, an eastern salt marsh species, although efforts to control cordgrass (*Spartina*) in recent years have essentially eliminated it from Leadbetter Point. Selective removal or control of plant species not native to Leadbetter Point, including *Spartina*, Scotch broom, and common gorse, was an approved management activity at the time the RNA was established. Removal and control of

the non-native beachgrasses has been approved and work has been done as part of the management of habitat for the federally threatened/State endangered western snowy plover (Caicco 1989; Willapa NWR files).

## 4.10.2 Important Bird Areas (IBAs)

Two areas on the Refuge have been officially identified as Important Bird Areas (IBAs): Leadbetter Point and South Willapa Bay. The Important Bird Areas Program is a global effort to identify and conserve areas that are vital to birds and biodiversity. IBAs are key sites for conservation and do one (or more) of three things:

1) Hold significant numbers of one or more globally threatened species.
2) Are one of a set of sites that together hold a suite of restricted-range species or biome-restricted species.
3) Have exceptionally large numbers of migratory or congregatory species.

As of 2009, approximately 11,000 sites in 200 countries and territories have been identified as IBAs.

# Chapter 5
# Public Use Program and Impact on Social and Economic Environment

*Willapa interpretive art trail*
USFWS

# Chapter 5. Public Use Programs and Impact on Social and Economic Environment

## 5.1 Introduction

Willapa National Wildlife Refuge encompasses approximately 16,000 acres of tidelands, temperate rainforest, ocean beaches, and small streams. It also includes several rare remnants of old-growth coastal cedar forest. The Refuge preserves habitat for spawning wild salmon, hundreds of thousands of migrating shorebirds, and threatened and endangered species such as the marbled murrelet. The Refuge is a great place to see what the Pacific Northwest looked like over 100 years ago.

The Refuge is located in southwestern Washington on Willapa Bay, one of the most pristine estuaries in the United States. Willapa Bay is the second largest estuary on the Pacific Coast and includes over 260 square miles of water surface. The Refuge was established in 1937 to protect migrating and wintering populations of brant, waterfowl, shorebirds, and other migratory birds. The Refuge was established at a time when many estuaries were rapidly being destroyed by diking, draining, dredging, sedimentation, and pollution.

Willapa National Wildlife Refuge is located in Pacific County, which is bordered by the Columbia River, the Pacific Ocean, and the pristine Willapa Bay. Traditionally, the county's economy has been natural resource–based (i.e., tourism, logging, lumber, manufacturing, oyster harvesting, seafood canning, crabbing, sports and commercial fishing, dairy farming, and cranberry growing) (Pacific County 2009). With over 25 miles of beach area located along the Pacific Ocean, coastal life provides recreation opportunities such as fishing, hunting, beach combing, clam digging, camping, bird watching, trail hiking, whale watching, kite flying, and various organized community sports. Access to this rural county is an easy drive from Interstate 5 via Highway 12, Highway 6, and Highway 4, connecting to coastal U.S. Highway 101.

Visitors to the Refuge can enjoy viewing a wide variety of wildlife, from spawning salmon in the Refuge's numerous streams, Roosevelt elk on Long Island, and the tens of thousands of migrating shorebirds that crowd the beaches at Leadbetter Point and shores of Willapa Bay.

The majority of the public recreation in the local area centers on the Pacific Ocean, Willapa Bay, and the many trails. Water-related recreational opportunities, including power boating, kayaking, canoeing, waterfowl hunting, fishing, and camping, provide the majority of the outdoor pursuits for the local and visiting public. As would be expected, outdoor activities significantly increase during the summer months, although many recreational activities are not restricted to a specific season.

Designated camping facilities are limited in the local area. Although most national wildlife refuges do not allow camping, Willapa Refuge permits camping in designated spaces on Long Island. Camping sites on Long Island require a boat to access and are primitive. Cape Disappointment, a State Park just southwest of the Willapa Refuge provides many multiuse camping opportunities. Newly established yurts help extend the camping season into the fall and winter for individuals without RVs or other types of camp trailers. A few other private parks in the area allow RV or tent camping on a seasonal basis.

Boat launch sites on the Willapa Refuge are available at milepost 24 on Highway 101 adjacent to the Willapa Refuge office headquarters and at the Port of Nachotta, located in the town of Nachotta on

the Long Beach Peninsula. To the east of the Refuge is the Naselle River boat launch located in the town of Naselle. Public and commercial oyster and clam beds reside in Willapa Bay along with public and commercial fishing and crabbing.

Willapa National Wildlife Refuge provides opportunities for both big game and waterfowl hunters. Archery hunters interested in a remote hunting experience find Long Island a challenging place to pursue Roosevelt elk, black-tailed deer, black bear, and both ruffed and blue grouse. A free refuge hunting permit is required to hunt on Long Island. Many people who hunt on Long Island prefer to camp overnight because tides can make travel to and from the island challenging. Most of the refuge lands on the mainland between Bear River and Teal Slough are open for those interested in hunting Roosevelt elk or black-tailed deer using modern firearms or archery.

For those interested in hunting waterfowl, portions of the Leadbetter Point, Stanley Point, Potshot, and North Potshot Units are open to walk-in duck hunting seven days a week and goose hunting two days per week. The Porter Point Unit is open for waterfowl hunting on Sunday, Monday, and Thursday. The Riekkola Unit is open to goose hunting only from blinds on Sunday and Wednesday. Blind selection is done by lottery early the morning of each hunt. There is a small fee for use of the blinds. Although dogs are normally not permitted on the Refuge, they are allowed when actively engaged in hunting waterfowl.

## 5.2 Public Use Infrastructure and Administrative Facilities

The infrastructure and facilities discussed in this section include public entrances, roads, trails, and administrative buildings. This section also discusses seasonal closures, easements, and rights-of-way. Planned public and administrative facilities are depicted in Maps 1 through 4.

There are currently 13 units on the Willapa National Wildlife Refuge. For brevity and clarity, some units have been combined to form five identifiable refuge areas. These units are located throughout Pacific County, in the southwest portion of Washington State.

### 5.2.1 East Hills Units

The East Hills Units consist of the property east of Bear River, Headquarters, Teal Slough, and Potshot, North Potshot, and Stanley Point tideland units.

The Bear River Unit extends from south of Greenhead Slough, east of Highway 101 to milepost 19. Refuge housing (Quarters 88) is located within this unit; therefore, it is closed to all public access.

The Teal Slough Unit extends from Teal Slough eastward. The Teal Slough Trail is easily accessible from Highway 101 and is approximately 0.6 mile round trip. Limited parking is available at the Teal Slough gate. This site, located near the mouth of the Naselle River, supports a remnant coastal old-growth forest represented by ancient cedars and a Sitka spruce–western hemlock/salal community. The forest provides habitat suitable for two State and federally protected species, marbled murrelets and spotted owls, as well as Dunn’s and Van Dyke’s salamanders, Vaux’s swifts, and pileated woodpeckers. Deer and elk trails network the area.

The Potshot, North Potshot, and Stanley Point Units are tidelands that are located adjacent to the Stanley Peninsula located east of Chettlo Harbor. There are no facilities on these units. They are open to waterfowl hunting according to Washington State regulations.

The Refuge Headquarters Unit includes Omeara Point. It is located near milepost 24 on Highway 101 and extends north from Greenhead Slough to Teal Slough. The existing headquarters administrative building, which is the former house for the Refuge Manager, is over 55 years old. It has been renovated but still does not provide enough space and a design that accommodates the staff. The headquarters area also has a maintenance shop, equipment storage facility, and tool shed. The facilities at the existing site cannot be expanded due to the location in a narrow valley and impacts on threatened species.

Geological conditions limit effective water and sewage treatment at this site as well. The water supply is heavily contaminated with iron, boron, salts, and coliform bacteria, which an elaborate water treatment system cannot satisfactorily remove. The Refuge is outside all city water districts. In addition, the building is located too close to a salmon-producing stream that drains directly to Willapa Bay, posing a serious contaminant risk. In violation of environmental regulations and the Clean Water Act, the septic tank is 100 feet away from the wetland, the leach line is only 60 feet from the wetland, and an underground waterway goes directly over the leach line.

The public parking lot at the existing headquarters contains 16 car spots, nine trailer spots, and two accessible spots. Two public vault toilets are available. No running water is available to the public. A public boat launch into Willapa Bay is available directly across from the headquarters, on the west side of Highway 101.

An interpretive kiosk next to the parking lot offers directional, educational, and safety information. A temporary addition to this kiosk is also used for camping and archery permit registration during the early elk archery season. The indoor porch in the main headquarters building serves as an additional informational area with maps, pamphlets, and a collection of avian specimens.

The Willapa Art Trail is a quarter-mile-long, curving, barrier-free accessible boardwalk that provides visitors access to the tideland marsh and stream. Artwork located along the boardwalk tells the story of the stream and the many species who live there. Students from the University of Washington Public Arts Program designed, constructed, and installed the artwork.

The Cutthroat Climb Trail, a spur off the Willapa Art Trail, provides a climb into the forest surrounding the refuge headquarters. The trail is a moderate three-quarter-mile-long trail with steps cut into the hillside for easier movement up and down the ridge. Additional art pieces weave through the trail.

### 5.2.2 Leadbetter Point Unit

The primary public access to Leadbetter Point Unit occurs at the end of a narrow road near the northern tip of the Long Beach Peninsula. The parking lot has two barrier-free accessible spots, 23 standard parking spots, two bus/RV parking spots, and a turnaround. The parking lot and the two vault toilets that are maintained by Washington State Parks. A kiosk and signs offer directional, educational, and safety information, as well as a trail and wildlife viewing platform. Pedestrians access the Refuge and adjacent State Park lands from a trail that begins at the north end of the parking lot.

Hiking trails at Leadbetter Point Unit allow visitors to walk through coastal woodlands, salt marshes, and beaches. A 1.3-mile Bearberry Trail, 0.5-mile Beach Trail, and a 1.2-mile Bay Loop Trail link the Leadbetter Point Unit with adjacent Washington State Park trails. These trails can be flooded

during the rainy season (October through May). The nesting area for the threatened snowy plover is closed to all public entry from March 15 through September 30 and is posted with signs. These dates can vary, if necessary, due to the seasonal variation in the use by snowy plovers.

There are no administrative facilities on Leadbetter Point Unit.

### 5.2.3 Long Island Unit

Long Island is the Pacific Coast's largest estuarine island. Long Island's 5,451 acres contain a rare 274-acre remnant of old-growth lowland coastal forest. The island is entirely owned by the Service, except for 1.25 acres located at the southern tip of the mouth of Lewis Slough. Long Island can only be accessed by boat. Most of the campgrounds require a 6-foot or higher tide; however, the boat landing directly across from the existing refuge headquarters can be accessed at any tide.

There are five campgrounds on Long Island: Lewis (two campsites), Sawlog (six campsites), Pinnacle Rock (five campsites), Smokey Hollow (four campsites), and Sandspit (three campsites). Each campsite has a fire pit and a picnic table. Each campground also has an evaporator vault toilet. Cutting of live trees or standing dead trees is prohibited because they provide homes for wildlife, but collection of fallen wood is allowed. To maintain the quiet, remote nature of the island, motor vehicles and power equipment are prohibited on Long Island.

Campsites are available on a first-come, first-serve basis only. Campers are required to register for specific campsites one week prior to the start of early elk archery season through the end of the early elk archery season. Registration is not required the remainder of the year. Early elk archery season generally takes place for three weeks in September, but exact dates vary. Leaving items unattended to hold a campsite is prohibited. Due to the high numbers of visitors during this period, no individual or group (maximum five people) may camp for more than 14 days during this period.

Hiking trails occur throughout Long Island. A network of old logging roads converted to trails provides well over 10 miles of hiking opportunities. One of the most popular destinations is the Cedar Grove Trail, a three-quarter-mile loop trail near the center of the island, which takes visitors through the northern corner of the old-growth forest. The hike from the old ferry landing, on the southern tip of Long Island, north along the center road to the Cedar Grove Trail is approximately 2.5 miles.

Refuge facilities located on Long Island include a shop building that serves as an equipment/supply storage space. The shop is located on the southern portion of the island situated immediately adjacent to the service road.

### 5.2.4 Shoalwater and Wheaton Units

The Shoalwater Unit is located in the mouth of the Willapa Bay, immediately south of State Highway 105 and west of the town of Tokeland. There are no facilities on the Shoalwater Unit. The Wheaton Unit is located approximately 5 miles southeast of Raymond, Washington, along the Willapa River. It was received in July 19, 1989, through the Farmers Home Administration. There is a shop on the Wheaton Unit and an RV pad with electrical hook-ups.

### 5.2.5 South Bay Units

The South Bay Units consist of the Tarlatt, Riekkola, Lewis, and Porter Point Units.

The Tarlatt Unit has northern and southern subunits. The northern subunit is located in the southwest portion of Willapa Bay west of Tarlatt Slough and east of the peninsula. The northern subunit consists of tidal mudflat and native salt marsh. The southern subunit is located between Lone Fir Cemetery Road and 95th Street on the Long Beach Peninsula. The southern Tarlatt Slough subunit has a Wetland Reserve Program (WRP) easement located on the Old Shier property. This WRP easement is administered by the USDA NRCS and offers landowners the opportunity to protect, restore, and enhance wetlands on their property.

There is a photography blind on the southern Tarlatt Unit. The Friends of Willapa National Wildlife Refuge constructed this photography blind on a seasonal freshwater wetland in 2003. The best time of year to use the blind is during the winter and early spring when the wetland is full of water and feeding waterfowl. The blind is available by reservation only. There is a short foot trail to the photo blind. Additionally, the Tarlatt Unit has a temporary hunting blind constructed for the goose hunting season.

The Riekkola Unit is located at the end of 67th Place off of Sandridge Road on the Long Beach Peninsula. There is an equipment storage building, shop office, maintenance shop, and shop yard on the Riekkola Unit. The Riekkola Unit currently has a gravel parking lot. There are seven temporary hunting blinds that are constructed for the goose hunting season. Blind #6 is reserved for hunters with a State disabled permit and their partners.

The Lewis Unit consists of managed freshwater wetland impoundments, intertidal salt marsh, and mudflats. Fish ladders are active within the unit to provide fish passage for anadromous fish between the wetland and Willapa Bay. The freshwater wetland water is manipulated by using adjustable slide gates to vary the water depth based on current management habitat targets. Entry to the Lewis Unit occurred via a private road, Jeldness Road, off of Highway 101. Jeldness Road was closed by the property's owners in 2008. Since the closure of Jeldness Road, the Lewis Unit has been closed to public access.

The Porter Point Unit consists of managed freshwater wetland impoundments, intertidal salt marsh, and mudflats. Fish ladders are active within the unit to provide fish passage for anadromous fish between the wetland and Willapa Bay. The Porter Point Unit has parking for car-top boat and foot access. The dike trail is open for hiking. It is accessible by way of 67th Place. During the hunting season, this area is closed on Wednesday and Saturday due to a managed goose hunt in the adjacent Riekkola Unit. During the hunting season, the Porter Point Unit is open on Sunday, Monday, and Thursday for waterfowl hunting, and on Tuesday and Friday for nonconsumptive uses such as hiking and wildlife observation.

## 5.3 Public Use Overview

Willapa Refuge is a destination for nearby community members, as well as visitors from outside the area. It is difficult to determine exact numbers of visitors to the Refuge but it is estimated the Refuge has approximately 128,000 visitor use-days each year. See Table 5-1 below for details. The Refuge provides funding for one full-time Visitor Services staff member dedicated to public use and

volunteer programs. Maintenance of the campgrounds, signs, trails and other visitor use facilities is completed each summer by the Youth Conservation Corps.

Many refuge visitors discover the Refuge while on their way to and from other destinations, while others visit the Refuge for specific activities such as bird watching, hunting, hiking, and camping. The Refuge provides refuge-specific information, orientation and interpretive panels, and printed materials at the existing refuge headquarters and throughout the Refuge.

**Table 5-1. Visitor Use Days at Willapa National Wildlife Refuge.**

| Visit Type | 2010 Visits | Projected Visits – Management Direction |
|---|---|---|
| Hunting: Waterfowl | 350 | 400 |
| Hunting: Big game | 330 | 430 |
| Fishing: Estuarine and shellfish | 150 | 150 |
| Wildlife observation/photography | 109,500 | 164,500 |
| Environmental education and interpretation | 1,900 | 5,850 |
| Visitor center and picnicking* | 13,500 | 28,200 |
| Camping | 1,700 | 1,700 |
| Boat launch | 550 | 650 |
| **Total visits** | **127,980** | **201,880** |

* Includes Highway 4 restroom stops.

Projected figures for the management direction reflect an increase in waterfowl hunting due to more area available to hunting seven days a week, and an increase in big game hunting due to additional opportunities for elk and deer hunting. The addition of an Environmental Education Specialist will increase the scope and quantity of outreach and interpretation activities. The creation of additional trails, an observation site, outdoor classroom, and indoor visitor space will provide enhanced opportunities for wildlife viewing, photography, and education. The location of these new facilities will draw a higher concentration of use due to the proximity to Long Beach Peninsula area attractions and the Discovery Trail.

The majority of the Refuge is open to the public with a few exceptions. During the snowy plover nesting season, portions of the beach on Leadbetter Point are closed. Visitors can check with the Refuge for dates and look for posted signs. In addition, the Lewis Dike Road has been closed to waterfowl hunting and wildlife observation. Entry to the Lewis Unit occurred via private road, Jeldness Road, off of Highway 101. Jeldness Road was closed by the property's owners in 2008. An alternative access to the Porter Point Unit through the Riekkola Unit has been developed. Although Long Island is open to public access, the Presidential Proclamation Boundary around the island restricts waterfowl hunting in this area.

The principles of universal design are an important part of planning at Willapa Refuge to ensure that facilities are available to all individuals regardless of ability. Several facilities at Willapa Refuge are barrier-free and accessible, including the Willapa Art Trail, public space at the existing headquarters office, public restrooms, and one hunting blind for the goose hunt.

### 5.3.1 Area Outdoor Recreational Opportunities and Trends

According to the National Survey on Recreation and the Environment (NSRE 2000), the five most popular individual outdoor recreational activities and percentage of the U.S. population participating were walking (87.1 percent), family gatherings (76.1 percent), viewing natural scenery (69.8 percent), visiting a nature center, nature trail, or zoo (62.8 percent), driving for pleasure through natural scenery (60.0 percent), and picnicking (59.9 percent). These types of activities are likely popular because the costs to participate are relatively low, physical exertion is minimal, and special equipment or developed skills are not required.

The Washington State Recreation and Conservation Office (RCO, formerly known as the Interagency Committee for Outdoor Recreation [IAC]) contracted with Clearwater Research, Inc., (Clearwater) to perform questionnaire consultation, data collection, data preparation, data analysis, and reporting activities as part of a population-based research study on outdoor recreation in Washington. The Washington Outdoor Recreation Survey (ORS) was designed to accurately measure the outdoor recreational activity among Washington residents.

The most recently released Washington ORS (RCO 2007) identified the 15 major categories of outdoor recreation. Table 5-2 lists the activities in order from most to least in terms of participation rates. Walking and hiking activities, followed by exercise and sports activities, had the highest levels of participation.

**Table 5-2. Ranking of Major Activity Areas of Washington State Residents (2007).**

| Activity Category | Percentage of Population |
|---|---|
| Walking/hiking | 73.8 |
| Team/individual sports, physical activity | 69.2 |
| Nature activity | 53.9 |
| Picnicking | 46.8 |
| Indoor community facility activity | 45.1 |
| Water activity | 36.0 |
| Sightseeing | 35.4 |
| Bicycle riding | 30.9 |
| Off-road vehicle riding | 17.9 |
| Snow/ice activity | 17.5 |
| Camping | 17.1 |
| Fishing | 15.2 |
| Hunting/shooting | 7.3 |
| Equestrian activity | 4.3 |
| Air activity | 4.0 |

The ORS survey discusses each activity category in detail, further breaking down the categories into specific activities. Several of these are of note in planning for public use at Willapa National Wildlife Refuge.

- **Walking/hiking:** The most prevalent settings for walking without a pet were sidewalks (at least 57.3 percent), park or trail settings (at least 47.8 percent), and roads or streets (at least 42.4 percent).
- **Nature activity:** The most frequent nature activity (over 35 million times) was observing or photographing wildlife or nature, performed by at least 39.0 percent of Washingtonians. Visits to nature/interpretive centers were reported by 15.9 percent of Washington residents.

The only significant demographic difference for observing or photographing wildlife or nature for all types and settings combined was age, with the largest percentage (41.7 percent) seen for Washingtonians 50 to 64 years old.

- **Water activity:** The water activities with the greatest prevalence in the Washington population were beachcombing (19.9 percent), motorboating (11.4 percent), and canoeing, kayaking, row boating, and other hand-powered boating (7 percent).
- **Sightseeing:** The most prevalent setting for sightseeing was scenic areas (at least 41.7 percent of residents).
- **Camping:** Camping with a kayak or canoe was reported by 1.4 percent of Washingtonians. Those with incomes from $15,000 up to $25,000 showed more interest (33.6 percent) than those in any other income range to do more camping in general.
- **Fishing:** Roughly equivalent percentages of Washington residents (at least 17 percent) participated in fishing from a bank, dock, or jetty and fishing from a private boat. However, fishing was performed more frequently from a bank, dock, or jetty (over 2.3 million times) than from a private boat (over 1.4 million times). Fishing for shellfish was reported by 9 percent of the population.
- **Hunting:** Two categories of hunting or shooting—each one divided into types—were included on the survey questionnaire. The main categories were archery and firearms. The category that the most Washington residents participated in during 2006 was firearms (at least 10.8 percent). The most prevalent type of activity with firearms was target, trap, or black powder shooting (at least 7.9 percent), followed by hunting big game (at least 6.1 percent), hunting birds or small game (at least 3.4 percent), and hunting waterfowl (at least 2.5 percent). At least 2.9 percent of Washingtonians engaged in archery, nearly all of it target shooting.

The most recently released 2007 Washington ORS did not offer forecasts of future regional recreation demands. The previous survey, which was released by the Washington IAC (IAC 2002a), states that outdoor recreation in most activities continues to increase at high growth rates. Many outdoor activities generally permitted on refuges are expected to show increases of 20 to 40 percent over the next 20 years. Table 5-3 shows the percentage change expected for Washington State by activity as reported by IAC in 2002.

**Table 5-3. Projected Future Increase in Participation for Selected Outdoor Recreation Activities.**

| Activity | Estimated Change, 10 Years (2002-2012) | Estimated Change, 20 Years (2002-2022) |
|---|---|---|
| Walking | 23% | 34% |
| Hiking | 10% | 20% |
| Nature activities | 23% | 37% |
| Fishing | -5% | -10% |
| Hunting | -15% | -21% |
| Sightseeing | 10% | 20% |
| Camping | 10% | 20% |
| Canoeing/kayaking | 21% | 30% |
| Motor boating | 10% | No estimate |
| Equestrian | 5% | 8% |
| Non-pool swimming | 19% | 29% |

## 5.3.2 Overview of Refuge Wildlife-dependent Public Uses

The National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57) recognizes that six priority wildlife-dependent recreational uses—hunting, fishing, wildlife observation and photography, and environmental education and interpretation—are legitimate and appropriate public uses of the Refuge System, provided the activity is compatible with the purpose for which a refuge was established.

Willapa Refuge provides opportunities for big game and waterfowl hunters as well as recreational fishing and shellfish harvesting. Hunting and fishing rules and regulations on the Refuge are consistent with the State regulations except as specifically noted herein. Hunting is permitted in some, but not all, of the management units. Specific species/numbers to be taken and hunting/fishing periods are set by the WDFW.

### 5.3.2.1 Waterfowl Hunting

Recreational hunting has been identified in the National Wildlife Refuge System Improvement Act of 1997 as a priority public use, provided it is compatible with the purpose for which a refuge was established. Because hunting is one of the six designated wildlife-dependent public uses of the National Wildlife Refuge System, refuges grant hunting special consideration in planning and management.

For those interested in hunting waterfowl, portions of the Leadbetter Point Unit are open to walk-in duck and goose hunting. Access is by Stackpole Road. Hunting is prohibited in the snowy plover closure area. The Stanley, Potshot, and North Potshot Units are also open during the Washington State hunting season for waterfowl.

The Riekkola and Tarlatt Units are open to regulated goose hunting only from eight assigned blinds. One of these blinds provides barrier-free access for disabled hunters. Blind selection is done by lottery early the morning of each hunt. There is a small fee for use of the blinds. Although dogs are normally not permitted on the Refuge, they are allowed when actively engaged in hunting waterfowl and must be kept under control at all times.

Waterfowl hunting previously occurred on the freshwater marsh and salt marsh in the Lewis Unit. Entry to the Lewis Unit occurred via a private road, Jeldness Road, off of Highway 101. Jeldness Road was closed by the property's owners in 2008. An alternative has been developed for waterfowl hunters to access the adjacent areas of freshwater marsh and salt marsh at the Porter Point Unit in lieu of the Lewis Unit. Access to the Porter Point Unit occurs through the Riekkola Unit, off 67th Place in Long Beach. The Porter Point Unit is suitable for car-top boats and small craft that can be easily moved. No gas-powered engines are allowed in the freshwater wetland. Parking is available across the Riekkola Unit pastures in a delineated graveled parking area with 10 sites for waterfowl hunters. The freshwater wetland can be accessed by the Porter Point Unit dike or boating the wetland. The salt marsh of Willapa Bay can be reached from the existing footbridge on the east end of Porter Point Unit or by walking into the bay from the dike on the west end of the unit. Signs are placed on the east and west boundary of the Porter Point Unit, extending into the bay, to delineate the hunt area.

The schedule for the waterfowl hunt has been designed to best accommodate multiple users on adjacent areas throughout the week. A regulated goose hunt occurs on an adjacent pasture on the

Riekkola Unit on Wednesday and Saturday. To reduce impacts to the goose hunt, waterfowl hunting is open Sunday, Monday, and Thursday on the Porter Point Unit. Gates are open from 6 am until 5 pm. The Porter Point Unit is open for other wildlife observation on Tuesday and Friday during the waterfowl hunt season. All users other than waterfowl hunters walk in through the pedestrian gate at the main Riekkola Unit entrance by way of 67th Place.

#### 5.3.2.2 Big Game Hunting

Recreational hunting has been identified in the National Wildlife Refuge System Improvement Act of 1997 as a priority public use, provided it is compatible with the purpose for which a refuge was established. Because hunting is one of the six designated wildlife-dependent public uses of the National Wildlife Refuge System, refuges grant hunting special consideration in planning and management.

Big game hunting occurs on both the mainland and Long Island. Most of the refuge lands on the mainland between Bear River and Teal Slough with the exception of the quarters (Quarters 88) and the existing headquarters area are open for those interested in hunting Roosevelt elk or black-tailed deer using modern firearms or archery. There are no firearms permitted on Long Island. Archery hunters interested in a remote hunting experience find Long Island a challenging place to pursue Roosevelt elk, black-tailed deer, black bear, and both ruffed and blue grouse. A free refuge hunting permit is required to hunt on Long Island. Many people who hunt on Long Island prefer to camp overnight because tides can make travel to and from the island challenging.

#### 5.3.2.3 Fishing

Although it surrounds much of southern Willapa Bay, the Refuge is not considered a prime fishing location. However, fishing is permitted from the shores of Willapa Bay. Most visitors interested in fishing on the Refuge are in search of sturgeon. Fishing is not permitted on the Refuge's nontidal streams or interior sloughs. All fishing on the bay follows WDFW regulations.

#### 5.3.2.4 Shellfish Harvesting

All harvesting on the Refuge follows Washington State shellfish licensing procedures. Shellfish harvesting of Manila clams and Pacific oysters occurs at two locations on Long Island. The public clam and oyster beds were surveyed and posted in 2009.

Diamond Point is located on the northwest tip of Long Island from the mean high water out to the eastern boundary of the Long Island Oyster Reserve. Harvest is allowed west on reserve tidelands to MLLW between reserve monuments 39, 40, and 41. Pinnacle Rock is located on the southwest side of Long Island nearest Pinnacle Rock and Smokey Hollow campgrounds.

#### 5.3.2.5 Wildlife Viewing and Photography

Opportunities for wildlife viewing and photography exist along refuge trails. Biologists have recorded over 100 species of birds on Leadbetter Point. Fall and spring migrations bring high concentrations of sandpipers, sanderlings, plovers, dowitchers, and other shorebirds to its shores and tideflats, while dunlin peak in the winter. Peregrine falcons and bald eagles are among the most common raptors at Leadbetter Point. The South Bay Units also provide locations for wildlife

viewing and photography. Due to the current hunting schedule and gated access, opportunities are limited.

Long Island offers a multitude of opportunities to observe and photograph wildlife. High Point Meadow is a good place to observe deer and elk. Glimpses of bear are common on hikes along the trails and roads. Birds can be found both on the shores and throughout the forest.

River otters and muskrats glide through the waters of the Porter Point Unit. Visitors can also view wildlife within the wetland units and enjoy a sweeping view of the many waterfowl that congregate in the south end of Willapa Bay.

The Friends of Willapa National Wildlife Refuge constructed a photography blind on a seasonal freshwater wetland in the Tarlatt Unit in 2003. The blind is available by reservation only.

#### 5.3.2.6 Environmental Education and Interpretation

Environmental education and interpretation opportunities range from formal lessons led by volunteers and refuge staff to self-led walks along the Willapa Art Trail. Refuge staff and volunteers provide talks and lessons to local colleges, scouting groups, community organizations, and local schools both on the Refuge and off-site at schools or community centers. Lessons can be customized and aligned to national and State educational standards.

Over a three-day period in late spring, the Friends of Willapa National Wildlife Refuge and the Refuge host students from regional schools as part of the fourth-grade environmental education program. All activities are aligned to Washington State Science Learning Standards. Each classroom activity takes about one class period, approximately 45 to 55 minutes.

### 5.3.3 Overview of Refuge Non-wildlife Dependent Public Uses

While several public uses are not recognized as wildlife-dependent by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57), camping and boating have been found appropriate due to specific site circumstances. Because a large portion of the Refuge consists of navigable waters and island habitat, visitors to the Refuge often use some type of watercraft to access these areas. Due to difficulty accessing Long Island during tidal fluctuations, camping is allowed in designated sites.

### 5.3.4 Impact of Illegal Uses

The most common law enforcement issues encountered are trespass into closed areas, harvesting of natural resources (mushrooms, berries), hiking with dogs, waterfowl hunting violations (lead shot, hunting in closed areas, taking birds out of season, unplugged shotguns), vandalism (broken gates, defaced signs, vault toilet damage), theft (stolen gas, tools, equipment, signs), and illegal camping. Illegal uses persist partly due to limited law enforcement capability and lack of public awareness of the sensitivity of the wildlife to human disturbance. There is currently one full-time Refuge Law Enforcement Officer assigned to cover all three refuges within the Willapa National Wildlife Refuge Complex. The refuge staff coordinates internally with other Federal officers/agents and works with the U.S. Coast Guard as well as State, county, and local law enforcement offices.

# 5.4 Cultural and Historical Resources

A complete cultural resources overview of Willapa National Wildlife Refuge was completed by Gary Wessen in 2008. Excerpts from this document (Wessen 2008) are provided in the following sections. It is important to consider the cultural and historical setting of the Refuge in planning public use activities and resource management actions. Recognizing the cultural and historical resources of the Refuge will allow educational programs to enhance the public's understanding of this important aspect of the Refuge. This section briefly describes both the Native American and Euro-American occupants of the vicinity.

## 5.4.1 Native American Cultural History and Landscape

There can be no doubt that the Willapa Bay area once supported a considerable number of Native American people and that they continue to have a presence today. Having said this, we acknowledge that the details of early historic Native American occupation are only poorly documented and many aspects of their presence are not well understood.

Assessing the presence of native people in the Willapa Bay area during the nineteenth century is complicated by the fact that Native Americans from neighboring regions came here to work for Euro-Americans. In the days before European settlement the shores of Shoalwater Bay were a mix of a bountiful natural environment and many native villages. The north end of the bay around the present-day Shoalwater Bay Indian Reservation was populated predominantly by Lower Chehalis–speaking peoples. The southern end of the bay, near present-day Bay Center and southward, was inhabited by Willapa Chinook peoples. It has also been documented that trade and intermarriage between the two groups was very frequent.

The most detailed information about Native Americans from the Willapa Bay area comes from Ray (1938). They had a traditional economy much like those of most Northwest Coast peoples. They were skilled fishermen, hunters, and plant-material gatherers who possessed great knowledge about the resources available in their environment. Anadromous and marine fish were the most important part of their diet, and most fishing occurred in Willapa Bay, the rivers that drained into it, and in the Columbia River mouth. The material culture was also similar to that of most Northwest Coast peoples. They were skilled craftsmen and technicians who produced a wide range of goods from plant, bone, and stone materials. Shoalwater winter villages were marked by the presence of large plank houses. Cedar bark and other plant fibers were used to make a wide variety of basketry, cordage, nets, and clothing. Finally, the social and ceremonial life had much in common with that of other Northwest Coast peoples. Most types of social affiliation appear to have focused upon local lineal (family) groups, which were based in one or more winter villages. Three broad categories of social standing existed within the local groups: nobles or upper class freemen, commoners, and slaves.

An executive order signed by President Andrew Johnson created the small 355-acre Shoalwater Bay Indian Reservation on the northern shore of Willapa Bay in 1866 (Anderson 2000:1-3). Although small compared to many reservations, the Shoalwater Bay Indian Reservation community has modern facilities today and is an active part of the cultural landscape of northern Willapa Bay.

## 5.4.2 Euro-American Exploration and Settlement

Non-Native people were first present in the vicinity of Willapa Bay starting in the late eighteenth century but were not much of a factor until after ca. 1850. Since that time, they have dominated the area. This section summarizes the earliest period of exploration, the first Euro-American settlers, and more recent developments in the Willapa Bay area.

The discovery and early exploration of the Willapa Bay area occurs within the context of the search for and subsequent use of the mouth of the Columbia River. Distracted by this nearby feature, exploration and documentation of details of the bay lagged until the mid-nineteenth century. In 1788, English explorer and trader John Meares observed the entrance to a large bay when sailing southward to investigate the report of a large river (Hazeltine 1957:252-254). Meares called the bay "Shoalwater Bay", Leadbetter Point "Low Point", and a prominent headland near it "Cape Shoalwater." While Meares never entered the bay, he comments:

> From the masthead it was observed that this bay extended a considerable way inland, spreading into several arms or branches to the northward and eastward. The back of it was bounded by high and mountainous land which was at a great distance to us. We had concluded this wild and desolate shore was uninhabited; but this opinion proved to be erroneous, for a canoe now came off to us from the point with a man and a boy. On their approach to the ship they held up two sea otter skins. (Hazeltine 1957:252-254)

The Lewis and Clark Expedition, which arrived from the east on the Columbia River in the fall of 1803, was the next well-documented account of the area. Although they spent most of their time on the south side of the Columbia River, they briefly explored the area. William Clark and some of the party ventured north on the southern part of the Long Beach Peninsula (Coues 1893:716). Clark noted the presence of a prominent headland further to the north but never specifically mentions a large bay in the area.

The Willapa Bay area was visited briefly again in August 1841 when representatives of the U.S. Exploring Expedition passed through the area travelling from the Grays Harbor area to Astoria. The survey party did not map Willapa Bay, but it did canoe across the bay. The first detailed map of Willapa Bay was prepared by Lieutenant James Alden of the U.S. Coast Survey in 1852. Although Alden was unable to record some details of the bay's southern end, this was the first map to accurately show its major features.

The first significant movement of settlers into the Willapa Bay area occurred after passage of the Donation Land Act of 1850. A major draw for the earliest arrivals was the oyster business, and several early entrepreneurs made a significant income by hiring Native people to collect oysters for shipment to San Francisco. By 1860, the Euro-American population of Pacific County had reached 406 (Hazeltine 1956:73). The earliest communities to be established on the bay were Bruceport and Oysterville.

Against the backdrop of early settlement, governmental organizations began to form. Pacific County was first established as part of the Oregon Territory after the latter was created in 1851. It subsequently became a part of Washington Territory after the latter was created in 1853. The earliest Federal presence near Willapa Bay was at the Columbia River mouth, where fortifications and a lighthouse were present by the mid-1850s. The first lighthouse at Cape Shoalwater, at the entrance to Willapa Bay, was established in 1858.

More settlers arrived after the Civil War, but the rate of growth was relatively slow. The Pacific County population had only reached 1,645 by 1880 (Hazeltine 1956:73). The pace picked up during the 1880s, however, and it had swelled to 4,538 by 1890. Although some early settlers came to the area to become farmers, it appears that most were drawn by opportunities in various pursuits that exploited the region's rich natural resources. The first interests were primarily timber and oysters, but other marine animals such as salmon and crabs became increasingly important over time.

The first railroad to reach South Bend was finished in 1892 and it also became increasingly important as a port after this time (Hazeltine 1956:117-122). As the latter trend developed, the name "Shoalwater Bay" was increasingly seen as a problem for shipping interests and the northern half of the bay began to be called "Willapa Harbor" in about 1900. Eventually, the entire bay came to be known as Willapa Bay. Although much of the early transportation within the Willapa Bay was by watercraft, increased road building around the bay began to occur during the 1920s (Hazeltine 1956:157).

The principal economic activities in the Willapa Bay area during the twentieth century were much like those of the second half of the nineteenth century. Chief among them were those associated with timber, oysters, and salmon. Agricultural activities also became increasingly important in Pacific County, with the most important cultivation being cranberries. Finally, another industry that began in the late nineteenth century but did not become important until after the Second World War is tourism.

The Refuge was established in 1937 by President Franklin Roosevelt to protect migrating and wintering populations of brant, waterfowl, shorebirds, and other migratory birds and their habitats. Today, these lands preserve a rich heritage of wildlife for environmental conservation and wildlife-dependent recreation.

### 5.4.3 Archaeological Resources and Historic Properties

According to the Archaeological Resources Protection Act of 1979 (Public Law 96-95; 16 U.S.C. 470aa-mm), the term *archaeological resource* means any material remains of past human life or activities. Archaeological and other cultural resource studies have been relatively limited in the Willapa Bay area, and it is very unlikely that the current inventories reflect the total number of resources that are actually present. It is important to note that one of the earliest written references to archaeological resources in western Washington comes from this region. In commenting about the Native population of the area, James Swan (1857:211-212) states: "The relics of old lodges, canoes, heaps of shells, and other remains, give evidence that at some period there must have been a large body of Indians around Shoalwater Bay."

According to Wessen (2008), there are 55 recorded archaeological sites in the Willapa Bay Area, only 12 of which are located on refuge lands. Most of the sites are shell midden deposits, at least some of which contain human remains. Other types of sites include fish weirs, burial grounds, lithic sites, culturally modified trees, and historic sites. There are currently 149 recorded historic properties in the Willapa Bay area, but none of them are located on refuge lands. Most of the historic properties are existing residential or commercial structures that date to the late nineteenth or early twentieth centuries. Information on the condition of these sites is limited, and they are frequently threatened by shoreline erosion, vandalism, and development (Wessen 2008).

Project-specific archaeological surveys have also been conducted by USFWS archaeologists for refuge construction and restoration activities in compliance with Section 106 of NHPA.

# 5.5 Special Designation Areas

In addition to refuge status, the "special" status of lands within individual refuges may be recognized by additional designations, either legislatively or administratively. Special designation may also occur through the actions of other legitimate agencies or organizations. There is a wide variety of special land designations. Authority for designation of some special management area types (e.g., Research Natural Areas) on refuges lies solely with the Service. For most special management area types, responsibility is held by or shared with others. Refuges may also be included within much larger special management areas designated by other agencies or organizations, such as National Marine Sanctuaries. Special designation areas provide the visiting public with information on why the area is ecologically important.

## 5.5.1 Research Natural Areas

The Refuge has three designated RNAs. These RNAs are administered by the Service to 1) preserve examples of all significant natural ecosystems for comparison with those influenced by humans, 2) provide educational and research areas for ecological and environmental studies, and 3) preserve the genetic and behavioral diversity of native and endangered plants and animals. As directed in 8 RM 10.8, RNAs must be reasonably protected from any influence that could alter or disrupt the characteristic phenomena for which the area was established. Management practices, such as prescribed burning and chemical control of plants, may be conducted only where necessary to preserve necessary ecological characteristics.

Diamond Point RNA is an 88-acre forested area at the northern tip of Long Island that was designated an RNA in 1976. Diamond Point RNA is managed to preserve an example of second-growth Sitka spruce/western hemlock forest growing on an island in a coastal estuary for education and scientific purposes. The natural area includes 48 acres of mature red alder and 40 acres of mature Sitka spruce/sword fern forest and Sitka spruce/salal forest (Dyrness 1972).

Cedar Grove RNA is 274 acres of old-growth western red cedar/western hemlock/California huckleberry forest located in the southern portion of Long Island. The 1-mile Cedar Grove Trail loops through the northern edge of the Cedar Grove RNA (USFWS 1987).

Leadbetter Point RNA is located at the northern tip of the Long Beach Peninsula. The original designation included 1,705 acres of the peninsula tip, Grassy Island, and the marsh between the island and peninsula tip; however, the Leadbetter Point Unit is now approximately 2,397 acres due to sand accretion at the peninsula tip. The unique natural elements protected at Leadbetter Point include salt marsh, native dunegrass, lodgepole pine forest, shrub/lodgepole pine, and open beach habitats. Leadbetter Point contains high quality examples of high salinity Virginia glasswort/inland saltgrass marsh, low salinity marsh, and transition zone wetlands.

Flora associated with the marshes are of primary significance, as are the dune grassland and deflation plain communities. Pockets of native plants within the secondary dune, deflation plains, and dune troughs are also significant ecological features and are of high quality compared to these remaining plant communities elsewhere in Washington. The open beach and dune grassland communities of Leadbetter Point have been significantly impacted by the invasion and naturalization of two non-native dunegrasses. The salt marsh has been invaded by smooth cordgrass (*Spartina*), an eastern salt marsh species. Efforts to control cordgrass in recent years have slowed its spread at Leadbetter Point. Selective removal or control of plant species not native to Leadbetter Point, including

*Spartina*, Scotch broom, and common gorse, was an approved management activity at the time the RNA was established. Removal and control of the non-native beachgrass has been recently approved, and work has been done as part of the management of habitat for the endangered western snowy plover (Caicco 1989).

## 5.5.2 American Bird Conservancy Globally Important Bird Areas

American Bird Conservancy's (ABC) IBA Program was launched in 1995 and has concentrated on identifying and documenting the very top sites throughout all 50 states—those of significance on a global level. The goal of the IBA program is not just to recognize the sites as important but to mobilize the resources needed to protect them. The IBA designation is an important first step in raising awareness among the public and among land managers, of the importance of each site and its value to bird conservation. Using objective scientific information and relying on the recommendations of experts throughout the United States, ABC has developed a list and set of descriptions of 500 of these internationally significant sites. For a site to be included, it must, during at least some part of the year, contain critical habitat that supports 1) a significant population of an endangered or threatened species, 2) a significant population of a Watch List species, 3) a significant population of a species with a limited range, or 4) a significantly large concentration of breeding, migrating, or wintering birds, including waterfowl, seabirds, wading birds, raptors, or landbirds. Parts of north and south Willapa Bay have been identified as IBAs. This designation attracts visitors to these areas for birdwatching and is an important educational tool.

## 5.5.3 National System of Marine Protected Areas

The national system of Marine Protected Areas (MPAs) advances the conservation and sustainable use of the nation's vital natural and cultural marine resources. Executive Order 13158 of May 26, 2000, defines an MPA as "any area of the marine environment that has been reserved by federal, state, territorial, tribal or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein." The National Marine Protection Areas Center website (NOAA and DOI 2010) provides the following summary of the MPA system:

> The national system of MPAs 1) enhances protection of U.S. marine resources by providing new opportunities for regional and national cooperation, 2) supports the national economy by helping to sustain fisheries and maintain healthy marine ecosystems for tourism and recreation businesses, and 3) promotes public participation in MPA decision-making by improving access to scientific and public policy information.
>
> The purpose of the national system is to support the effective stewardship, conservation, restoration, sustainable use, and public understanding and appreciation of the nation's significant natural and cultural marine heritage and sustainable production marine resources, with due consideration of the interests of and implications for all who use, benefit from, and care about our marine environment
>
> The goals of the national system are to conserve and manage natural heritage, cultural heritage, and sustainable production. Natural heritage is the nation's biological communities, habitats, ecosystems, and processes and the ecological services, values and uses they provide. Cultural heritage is the cultural resources that reflect the nation's maritime history and traditional cultural connections to the sea, as well as the uses and values they provide. Sustainable production is the nation's renewable living resources and

> their habitats (including, but not limited to, spawning, mating, and nursery grounds and areas established to minimize bycatch of species) and the social, cultural and economic values and services they provide.

The Refuge is a 2009 charter member of the national system of MPAs. The site area for the Willapa MPA is 9.8 $km^2$ (3.8 square miles). The level of protection for the Willapa MPA is the uniform multiple-use category, and its primary conservation focus is sustainable production. Uniform multiple-use offers a consistent level of protection for marine habitat and species while providing opportunities for combinations of compatible human activities such as research, education, recreation, and consumptive and nonconsumptive uses. There are no site restrictions imposed by the MPA status on fishing regulations in Willapa Refuge. The primary conservation focus of the Refuge is sustainable production, which recognizes management wholly or in part with the explicit purpose of supporting the continued extraction of renewable living resources (such as fish, shellfish, plants, birds, or mammals) that live within the MPA, or that are exploited elsewhere but depend upon the protected area's habitat for essential aspects of their ecology or life history (feeding, spawning, mating, or nursery grounds).

### 5.5.4 Presidential Proclamation Boundary

The Refuge administers the Presidential Proclamation Boundary of 1937 that closes approximately 11,000 acres surrounding and including Long Island in the southern portion of Willapa Bay to hunting, taking, capturing, or killing of migratory waterfowl or other migratory birds, or the attempt to hunt, take, capture, or kill such waterfowl of other birds, or the taking of their nests or eggs.

## 5.6 Social and Economic Conditions

The Refuge is situated entirely within Pacific County, Washington. Pacific County includes Willapa Bay and extends west to the Pacific Ocean. It is bordered to the north by Grays Harbor County, the south by the Columbia River and State of Oregon, and to the east Lewis and Wahkiakum counties. With 975 square miles, Pacific County ranks thirtieth in size among Washington counties. The nearest towns are located on the Long Beach Peninsula (Oysterville, Nahcotta, Ocean Park, Oceanside, Long Beach, Seaview, Ilwaco, and Chinook) and inland (South Bend, Raymond, Nemah, and Naselle).

The population of Pacific County is just over 21,000 with a density of 23.37 persons per square mile (Office of Financial Management 2009). Population growth is predicted to be less than state average, with a low estimate of 19,906 and a high estimate of 28,043 for the year 2030. According to Washington State's Office of Financial Management, Pacific County experienced a population increase by 12.6 percent over the decade, growing from 1990 to 1997, and then decreased at an average annual rate of 0.4 percent from 1997 to 2000. Between the years 2000 and 2008, Pacific County experienced a slight increase of 0.4 percent. Pacific County has key competitive assets for future growth: competitive land cost, reasonable property taxes, proximity to urban amenities, education and training resources, dedication to industrial growth, and gateway status for parks and recreation. Because of these assets Pacific County continues to see growth in new housing developments in the northern and southern parts of the county, and a slight population growth in the future is anticipated. However, because of the proximity of the Refuge to population centers in the Portland/Vancouver area of northwest Oregon and southwest Washington, the Refuge can expect much greater pressure for recreational and tourism use in the future. Visitation to Pacific County is

over 1 million visitor-days per year. In 2008, Cape Disappointment by itself saw 89,286 day-visits and over 92,230 overnight visits. It is likely that an increase in parks and conserved areas for recreation will increase visitations, prolong by days the duration of each visit, and proportionately increase local spending by visitors (Pacific County Economic Development Council 2009).

Table 5-4 summarizes the population and associated social statistics of Pacific County and Washington State.

**Table 5-4. Selected Population and Associated Social Statistics.**

| Population Statistics | Pacific County | Washington State |
|---|---|---|
| Population, 2008 estimate | 21,271 | 6,549,224 |
| Population, percent change, April 1, 2000 to July 1, 2008 | 1.4% | 11.1% |
| Population estimates base, 2000 | 20,984 | 5,894,143 |
| Persons under 5 years old, percent, 2008 | 5.1% | 6.6% |
| Persons under 18 years old, percent, 2008 | 18.8% | 23.5% |
| Persons 65 years old and over, percent, 2008 | 23.9% | 12.0% |
| White persons, percent, 2008 | 92.0% | 84.3% |
| African American persons, percent 2008 | 0.5% | 3.7% |
| American Indian and Alaska Native persons, percent, 2008 | 2.6% | 1.7% |
| Asian persons, percent, 2008 | 2.1% | 6.7% |
| Native Hawaiian and Other Pacific Islander persons, percent, 2008 | 0.1% | 0.5% |
| Persons reporting two or more races, percent 2008 | 2.7% | 3.1% |
| Persons of Hispanic or Latino origin, percent, 2008 | 6.9% | 9.8% |
| White persons not Hispanic, percent, 2008 | 85.7% | 75.5% |
| Living in same house in 1995 and 2000, percent age 5+ | 57.0% | 48.6% |
| Foreign-born persons, percent, 2000 | 6.0% | 10.4% |
| Language other than English spoken, percent age 5+, 2000 | 8.2% | 14.0% |
| High school graduates, percent of persons age 25+, 2000 | 78.9% | 87.1% |
| Bachelor's degree or higher, percent of persons age 25+, 2000 | 15.2% | 27.7% |
| Persons with a disability, age 5+, 2000 | 5,410 | 981,007 |
| Housing units, 2007 | 14,598 | 2,744,069 |
| Homeownership rate, 2000 | 74.8% | 64.6% |
| Housing units in multiunit structures, percent, 2000 | 7.5% | 25.6% |
| Median value of owner-occupied housing units, 2000 | $102,700 | $168,300 |
| Households, 2000 | 9,096 | 2,271,398 |
| Persons per household, 2000 | 2.27 | 2.53 |
| Median household income, 2007 | $37,501 | $55,628 |
| Per capita money income, 1999 | $17,322 | $22,973 |
| Persons below poverty, percent, 2007 | 16.0% | 11.4% |

Source: U.S. Census Bureau (2009).

Pacific County's economy is still identified as natural resource–based. Timber and tourism contribute more total value to Willapa's economy than do other key natural resources (The Willapa Alliance WISC Committee 1995). Beyond those that are natural resource–based, key industries in Pacific County include food products manufacturing, high-tech/light manufacturing, tourism, and health care/retirement, as summarized in Table 5-5.

**Table 5-5. 2009 Pacific County Economic Summary by Industry.**

| Industries | Summary |
|---|---|
| **Natural resources** | • There are 12 industrial timber companies that own and harvest timber in Pacific County. These companies together have employed and/or subcontracted jobs to over 500 residents annually since 1993, providing an average annual wage of $46,881.<br>• Fishing (which includes shellfish) is an important subsector of the income base in Pacific County, as well as the seafood supply in Washington. Half of the state's oysters, 25% of the state's crabs, 99% of the sturgeon catch, and over 10% of the salmon catch are landed in this region. The industry generates over $12 million in personal income and provides nearly 600 jobs to the local economy.<br>• At one time, farming made up a large proportion of Pacific County's economic activity, but the last 25 years have shown steady declines in income. While the area has diverse cultivated crops and ranches, the vast majority of activity is in the cranberry industry. |
| **Food products manufacturing** | • The food processing industry accounted for an average of 45% of the manufacturing activity in Pacific County throughout the 1990s and into the twenty-first century. Pacific County has businesses throughout the county that process shellfish and oysters.<br>• Changes continue to occur in the food processing industry in Pacific County, which is highly dependent upon favorable harvesting seasons and market prices each year for cranberries, fish, and shellfish. |
| **High-tech/light manufacturing** | • With the necessary infrastructure in place, Pacific County has begun to see interest from small light industries relocating to port properties. In 2005, the first light manufacturing of aerospace components moved to the Port of Willapa Harbor providing high-tech machining and fabrication employment opportunities. |
| **Tourism** | • With its strategic location, bordered on the southwest by the Columbia River and the west by the Pacific Ocean, Pacific County offers breathtaking views of the Columbia River and the Pacific Ocean, recreational opportunities, fishing, hunting, birding, clamming, and a variety of outdoor experiences. The significance of tourism to Pacific County cannot be understated.<br>• As a gross revenue engine, tourism delivers over $90 million annually to local businesses, by any measure a huge contribution of the county's total output of goods and services. Business earnings from tourism approach $25 million annually. There are over 2,000 jobs related to or dependent on this industry. |
| **Health care/retirement** | • Pacific County's two hospitals made significant improvements or expansion of their health care facilities in recent years. The population in Pacific County has a median age of 45.8 years, and the health care industry is an extremely important part of the social and economic picture. An estimated 650 direct jobs depend on health care while another 271 jobs exist in support of this cluster. |

Source: Pacific County Economic Development Council (2009).

# Appendices A-F

*Headquarters stream*
USFWS

# Appendix A. Land Protection Plan

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Washington, D.C. 20240

In Reply Refer To:
FWS/ANRS/NRCP/049218

SEP 27 2011

Memorandum

To: Regional Director, Region 1

From: Deputy Director Gregory E Siekaniec

Subject: Approval to Proceed with Publication and Distribution of the Final Planning Documents for the Expansion of the Willapa National Wildlife Refuge, Pacific County, Washington

I approve your request dated August 12, 2011, to expand the acquisition boundary of the Willapa National Wildlife Refuge by approximately 6,809 acres.

This request is part of a Comprehensive Conservation Plan that has been in development since February 9, 2008. Federal, State and local conservation organizations support the Service's proposed protection and stewardship of the Willapa National Wildlife Refuge as described in the plan.

The Decision Package you submitted for my review included an Environmental Impact Statement, Land Protection Plan, and other related documents indicative of detailed planning. These documents comply with the requirements of the Director's land acquisition planning procedures memo dated August 11, 2000.

The lands targeted for protection will assist the refuge in buffering against the adverse impacts associated with a variety of environmental stressors and ensure progress in achieving the mission of the National Wildlife Refuge System.

Attachments

**U.S. Department of the Interior**
**Fish and Wildlife Service**

# Land Protection Plan

*Willapa National Wildlife Refuge*

*Pacific County, Washington*

Prepared by:

U.S. Fish and Wildlife Service

Willapa National Wildlife Refuge
3888 SR 101
Ilwaco, WA 98624

U.S. Fish and Wildlife Service
911 NE 11th Avenue
Portland, Oregon 97232

**October 2011**

## APPENDIX A

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## A.1 Introduction

The U.S. Fish and Wildlife Service (Service) has prepared this Land Protection Plan (LPP) in conjunction with the Comprehensive Conservation Plan (CCP) for the Willapa NWR.

A management direction has been identified in the CCP for the long-term (15-year) management of the Refuge. This LPP is one component of the 15-year plan, which identifies LPP project details. Information regarding habitats and wildlife, as well as public and economic uses, and the effects of the LPP are further described within Chapters 1 through 5 of the CCP.

Identified in this LPP is a description of the proposed LPP, land and habitat protection methods, and a priority listing of lands to be considered for acquisition within the proposed boundary and/or current approved boundary.

Reference maps that identify the management direction can be found in Chapter 2 of the CCP. Tract maps are provided within the LPP.

## A.2 Project Description

Situated in the South Willapa Bay Watershed of Pacific County, Washington, the proposed South Willapa Bay Addition encompasses three distinct areas: Nemah/Naselle, East Hills, and South Bay (Map 1). Combined, these areas total 6,809 acres. The nearest cities to these areas are Ilwaco, Long Beach, and South Bend.

### A.2.1 Nemah/Naselle Area

The Nemah/Naselle area encompasses 1,909 acres (three land ownerships). The areas are located slightly north and east of the Long Island Unit on the mainland and most of these properties are found directly adjacent to the bay. Highway 101 is east of this area. In general, this area is upland forest habitat, which can be described as a very young, less than 20-year-old monotypic Sitka spruce forest. This forested unit contains many small seasonal streams and drainages that flow directly into Willapa Bay, and many gravel logging roads bisect this area. The management direction in the CCP includes restoration of forest habitat within the Nemah/Naselle area, and road decommissioning and forest restoration management practices that would improve and protect the water quality of the bay, which is important for many species such as juvenile salmon and shorebirds.

### A.2.2 East Hills Area

The East Hills area encompasses 4,339 acres (six land ownerships) located west of the Bear River Ridge and east of Highway 101. This is the largest area being proposed in the CCP acquisition boundary expansion. The area follows the Bear River watershed boundary from the crest of the Bear River ridgeline, leading toward the west and connecting with the current Bear River Unit. This East Hills area strategically connects The Nature Conservancy property, which lies on the eastside of the Bear River ridgeline. Connection of the two forests will provide landscape-scale habitat restoration and protection opportunities (see Map 1). The current patchwork of upland forest age classes is evident in this area: newly harvested timber units (clearcuts) to well-established second- and third-growth forest stands. The area has a large number of gravel roads that bisect small streams and

drainages. Restoration opportunities also include decommissioning old gravel roads and restoring fish passage as appropriate.

### A.2.3 South Bay Area

The South Bay area encompasses 561 acres (five land ownerships). The ten surrounding upland units that make up the 561 acres are considered upland forest habitat, and over half of these acres have been used for timber purposes within the last five years. The area is bordered by Refuge wetlands to the north; historically this area was diked and developed into intensively managed wetlands and grasslands. The CCP proposes to remove the Refuge's artificial dikes adjacent to the upland forested area and promote tidal function of the historical estuarine habitat. Future acquisition of the upland area adjacent to current Refuge lands will provide an easily managed/recognized Refuge boundary. Forest habitat restoration within the area includes road decommissioning and forest restoration management practices, which would improve and protect the water quality of the bay, which is important for juvenile salmon, shorebirds, and the mariculture industry. Acquisition would also protect the current remaining forested lands from future timber harvest activities and/or development.

## A.3 Status of the Resource

Land use activities have affected fish and wildlife habitat values in the Willapa Bay area. There is increasing pressure for development of bay-front property for residential use, as well as future timber harvest of these lands. Pacific County land use restrictions classify the area as timber land, which precludes development. However, landowners can ask for re-zoning to allow for development. Currently there is a 5-acre minimum restriction in place per house outside of designated zones/towns. Several property owners (private and commercial) within the proposed project study area presently have lands for sale. If sold, the lands may become new housing developments. It is well documented that with development of communities, nonpoint source pollution increases within a local watershed. Nonpoint source pollution in the bay may increase and degrade the water quality within the watershed as lands are cleared and developed with newly constructed roads and homes. Potential nutrient loads, sedimentation, and concentrations of pollutants will run off, and possibly in the future, further degrade this important ecosystem and its fishery resources. Present impacts to the overall water quality within the south Willapa Bay are not known.

Continued habitat fragmentation due to timber harvesting and development may limit the ability of the Refuge and its partners to develop habitat planning and restoration activities on a viable landscape level that would provide habitat benefits to wildlife and threatened and endangered species. Climate change poses a considerable threat to the temperate Northwest rainforests. The forests are quite sensitive to climate variation because warm, dry summers stress them directly, by limiting seedling establishment and summer photosynthesis, as well as indirectly, by creating conditions favorable to pests and fire. The extent, species mix, and productivity of Northwest forests are likely to change under projected twenty-first century climate change, but the specifics of these changes are not known with confidence at present. Refuge Sitka swamp forested lands found adjacent to the bay and rivers may be affected by sea level rise. In time, these forest losses could be mitigated by increasing the protected forested area within the proposed boundary expansion area. Any sea level rise will not affect upland forest lands identified in our proposal.

## A.4 Purpose of the Proposed Expansion

The boundary expansion proposal will set the stage for the Refuge and its partners to work together on a landscape scale to achieve historical late-successional old-growth forest conditions, protect forest habitat, protect habitat for endangered species, and provide long-term protection of the South Willapa Bay watershed.

The expansion of the Refuge would (1) contribute to the protection and overall health and function of the watershed that supports a healthy Willapa Bay and the aquatic species within it, (2) create an opportunity to enhance and restore western red cedar forests to eventually re-establish late-successional old-growth function, (3) protect and restore important migratory bird habitat, especially for threatened and endangered species such as the marbled murrelet (*Brachyramphus marmoratus*) and spotted owl (*Strix occidentalis caurina*), (4) contribute to the enhancement of riverine/stream habitat where necessary for the benefit of endangered salmon and other species, and (5) provide high-quality wildlife-dependent public use where appropriate.

The LPP boundary is located within the North Pacific Coast Ecoregion. The Service's goal for the North Pacific Coast Ecoregion is to protect, restore, and enhance the functional, structural, and species composition of ecosystems for fish and wildlife conservation, and for the continuing benefit of people, by implementing an ecosystem approach to management. This goal will be attained to the degree that the Service, working through partnerships, would (1) minimize species extinction, (2) reverse population declines, (3) maintain and enhance healthy populations of native fish and wildlife, (4) provide people with healthy ecosystems, and (5) work with our partners and the public at all levels.

The objectives of the North Pacific Coast Ecoregion are to (1) maintain high biological productivity, reverse population declines, and recover federally listed species, (2) combine and coordinate federal, state, local, tribal, and private forest management practices and watershed restoration efforts with a holistic ecosystem approach across ownership boundaries, (3) increase awareness and knowledge of fish and wildlife issues and ecosystem management, and (4) provide state-of-the-art biological data to resource managers and partners to restore functioning watersheds and improve forest management practices.

The expansion of the Refuge would help achieve North Pacific Coast Ecoregion goals and objectives by (1) actively managing and restoring forest habitat to achieve late-successional old-growth quality, which would benefit a variety of wildlife species, (2) protecting and restoring habitats for populations of federally listed birds (marbled murrelet and northern spotted owl), (3) enhancing and contributing to existing habitat protection efforts in southwest Washington by The Nature Conservancy, Cascade Land Trust, Washington Department of Fish and Wildlife, and Washington Department of Natural Resources, (4) providing native habitats that will maintain and enhance healthy populations of fish, wildlife, and plant species, (5) protecting the long-term water quality of the bay, and (6) providing quality wildlife-dependent public use opportunities where appropriate.

The purpose of the boundary expansion is identified in Goal 10 of the CCP: "To contribute to the protection of the long-term environmental health of the Willapa Bay ecosystem." The objective of the goal is "to implement the new Land Protection Plan, recognizing the prioritized lands that provide habitat for endangered and threatened wildlife and the overall protection of the Willapa Bay ecosystem." Also identified in the CCP are wildlife-dependent recreational opportunities, which

would be considered for new Refuge lands acquired in the future. These recreational opportunities would be implemented only if found to be appropriate and compatible.

Also within the Refuge's long-term management plan, the CCP identifies the late-successional forest under Goal 1: "Protect, maintain, and restore ecologically functional late-successional forest habitats (mature and old-growth forest) characteristic of the low-elevation temperate forests in the southwest Washington coastal region for the benefit of endangered and threatened species, migratory and resident birds, and a diverse assemblage of other native species."

This project would provide the necessary protected habitat linkage to The Nature Conservancy's and Cascade Land Conservancy's lands outside the expanded boundary. By combining the conservation efforts with a shared focus on restoring late-successional old-growth forest habitat, success of this shared vision will result in landscape-level conservation measures that will help maintain wildlife populations, help protect the water quality of the bay, and help with the recovery of threatened and endangered species.

The authorities for the proposed expansion include the Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742(a)-754), and the Migratory Bird Conservation Act of 1929 (16 U.S.C. 715-715d). The Fish and Wildlife Act of 1956 authorizes the Service to use funds made available under the Land and Water Conservation Fund Act of 1965 (16 U.S.C. 4601-4601-11) to acquire lands, waters, or interests therein for fish and wildlife conservation purposes. Federal monies used to acquire private lands through the Land and Water Conservation Fund are derived primarily from oil and gas leases on the outer continental shelf, excess motorboat fuel tax revenues, and the sale of surplus federal property.

### A.4.1 Wildlife and Habitat

Low elevation coastal rainforest habitats, such as the small, old-growth stand fragments found in the South Willapa Bay watershed, only occur in a few regions of the world. The Refuge contains portions of the typical habitats found in and around Willapa Bay and includes a rare 274-acre remnant forest stand of old-growth western red cedar located on the Long Island Unit of the Refuge. Nearly all of the Refuge's forested areas can be considered small in size, which reduces the ability of the Refuge to provide landscape-level benefits such as a greater level of watershed and water quality protection, as well as safeguards to sensitive habitats and species, which may be considered somewhat compromised by the patchwork effect of the wide range of predominantly young forest stand age classes. Considering that less than 1 percent of the original old-growth forests remain in the overall 700,000-acre Willapa Bay watershed, the goal for the Refuge and its partners is to restore a forested landscape that is representative of past unmanaged landscape conditions. The natural ecological processes within the low-elevation coastal rainforest also support and maintain healthy freshwater streams and the adjacent estuarine habitat of the bay.

Historically, forests within this area have been managed for timber production over most of the last century. Extensive forest management over the years has profoundly changed ecological conditions within the landscape. Altered streams create scouring and carry high sediment loads, and extensive forest road systems fragment habitat and modify hydrological processes. The dominant, simplified, young-managed forests of today do not support several species that are dependent on complex, low elevation coastal old-growth rainforest, including the federally listed marbled murrelet and northern spotted owl, which are currently extirpated from the Refuge. Lack of late-successional forest habitat is one reason for the disappearance of the spotted owl from the Refuge. Spotted owls use

regenerated forest but depend greatly on old-growth forest for nesting and prey species. (Late-successional forests are forests in the mature and old-growth age classes.)

Recovery efforts for the marbled murrelet and spotted owl would be best accomplished by large contiguous areas of late-successional forest in the Willapa Bay area. Currently, suitable late-successional forest habitat in the Willapa Bay area is isolated and highly fragmented. As stated previously, less than 1 percent of the original old-growth forests remain in the Willapa Bay watershed. It should be noted that second- and third-growth forests currently dominate the watershed. According to recommendations in the recovery plan for the threatened marbled murrelet, in order to maintain a well-distributed marbled murrelet population, recovery efforts should be directed toward increasing the size and distribution of marbled murrelet populations between the Long Beach Peninsula and the small populations in southwestern Washington. Non-federal lands in this area currently provide a limited amount of marbled murrelet nesting habitat and have the potential to be managed to increase the amount of suitable nesting habitat in the future (USFWS 1997).

The forests of the Willapa Bay area provide habitat for diverse assemblages of species, from familiar vertebrate species (black bear, Roosevelt elk, black-tailed deer, river otter, and so on) and abundant salmon to the lesser known, such as fungi, lichens, bryophytes, and many groups of invertebrates such as mollusks and millipedes. These species, and others, all play key roles in functional pathways within the forest, such as decomposition and nutrient cycling. Amphibians are another important group of species within these forests. Surveys by The Nature Conservancy have shown the area to have some of the highest species richness found in the Pacific Northwest.

Willapa Bay is often described as one of the most pristine water bodies along the western coast of the United States. Mariculture is a large fishing industry here, and relies completely on the outstanding water quality of the bay. In addition to commercial shellfish operations and commercial fishing, recreational clamming, crabbing, and fishing are also supported by the excellent water quality and healthy tidelands of Willapa Bay. All are recognized as important economic industries and activities in Pacific County. By protecting and restoring the current forest lands surrounding the South Bay, the Refuge and its partners will protect and improve the water quality, which is important to the area's economy.

Efforts toward additional protection of the Willapa Bay watershed have been initiated between a number of entities including the Refuge and The Nature Conservancy, as well as state and county agencies and private landowners. Because of the rarity and biological significance of the old-growth forest ecosystem in the Willapa Bay region, the Refuge and The Nature Conservancy have been working together since 2003 to restore a forested landscape representative of past unmanaged landscape conditions within their respective boundaries.

## A.5 Land Protection Methods

### A.5.1 Willing Seller Policy

It is the policy of the Service to acquire lands from willing landowners. Landowners within the approved Refuge boundary who do not wish to sell their property or any other interest in their property are under no obligation to negotiate with or sell to the Service. In all acquisitions, the Service is required by law to offer 100 percent of the fair market value, as determined by an appraisal

completed by a professional certified appraiser, in accordance with the Uniform Appraisal Standards for Federal Land Acquisitions.

The Service, like other federal agencies, has the power of eminent domain. Eminent domain allows the use of condemnation to acquire lands and other interest in lands, such as easements, for the public good. The Service rarely uses this power. The Service typically is not compelled to buy specific land within a certain time frame.

Under the Uniform Relocation Assistance and Real Property Acquisition Policies Act, landowners who sell their property to the Service may be eligible for certain payments. Determinations are made on a case-by-case basis.

### A.5.2 Habitat Protection Methods

A variety of habitat protection methods can be used to preserve fish and wildlife habitat. The actual method selected for any individual parcel will depend upon both the needs and desires of the landowner and the Refuge. If a mutual agreement cannot be reached, the landowner retains full use, control, and responsibility for the property. Cooperative efforts could involve key partners, including the Shoalwater Bay Indian Tribe and The Nature Conservancy.

***A.5.2.1 Cooperative Agreements.*** The Service can enter into cooperative agreements with landowners to improve wildlife habitat management. Cooperative agreements may specify shared responsibilities or a transfer of funds from the Service to another entity or vice versa for management purposes. Cooperative agreements can be used for lands under any type of ownership.

***A.5.2.2 Conservation Easements.*** Conservation easements transfer some, but not all, property rights to the Service as specified by mutual agreement. Easements are managed in partnership with landowners and enable traditional low-impact land uses (such as forestry and agriculture) to continue on the landscape, while protecting wetlands and wildlife habitat. Under a conservation easement, a landowner could agree not to engage in activities damaging to wildlife habitat resources and/or the Service could manage the land for wildlife. The Service can acquire easements through purchase, donation, or exchange. The property owner retains all responsibility for paying property taxes. The Service could negotiate conservation easements on land under any type of ownership.

***A.5.2.3 Fee Title Acquisition.*** A fee title interest is normally acquired when (1) the fish and wildlife resources on a piece of property require permanent protection that is not otherwise available, (2) the property is needed for development associated with public use, (3) a pending land use could otherwise harm wildlife habitats, or (4) purchase is the most practical and economical way to assemble small tracts into a manageable unit. Fee title acquisition transfers all property rights held by the landowner to the federal government. A fee title interest may be acquired by purchase, donation, or exchange.

## A.6 Land Protection Priorities

Table A-1, the tract table, lists the lands within the management direction's expansion boundary by parcel and tract number, land ownership, total acres, and priority (ownership information is from the Pacific County Assessor's Office and is subject to change). Priorities 1, 2, or 3 are assigned to each tract; 1 means high, 2 means moderate, and 3 means low.

Tracts are being considered for acquisition because of their biological significance, existing or potential threats to wildlife habitat, significance of the area to Refuge management and administration, and/or existing commitments to purchase or protect the land. Landowners within the proposed Refuge boundary and approved Refuge boundary may or may not wish to participate in the Service's habitat protection objectives, or may not wish to divest themselves from their land management responsibilities. Based on this, the final configuration of the acquired lands is impossible to predict. But because the parcels have been identified and the potential effects of converting those lands to Refuge status have been assessed in the CCP, the delineated proposed expansion boundary will provide the Service with future habitat protection options if willing sellers and participants and available funds present themselves in the future.

## A.7 Ownership and Types of Acquisitions

The proposed acquisition boundary expansion area is 6,809 acres. The largest percentage (approximately 50 percent) is held by six corporations for investment and timber production purposes. Two non-governmental organizations hold approximately 36 percent of the land. The City of Long Beach and the State of Washington hold approximately 10 percent, and four private individuals own approximately 4 percent of these lands (see Table A-1 and maps).

Acquisition efforts would be prioritized by funding availability and necessary wildlife and habitat protection priorities. Fee title and conservation easements would all be considered as options to acquire lands in this area.

## A.8 Coordination

The Service worked with a variety of interested parties to identify issues and concerns associated with the proposed Refuge expansion. These interested parties included members of the public, interested private groups, landowners, elected officials, and state, federal, tribal, and local government agencies. The Service's public involvement activities included hosting public scoping meetings, developing and mailing planning updates, requesting information, undertaking consultations, and responding to inquiries. The Service provided information about the proposal to the media and other interested or affected parties throughout the public scoping period (Appendix E).

## A.9 Refuge Revenue Sharing

Under the Uniform Relocation Assistance and Real Property Acquisition Policies Act, as amended, landowners who sell their property to the Service are eligible for certain benefits and payments including: reimbursement of reasonable moving and related expenses or certain substitute payments; replacement housing payments under certain conditions; relocation assistance services to help locate replacement housing, farmland, or business property; and reimbursement of certain necessary and reasonable expenses incurred in selling real property to the federal government.

Under the provisions of the Refuge Revenue Sharing Act (Public Law 95-469), the Service will annually reimburse Pacific County for tax revenue that is lost as a result of the Service's acquisition of private property. This law states that the Secretary of the Interior (Secretary) shall pay to each county in which any area acquired in fee title is situated, the greater of the following amounts:

- An amount equal to the product of 75 cents multiplied by the total acreage of that portion of the fee area that is located within such county.

- An amount equal to three-fourths of 1 percent of the fair market value, as determined by the Secretary, for that portion of the fee area that is located within such county.

- An amount equal to 25 percent of the net receipts collected by the Secretary in connection with the operation and management of such fee area during such fiscal year. If a fee area is located in two or more counties, however, the amount for each county shall be apportioned in relationship to the acreage in that county.

Some payments to the counties have been less than the legislated amounts because of governmental funding deficits. Congress may appropriate, through the budget process, supplemental funds to compensate local governments for any shortfall in revenue sharing payments. The Refuge Revenue Sharing Act requires Service lands be reappraised every 5 years to ensure that payments to local governments remain equitable. Payments under this Act will be made only on lands that the Service acquires in fee title. On lands where the Service acquires only partial interest through easement, all taxes will remain the responsibility of the individual landowner.

The most recent Refuge Revenue Sharing Act payment to Pacific County of $46,765 was based on the 2005 Refuge Revenue Share Appraisal and may also be representative of federal budgetary constraints determined annually by Congress. Appraisals of Refuge lands are conducted every 5 years, and the 2005 appraisal evaluated approximately 11,000 fee title acres.

The formula of three-fourths of 1 percent of fair market value (estimated appraised value) is what is commonly used to determine the revenue sharing payments because this formula usually results in the highest revenue sharing calculation.

The most recent appraisal (2010 Appraisal Review and Approval of the Willapa Bay NWR Appraisal, Pacific County, Washington) identified 4,121 acres as second-growth forest lands, timberland with reproduction, at an appraised/estimated value of $2,800 per acre. These Refuge lands are appraised and evaluated as if they are privately owned parcels; the Refuge timberlands are in some cases generally larger continuous tracts of forested land specifically set aside for conservation purposes. The appraisal estimate value is based on the current local land and timber values at the time of the appraisal.

The future Revenue Sharing Act payments under the proposed land acquisition alternatives (see Goal 2.4.10) for Pacific County timberlands would generally be higher than the timberland taxes that would have been collected for these same private properties. The county property tax revenue is based only on the land value; a future tax is obtained once the timber is harvested.

Under Service ownership, these timberlands will be conserved for the long-term as part of the Refuge for wildlife and habitat purposes. If the proposed lands are acquired for Refuge purposes, the state and county will not receive tax revenue for timber cut (5 percent of timber value) on the lands identified in the management direction.

## A.10 Social and Cultural Impacts

The current quality of life for communities and individuals around the proposed additions to the Refuge is expected to be the same or better as a result of the Refuge's expansion. Intensified forest management would increase habitat quality and improve wildlife use, which would have positive effects on wildlife observation, interpretation, and photography opportunities at the Refuge.

Improvements would also enhance environmental education opportunities, particularly the opportunity to observe active habitat restoration/management activities.

In addition, enhanced forest and stream habitats would likely improve big game hunting and fishing opportunities (see Chapter 5). Approximately 6,809 acres could be considered for opening up to a big game hunting program. If sufficient lands are acquired that allow for adequate wildlife sanctuary, minimal conflicts with other priority public uses are expected. The hunting regulations on the acquired lands will match adjacent Refuge lands and be in accordance with Washington Department of Fish and Wildlife guidelines.

Bank fishing opportunities will be investigated along the shores of Willapa Bay and the rivers that enter it if appropriate sites are acquired. Overall, the fishing opportunity at Willapa Refuge is not expected to decrease (see Chapter 5).

The Refuge's environmental education program could be expanded to include formal and informal events highlighting habitat restoration activities. A new trail could be established, and trails could be expanded within the acquisition boundary, to offer a greater diversity of wildlife viewing opportunities if appropriate lands are acquired.

Through Refuge expansion, an economic expansion is expected, which would be proportionate to increased recreation and public access. Increased revenue for the Refuge and the surrounding region would depend on what lands were acquired. The effects of potential new facilities, new trails, improved habitat, and more visits would be expected to contribute to an increasing trend in visitation, producing increased economic benefits (see Chapter 5).

Expansion of the Refuge would result in the reduction of future commercial timber harvest opportunities and the conversion of some timberlands into long-term conservation status for habitats, but the impact on the overall timber production economy of Pacific County would likely be minor. Forest restoration and management practices of the younger stands on the lands identified for potential acquisition would include some standard timber management practices, such as thinning (Appendix K). Forest management practices would change very little, if at all, from commercial forest management over the life of this plan. The proposed total acquisition is less than 2 percent of the 70 percent of Pacific County that is currently managed for long-term commercial forest production.

Implementation of the management direction will have a minor but positive impact on property tax revenue. The boundary expansion of 6,809 acres is 1.1 percent of the total 975-square mile area of Pacific County, of which more than 95 percent is private land (Pacific County 2009). Expanding the boundary would add protection and enhancement of the forests within the watershed, help provide for healthy water quality, and benefit the mariculture industry and salmon streams. Future Refuge lands acquired from willing sellers would be opened to wildlife-dependent public use opportunities such as wildlife observation, hunting, and environmental education. These opportunities would provide expanded tax revenue from a potential increase in tourism and recreation.

## A.11 Tract Table

Table A-1, the tract table, and Map 2 in Chapter 2 of the CCP identify the lands within the proposed expansion boundary by parcel number, landowner, tract number, parcel acres, county assessor number, and priority. Land ownership information was obtained from the Pacific County Assessor's

Office and is subject to change. Priorities 1, 2, or 3 are assigned to each tract (1 means high, 2 means moderate, and 3 means low). An explanation of the tract table columns and the numbers on the maps follows.

- In Column 1, we listed parcel numbers; the corresponding parcel locations are identified in Maps 1A, 1B, 1C, 1D, and 1E.
- In Column 2, the names of the current landowners are listed.
- In Column 3, the tract numbers assigned by the Service to each landowner's parcel(s) of land are listed, and the corresponding tract locations are identified in Maps 2A and 2B.
- In Column 4, the number of acres in each parcel of land is identified.
- In Column 5, the county tax assessor's number for each parcel of land is listed.
- In Column 6, the priority the Service assigned to each tract of land is identified.

## A.12 References Cited

Pacific County, Washington. 2009. Statistical information. Available at: http://www.co.pacific.wa.us/geninfo.htm.

USFWS. 1997. Recovery plan for the threatened marbled murrelet (*Brachyramphus marmoratus*) in Washington, Oregon, and California. USFWS. Portland, OR. 203 pp.

**Table A-1. Lands within the Management Direction's Proposed Expansion Boundary.**

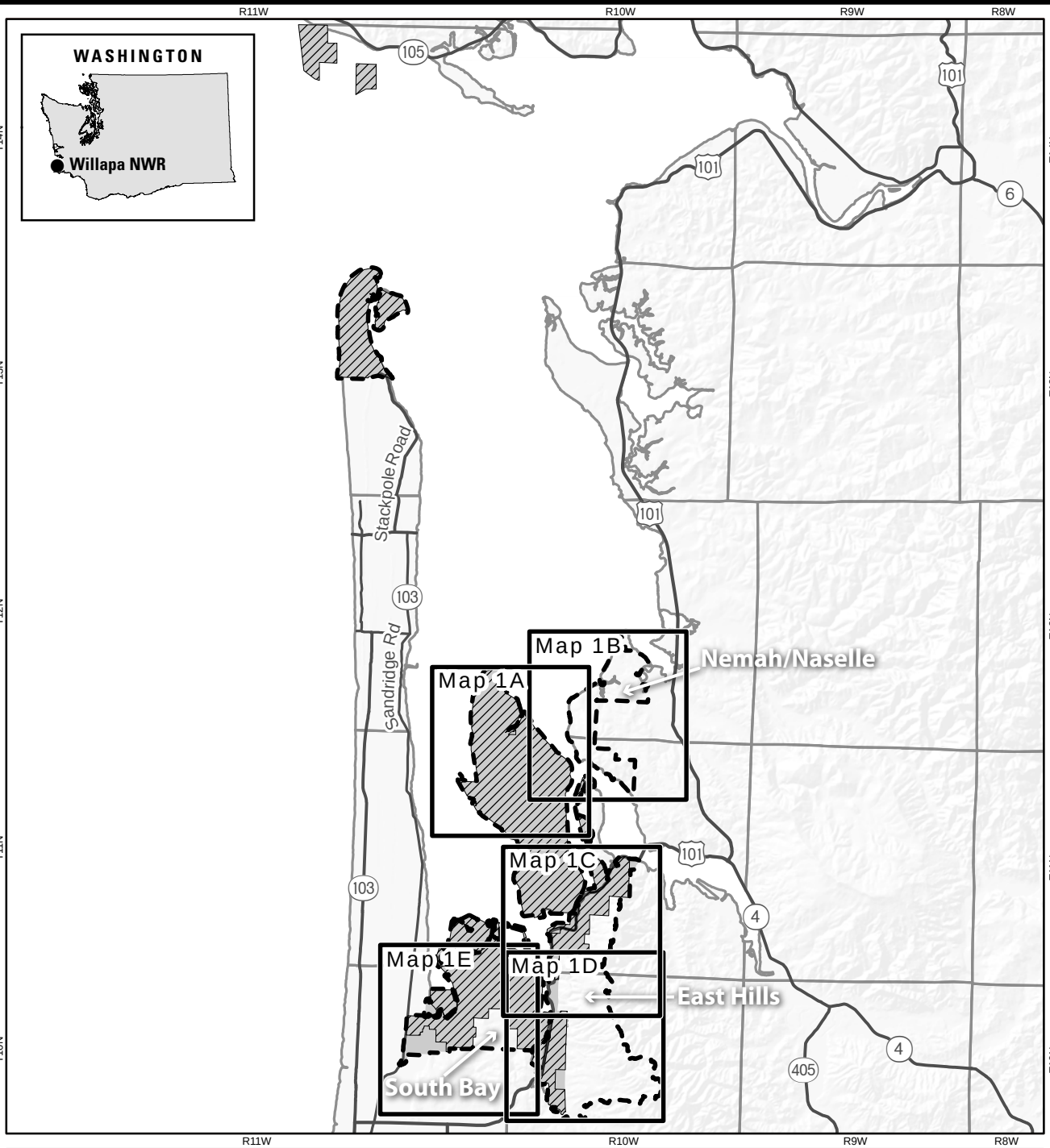
| Map # | Landowner Name | Tract # | Acres | Assessor | Priority |
|---|---|---|---|---|---|
| 1 | 730 Texas Timberlands II Ltd | 38,a | 304 | 10111210000 | 1 |
| 2 | Neikes, James J | 30,b | 20 | 10111223800 | 1 |
| 3 | Neikes, James J | 30,b | 6 | 10111250002 | 1 |
| 4 | Neikes, James J | 30 | 37 | 10111241000 | 1 |
| 5 | 730 Texas Timberlands II Ltd | 38 | 84 | 10100732000 | 1 |
| 6 | Neikes, James J | 30,b | 4 | 10111250003 | 1 |
| 7 | City of Long Beach | 7 | 7 | 10111231002 | 1 |
| 8 | City of Long Beach | 7 | 6 | 10111233004 | 1 |
| 9 | Neikes, James J | 30 | 80 | 10111247000 | 1 |
| 10 | Neikes, James J | 30,a | 13 | 10111250002 | 1 |
| 14 | Rayonier Trs West Timber LLC | 36,a | 319 | 10100810000 | 2 |
| 15 | Nature Conservancy | 79,h | 81 | 10100922000 | 2 |
| 17 | Nature Conservancy | 79,h | 159 | 10100930000 | 2 |
| 18 | Rayonier Trs West Timber LLC | 36,a | 318 | 10101780000 | 2 |
| 19 | State of Washington | 2,d | 658 | 10101600000 | 2 |
| 21 | Rayonier Trs West Timber LLC | 36,a | 152 | 10102016000 | 2 |
| 28 | Weyerhaeuser Company | 9,h | 21 | 11103211800 | 2 |
| 29 | Weyerhaeuser Company | 9,h | 28 | 11103322000 | 2 |
| 30 | Nature Conservancy | 79,h | 41 | 11103300000 | 2 |
| 31 | Weyerhaeuser Company | 9,h | 8 | 11103322001 | 2 |
| 35 | Nature Conservancy | 79,h | 46 | 11103234000 | 2 |
| 36 | Nature Conservancy | 79,h | 43 | 11103243000 | 2 |
| 37 | Nature Conservancy | 79,h | 120 | 10100516000 | 2 |
| 39 | Nature Conservancy | 79,h | 71 | 10100517000 | 2 |
| 40 | Nature Conservancy | 79,h | 77 | 10100423000 | 2 |
| 41 | Nature Conservancy | 79,h | 12 | 10100542001 | 2 |
| 42 | Nature Conservancy | 79,h | 1 | 10100542001 | 2 |
| 43 | Nature Conservancy | 79,h | 135 | 10100548000 | 2 |
| 44 | Nature Conservancy | 79,h | 3 | 10100542001 | 2 |
| 47 | Nature Conservancy | 79,h | 457 | 11102810000 | 2 |
| 48 | Nature Conservancy | 79,h | 317 | 11103300000 | 2 |
| 51 | Nature Conservancy | 79,h | 229 | 11103300000 | 2 |
| 53 | Nature Conservancy | 79,h | 419 | 10100980000 | 2 |
| 54 | Nature Conservancy | 79,h | 273 | 10100410000 | 2 |
| 56 | Nature Conservancy | 79,h | 259 | 10100437000 | 2 |
| 59 | Rayonier Trs West Timber LLC | 36 | 309 | 10101580000 | 2 |
| 62 | TC&I-Chinook LLC | 37 | 313 | 10101590000 | 2 |
| 64 | Rayonier Trs West Timber LLC | 36,a | 159 | 10102126000 | 2 |
| 65 | Rayonier Trs West Timber LLC | 36,a | 397 | 10102110000 | 2 |

**Table A-1. Lands within the Management Direction's Proposed Expansion Boundary.**

| Map # | Landowner Name | Tract # | Acres | Assessor | Priority |
|---|---|---|---|---|---|
| 67 | TC&I-Chinook LLC | 37 | 556 | 10102260000 | 2 |
| 145 | Nature Conservancy | 79,h | 263 | 11103246000 | 2 |
| 147 | United States of America | 1 | 85 | 11103210000 | 2 |
| 152 | Rayonier Trs West Timber LLC | 36,a | 91 | 10102017000 | 2 |
| 154 | Bear River Tree Farms LLC | 82,c | 51 | 10100524000 | 2 |
| 156 | Bear River Tree Farms LLC | 82,b | 140 | 10100524000 | 2 |
| 157 | Nature Conservancy | 79,h | 319 | 10100810000 | 2 |
| 158 | Nature Conservancy | 79,h | 3 | 10100548000 | 2 |
| 68 | Cascade Land Conservancy | 23 | 44 | 12102150002 | 3 |
| 69 | Cascade Land Conservancy | 23 | 7 | 12102150001 | 3 |
| 70 | Cascade Land Conservancy | 23 | 25 | 12102142000 | 3 |
| 71 | Cascade Land Conservancy | 23 | 23 | 12102150004 | 3 |
| 72 | Mid-Valley Resources Inc | 85,c | 42 | 12102814160 | 3 |
| 73 | Mid-Valley Resources Inc | 85,c | 5 | 12102850001 | 3 |
| 74 | Weyerhaeuser NR Company | 9,f | 64 | 12102827000 | 3 |
| 75 | Weyerhaeuser NR Company | 9,f | 39 | 12102813000 | 3 |
| 76 | Weyerhaeuser NR Company | 9,f | 161 | 12102830000 | 3 |
| 77 | Weyerhaeuser NR Company | 9,f | 41 | 12102842000 | 3 |
| 78 | Weyerhaeuser NR Company | 9,f | 72 | 12102950001 | 3 |
| 79 | Weyerhaeuser NR Company | 9,f | 403 | 12103200000 | 3 |
| 80 | Cochran, Gregory J & Sherry L | 33 | 3 | 12103231003 | 3 |
| 81 | Cochran, Gregory J | 32 | 3 | 12103231002 | 3 |
| 82 | Weyerhaeuser NR Company | 9,f | 171 | 11100550001 | 3 |
| 83 | Weyerhaeuser NR Company | 9,f | 93 | 11100423000 | 3 |
| 84 | Wilson, Charles Gary Trustee | 34 | 90 | 11100431000 | 3 |
| 85 | Weyerhaeuser NR Company | 9,g | 37 | 11100442000 | 3 |
| 86 | Weyerhaeuser NR Company | 9,g | 85 | 11100441000 | 3 |
| 87 | Wilson, Charles Gary Trustee | 34 | 36 | 11100431000 | 3 |
| 88 | Weyerhaeuser NR Company | 9,g | 39 | 11100950001 | 3 |
| 134 | Cascade Land Conservancy | 23 | 37 | 12102143000 | 3 |
| 136 | Cascade Land Conservancy | 23 | 34 | 12102150005 | 3 |
| 138 | Cascade Land Conservancy | 23 | 19 | 12102250007 | 3 |
| 139 | Cascade Land Conservancy | 23 | 33 | 12102750003 | 3 |
| 141 | Cascade Land Conservancy | 23,a | 32 | 12102750003 | 3 |
| 142 | Cascade Land Conservancy | 23,a | 37 | 12102750009 | 3 |
| 144 | Mid-Valley Resources Inc | 85,c | 233 | 12102814160 | 3 |

# Map 1. Index Page

## Willapa National Wildlife Refuge




**Land Ownership Parcels in the Stewardship Area**

- Stewardship area boundary
- Willapa National Wildlife Refuge approved refuge boundary
- Existing acquired refuge lands

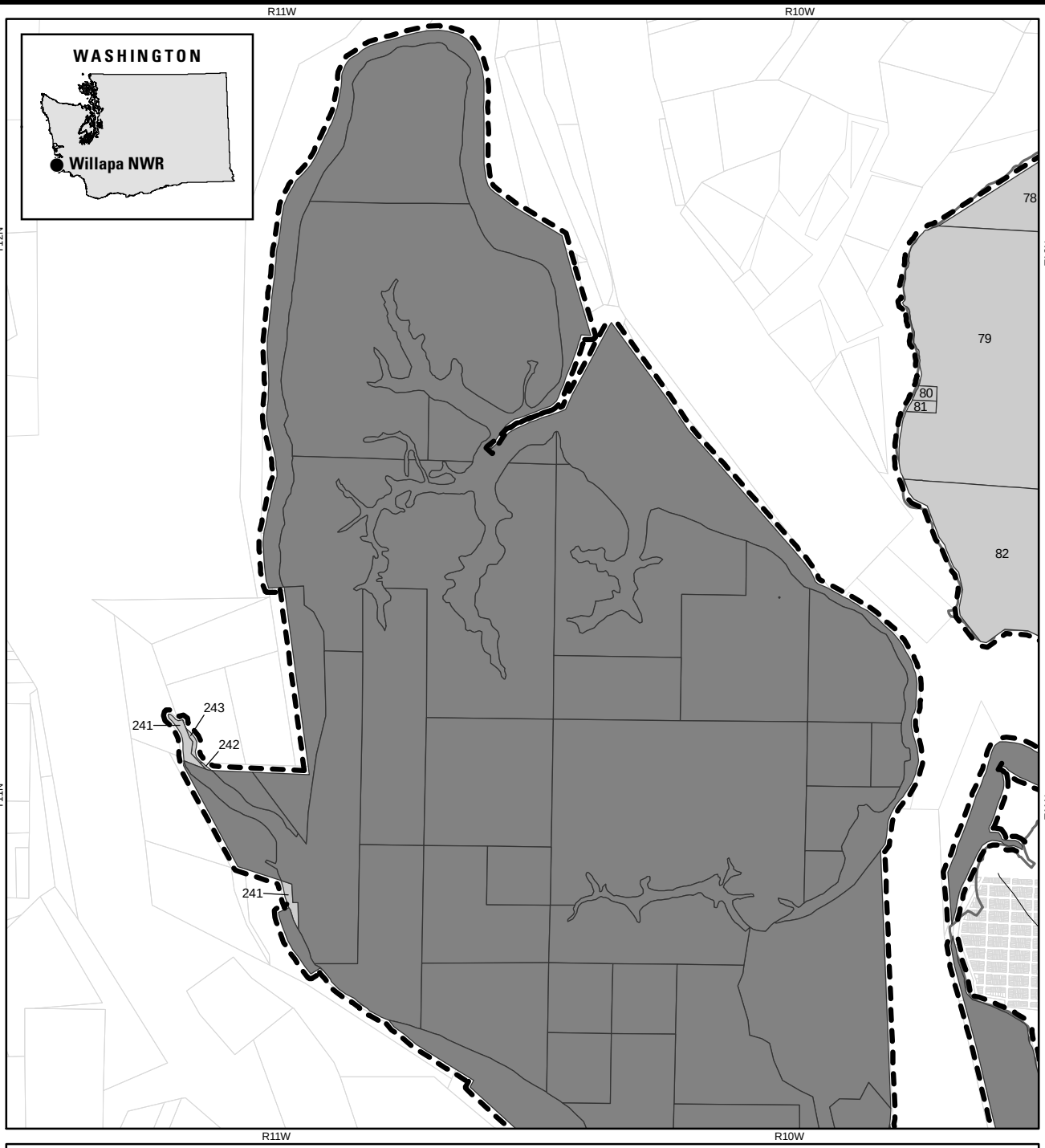
Miles: 0 2 4

Kilometers: 0 2 4

Meridian: Willamette
Print Date: 12/2/10
File: WLP_LPP_IDX_LTR_120210.MXD

Data Sources: Refuge Boundaries from USFWS/R1; Township/Range Boundaries from WA DNR; Roads from Open Street Map, current to April 9, 2010

**Map 1A.** Page 1 of 5 **Willapa National Wildlife Refuge**




**Land Ownership Parcels in the Stewardship Area**

150 Land protection priority index no.

Land ownership parcels inside the stewardship area boundary

Existing acquired refuge lands

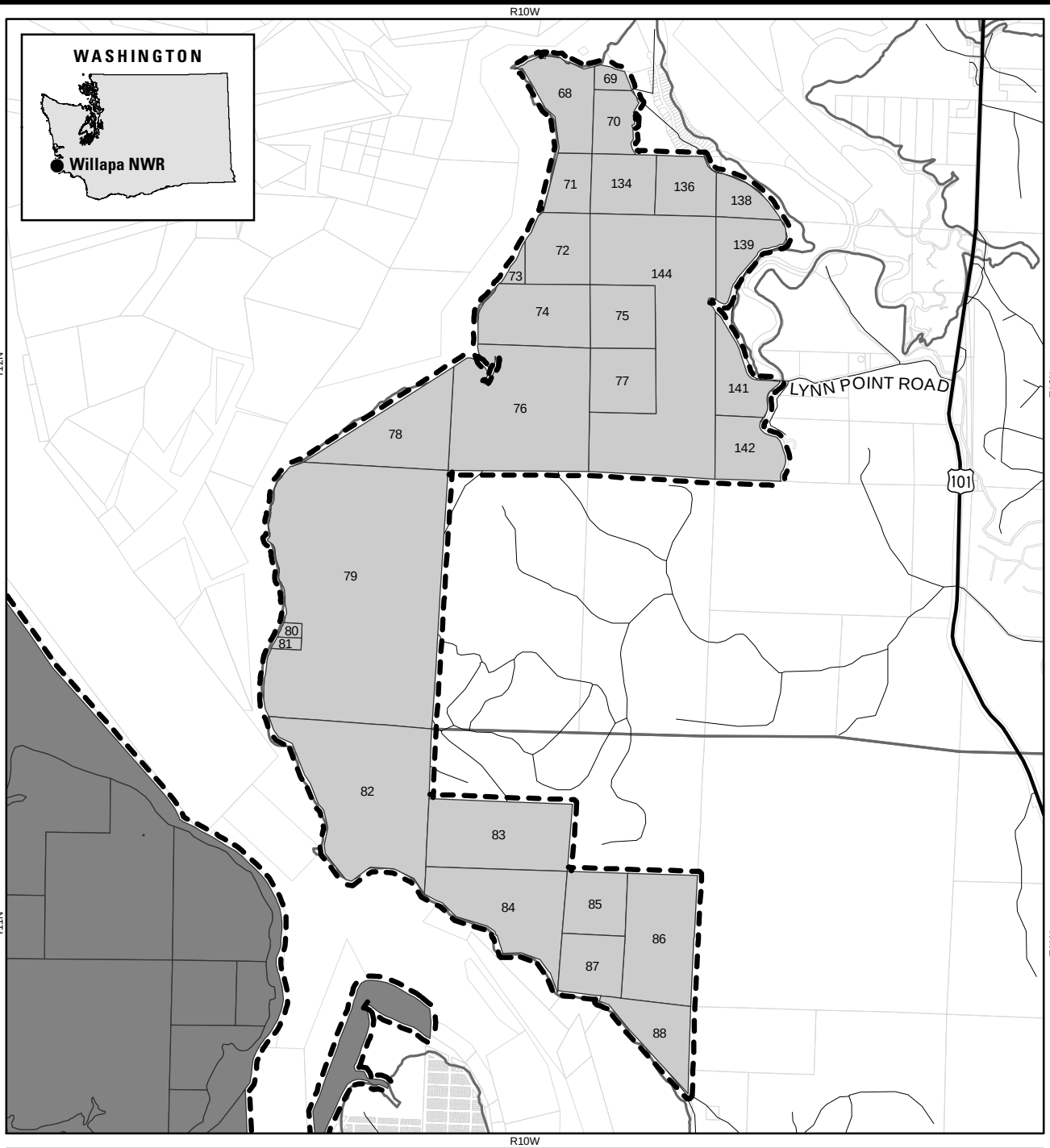
Stewardship area boundary

Miles
0 0.25 0.5

0 0.25 0.5
Kilometers

Meridian: Willamette
Print Date: 5/13/10
File: WLP_LPP_PARCELS1_051310.MXD

Data Sources: Refuge Boundaries from USFWS/R1; Tax Lot Boundaries from Pacific County, current to February 2010; Township/Range Boundaries from WA DNR; Roads from Open Street Map, current to April 9, 2010




## Land Ownership Parcels in the Stewardship Area

150 Land protection priority index no.

Land ownership parcels inside the stewardship area boundary

Stewardship area boundary

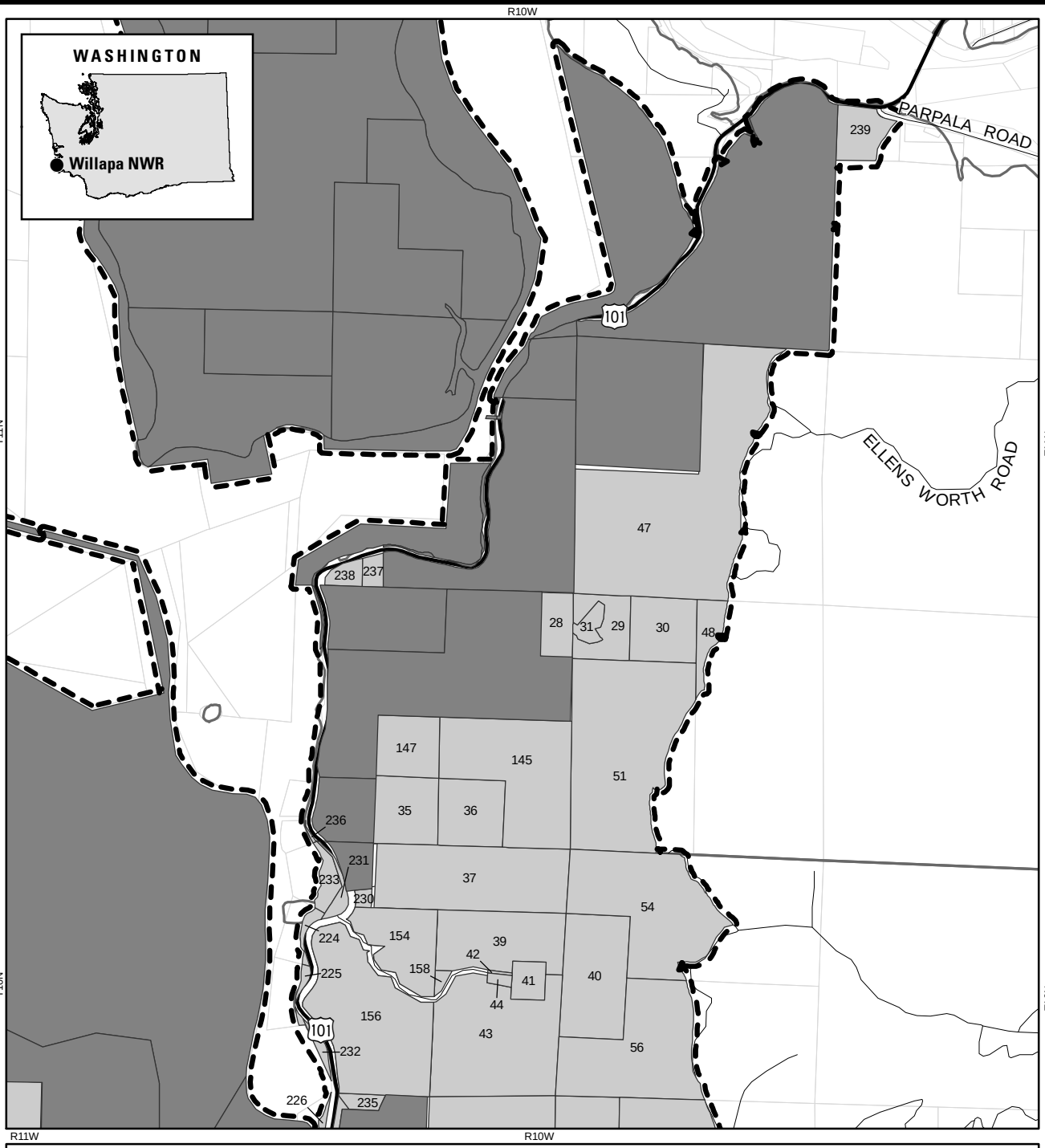
Existing acquired refuge lands

Miles
0 0.25 0.5

0 0.25 0.5
Kilometers

Meridian: Willamette
Print Date: 5/13/10
File: WLP_LPP_PARCELS2_051310.MXD

Data Sources: Refuge Boundaries from USFWS/R1; Tax Lot Boundaries from Pacific County, current to February 2010; Township/Range Boundaries from WA DNR; Roads from Open Street Map, current to April 9, 2010




**Land Ownership Parcels in the Stewardship Area**

150 Land protection priority index no.

Land ownership parcels inside the stewardship area boundary

Stewardship area boundary

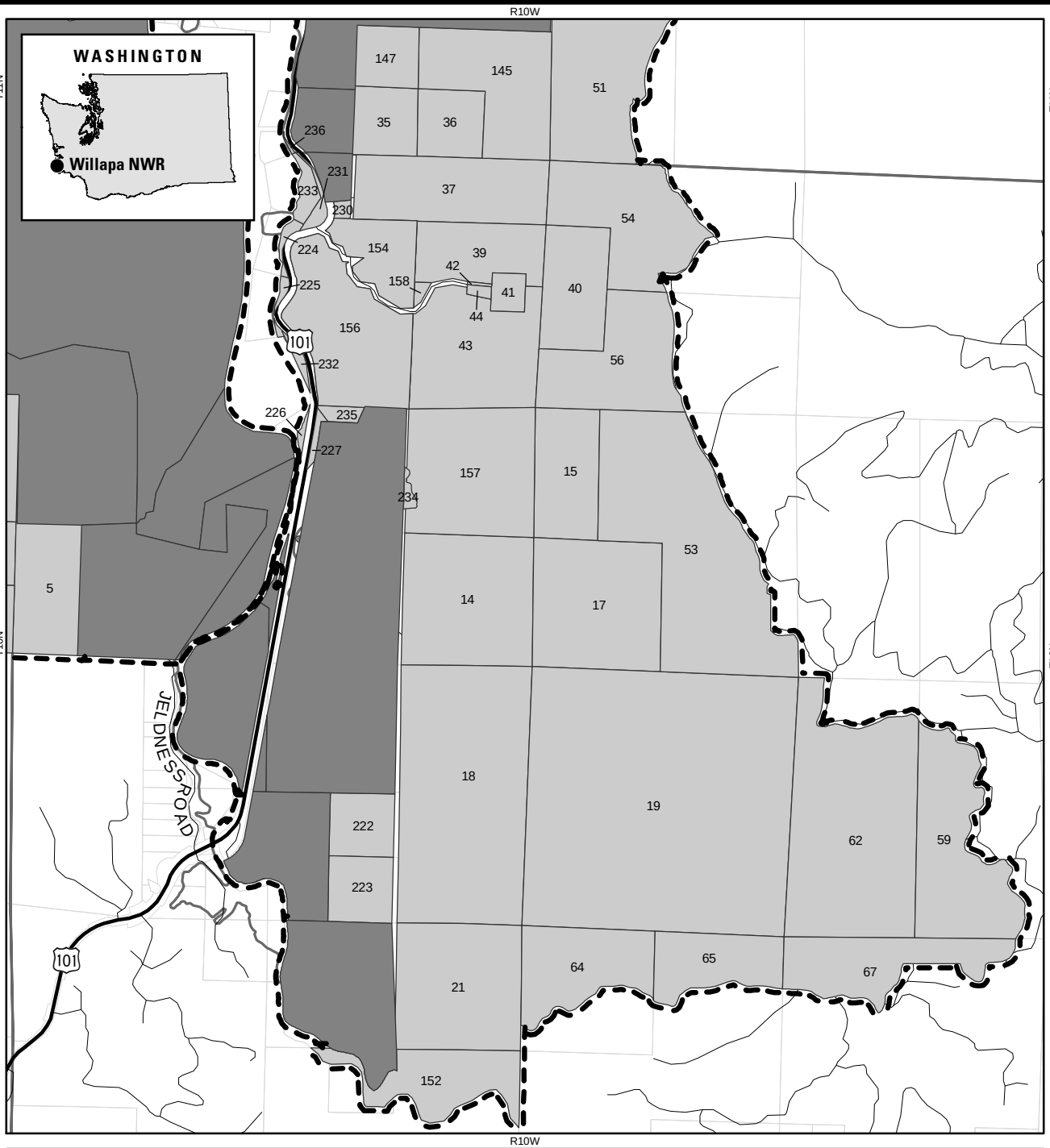
Existing acquired refuge lands

Miles
0 0.25 0.5

0 0.25 0.5
Kilometers

Meridian: Willamette
Print Date: 5/13/10
File: WLP_LPP_PARCELS3_051310.MXD

Data Sources: Refuge Boundaries from USFWS/R1; Tax Lot Boundaries from Pacific County, current to February 2010; Township/Range Boundaries from WA DNR; Roads from Open Street Map, current to April 9, 2010




**Land Ownership Parcels in the Stewardship Area**

150 Land protection priority index no.

Land ownership parcels inside the stewardship area boundary

Stewardship area boundary

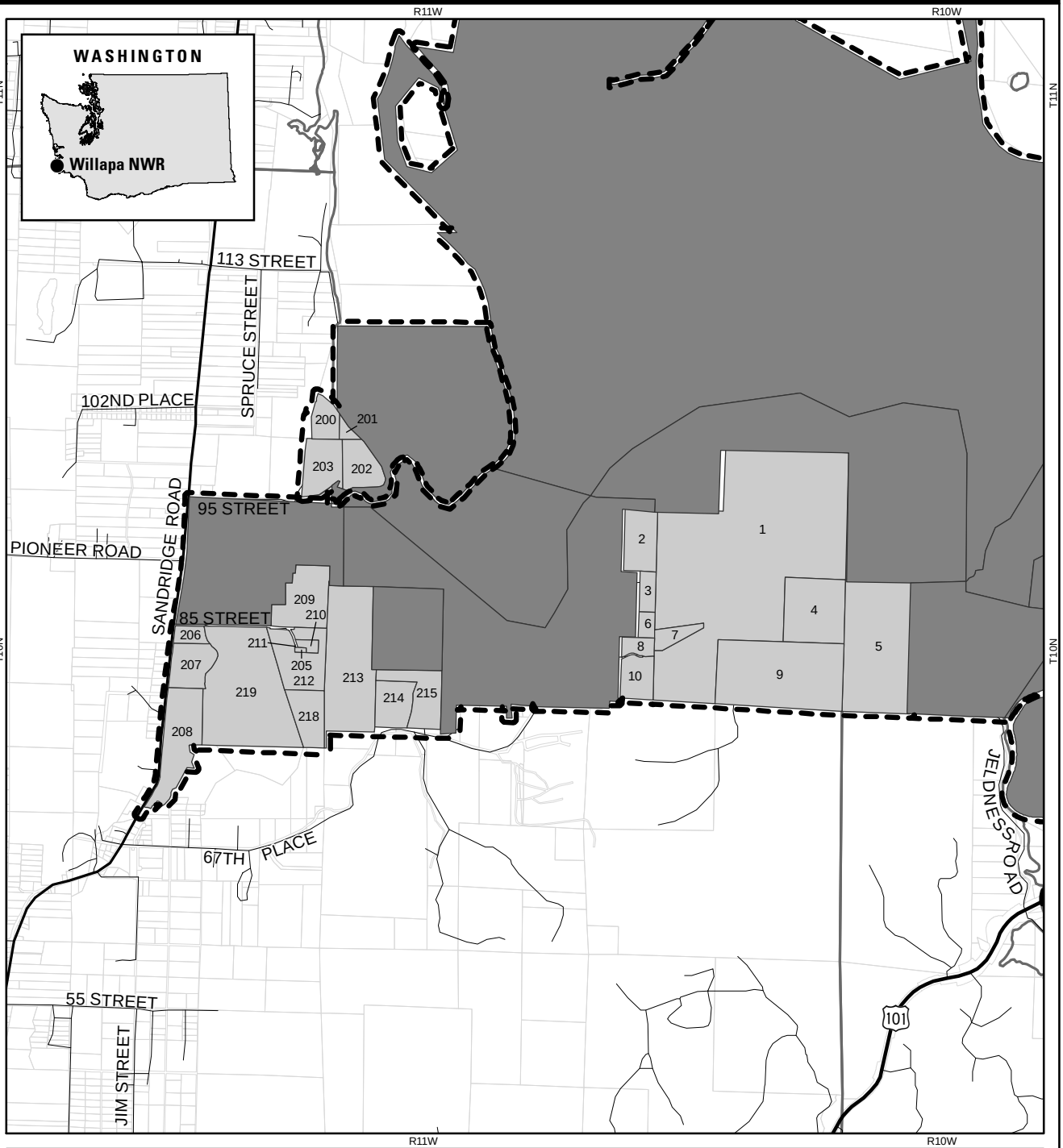
Existing acquired refuge lands

Miles
0 0.25 0.5

0 0.25 0.5
Kilometers

Meridian: Willamette
Print Date: 5/13/10
File: WLP_LPP_PARCELS4_051310.MXD

Data Sources: Refuge Boundaries from USFWS/R1; Tax Lot Boundaries from Pacific County, current to February 2010; Township/Range Boundaries from WA DNR; Roads from Open Street Map, current to April 9, 2010




## Land Ownership Parcels in the Stewardship Area

150 Land protection priority index no.

Land ownership parcels inside the stewardship area boundary

Existing acquired refuge lands

Stewardship area boundary

Miles
0 0.25 0.5

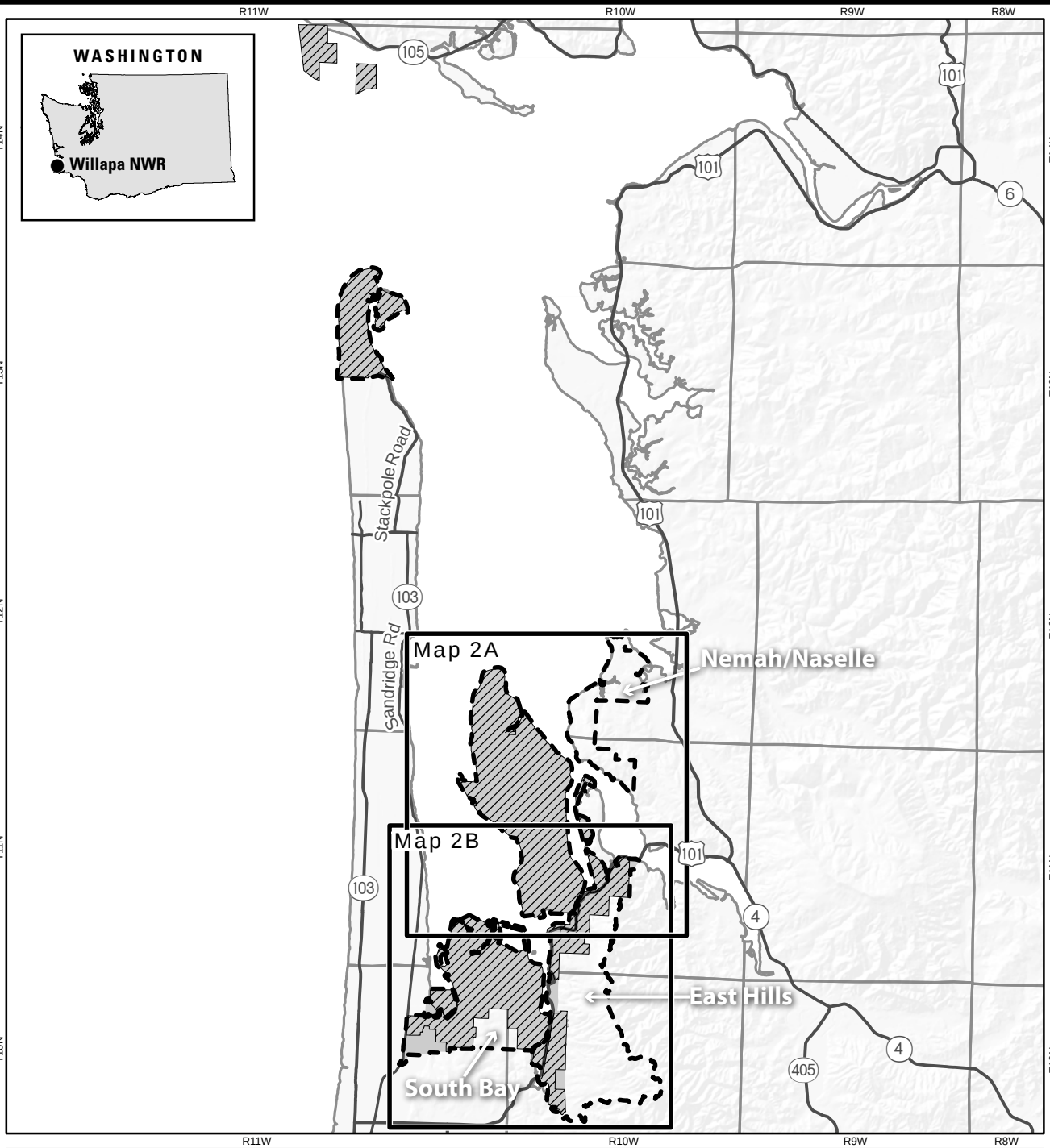
0 0.25 0.5
Kilometers

Meridian: Willamette
Print Date: 5/13/10
File: WLP_LPP_PARCELS5_051310.MXD

Data Sources: Refuge Boundaries from USFWS/R1; Tax Lot Boundaries from Pacific County, current to February 2010; Township/Range Boundaries from WA DNR; Roads from Open Street Map, current to April 9, 2010

# Map 2. Index Page

## Willapa National Wildlife Refuge




**USFWS Tracts inside the Stewardship Area**

Stewardship area boundary

Willapa National Wildlife Refuge approved refuge boundary

Existing acquired refuge lands

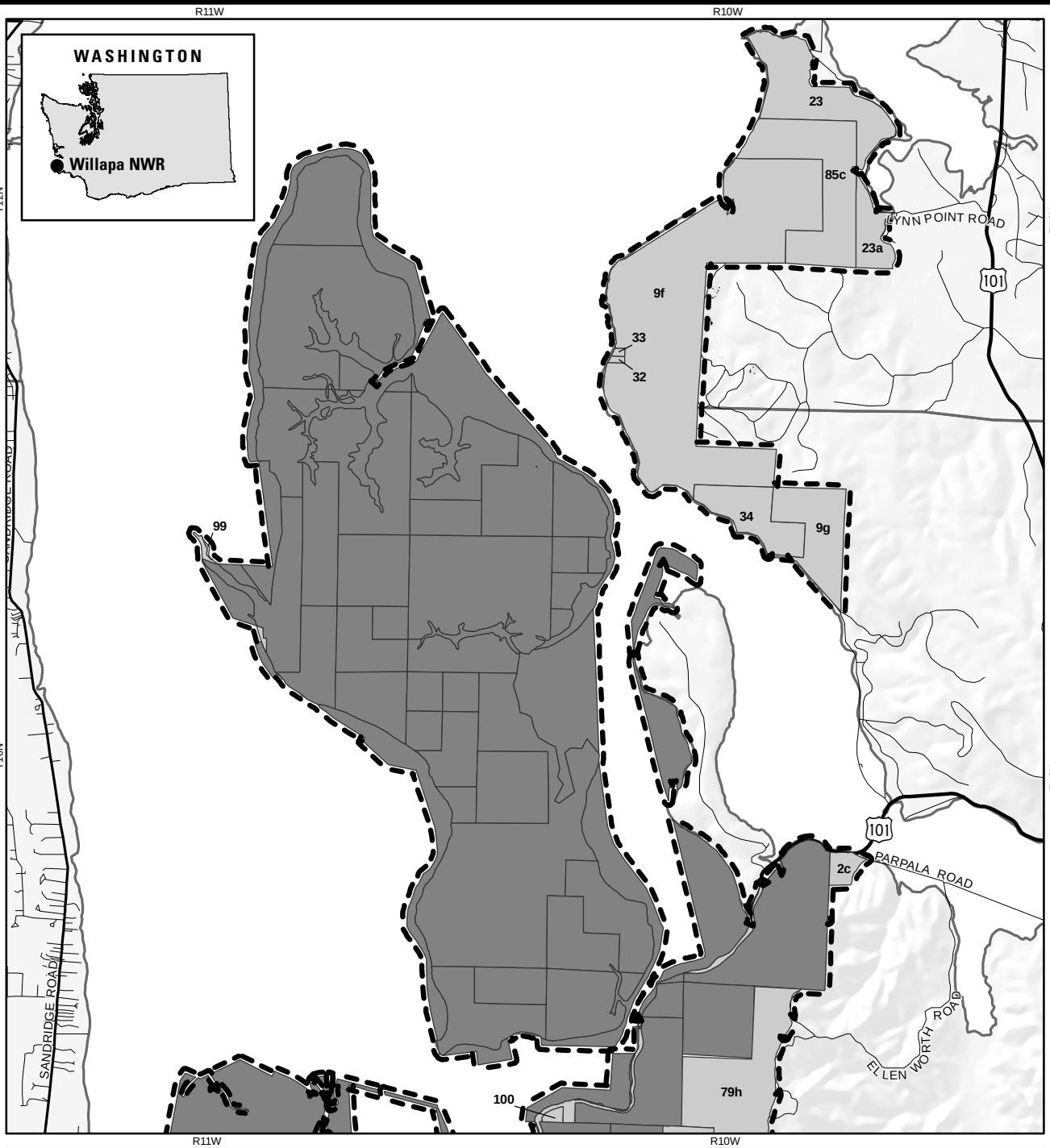
Miles
0 2 4

0 2 4
Kilometers

Meridian: Willamette
Print Date: 5/13/10
File: WLP_LPP_IDX2_LTR_051310.MXD

Data Sources: Refuge Boundaries from USFWS/R1; Township/Range Boundaries from WA DNR; Roads from Open Street Map, current to April 9, 2010

**Map 2A.** Page 1 of 2 **Willapa National Wildlife Refuge**




**USFWS Tracts inside the Stewardship Area**

150a Tract number

FWS designated ownership tracts

Stewardship area boundary

Existing acquired refuge lands

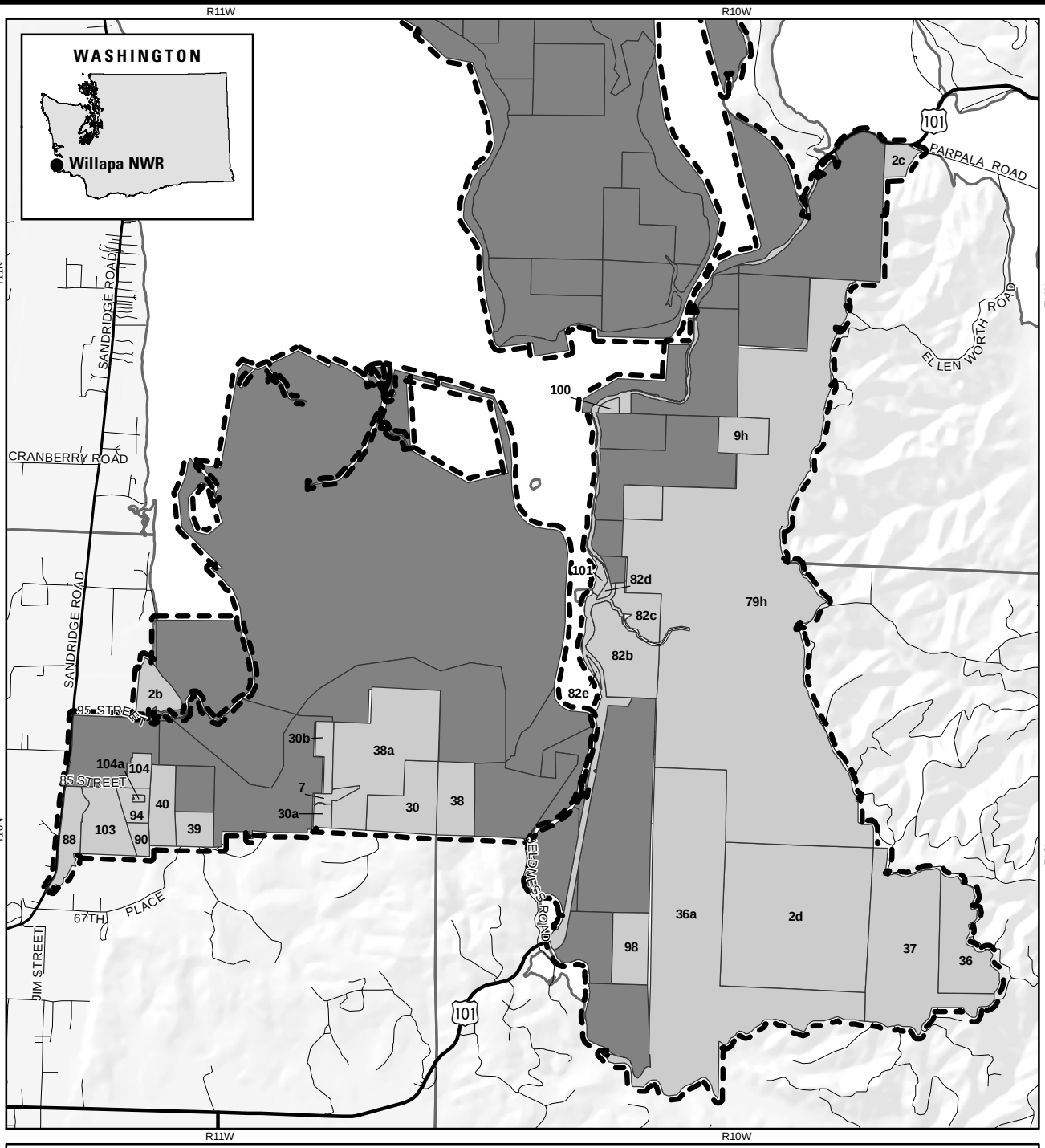
Miles
0 0.5 1

0 0.5 1
Kilometers

Meridian: Willamette
Print Date: 10/28/10
File: WLP_LPP_TRACTS1_102810.MXD

Data Sources: Refuge Boundaries from USFWS/R1; Tax Lot Boundaries from Pacific County, current to February 2010; Township/Range Boundaries from WA DNR; Roads from Open Street Map, current to April 9, 2010

**Map 2B.** Page 2 of 2 **Willapa National Wildlife Refuge**




**USFWS Tracts inside the Stewardship Area**

150a Tract number

FWS designated ownership tracts

Stewardship area boundary

Existing acquired refuge lands

Miles 0 0.5 1

0 0.5 1 Kilometers

Meridian: Willamette
Print Date: 10/28/10
File: WLP_LPP_TRACTS2_102810.MXD

Data Sources: Refuge Boundaries from USFWS/R1; Tax Lot Boundaries from Pacific County, current to February 2010; Township/Range Boundaries from WA DNR; Roads from Open Street Map, current to April 9, 2010

# Appendix B. Appropriate Use Determinations

## Introduction

The Appropriate Refuge Uses Policy (603 FW 1 [2006]) outlines the process that the Service uses to determine when general public uses on refuges may be considered. Priority public uses previously defined as wildlife-dependent uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation) under the National Wildlife Refuge System Improvement Act of 1997 are generally exempt from appropriate use review. Other exempt uses include situations in which the Service does not have adequate jurisdiction to control the activity, as well as refuge-management activities.

In essence, the appropriate use policy provides refuge managers with a consistent procedure to first screen and then document decisions concerning a public use. When a use is determined to be appropriate, refuge managers must then decide if the use is compatible before allowing it on a refuge. The policy also requires review of existing public uses.

During the CCP process, the refuge manager evaluated all existing and proposed uses at Willapa National Wildlife Refuge using the following guidelines and criteria as outlined in the appropriate use policy:

- Do we have jurisdiction over the use?
- Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?
- Is the use consistent with applicable executive orders and Department of the Interior (Department) and U.S. Fish and Wildlife Service (Service) policies?
- Is the use consistent with public safety?
- Is the use consistent with goals and objectives in an approved management plan or other document?
- Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?
- Is the use manageable within available budget and staff?
- Will this be manageable in the future within existing resources?
- 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?
- Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see Section 1.6D of the appropriate use policy for description of recreational uses) compatible, wildlife-dependent recreation into the future

The refuge manager also determined the following refuge uses were appropriate and directed that compatibility determinations be completed for each use: Camping; Haying, Silage Harvest, and Grazing; and Research, Scientific Collecting, and Surveys.

**Finding of Appropriateness of a Refuge Use**

Refuge Name: Willapa NWR

Use: Camping

This exhibit is not required for wildlife-dependent recreational uses, forms of 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? | X | |
| (b) Does the use comply with applicable laws and regulations (federal, state, tribal, and local)? | X | |
| (c) Is the use consistent with applicable executive orders and Department and Service policies? | X | |
| (d) Is the use consistent with public safety? | X | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | X | |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | X | |
| (g) Is the use manageable within available budget and staff? | X | |
| (h) Will this be manageable in the future within existing resources? | X | |
| (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? | X | |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see Section 1.6D for description) compatible, wildlife-dependent recreation into the future? | X | |

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 __X__

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 __X__

Refuge Manager: _____ Date: 9/28/11

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: _____ Date: 9/28/11

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

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

Finding of Appropriateness of a Refuge Use

Supplement to FWS Form 3-2319

Camping

Further Explanation of Answers Provided for the Decision Criteria:

(a) The use takes place within the boundaries of the refuge.

(b) 50 C.F.R. 26.31 states that "Public recreation will be permitted on national wildlife refuges as an appropriate incidental or secondary use only after it has been determined that such recreational use is practicable and not inconsistent with the primary objectives for which each particular area was established or with other authorized Federal operations." Willapa National Wildlife Refuge allows camping because it is difficult and sometimes dangerous to access the island due to tidal influences. Camping allows visitors to safely participate in the big six activities on the island.

(c)The use is consistent with Service policy. Specifically, 8 RM 9.5 (b) states that "Camping and picnicking may be permitted only when required to implement or sustain an approved wildlife/wildlands oriented activity only when no other alternative is practical." At Willapa National Wildlife Refuge, camping is sometimes required in order for the public to engage in wildlife-dependent public uses.

(d) The use is consistent with public safety.

(e) The use is consistent with goals or objectives in an approved refuge-management plan and other refuge documents.

(f) This use has previously been requested and allowed on the refuge.

(g) and (h) This use is currently manageable with available budget and staff. Based on current staffing, budget, and so on, this use would be manageable in the future within existing resources.

(i) The use does contribute to public understanding of the refuge's natural or cultural resources.

(j) This use would not impair existing wildlife-dependent uses.

**Finding of Appropriateness of a Refuge Use**

Refuge Name: Willapa NWR

Use: Haying, Silage Harvest, and Grazing

This exhibit is not required for wildlife-dependent recreational uses, forms of 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? | X | |
| (b) Does the use comply with applicable laws and regulations (federal, state, tribal, and local)? | X | |
| (c) Is the use consistent with applicable executive orders and Department and Service policies? | X | |
| (d) Is the use consistent with public safety? | X | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | X | |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | X | |
| (g) Is the use manageable within available budget and staff? | X | |
| (h) Will this be manageable in the future within existing resources? | X | |
| (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? | X | |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see Section 1.6D for description) compatible, wildlife-dependent recreation into the future? | X | |

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 X

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 X

Refuge Manager: [signature] Date: 9/28/11

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: 9/28/11

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

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

Finding of Appropriateness of a Refuge Use

Supplement to FWS Form 3-2319

Haying, Silage Harvest, and Grazing

Further Explanation of Answers Provided for the Decision Criteria:

(a) The use takes place within the boundaries of the refuge.

(b) The use does not violate applicable laws and statues. There are specific regulations that address economic uses of refuges. 50 C.F.R. 29.1 states, in part, that, "…We may only authorize public or private economic use of the natural resources of any national wildlife refuge, in accordance with 16 U.S.C. 715s, where we determine that the use contributes to the achievement of the national wildlife refuge purposes or the National Wildlife Refuge System mission." Grazing livestock and harvesting hay are listed in the regulation as example uses to which this provision applies.

(c) The use is consistent with Service policy ( 6 RM 5 "Grassland Management"), which states that, "Grazing programs may be implemented only when they benefit or are not harmful to wildlife and wildlife habitat" and "Frequency of grazing will vary according to productivity and condition of the site and should be held to the minimum necessary to achieve the desired results" (6 RM 5.6 (a)). The policy also states that, "annual haying of grasslands leads to reduced plant vigor, removal of organic material, and a reduction of wildlife values. However, under some circumstances annual haying may be necessary in order to provide emergent growth on seasonally flooded sites or otherwise support refuge objectives. In some situations, occasional haying can be used to remove excessive mulch accumulation that is inhibiting growth of desired plant species. Haying should be timed to achieve the desired results while minimizing the adverse effects" (6 RM 5.6 (c)).

(d) The use is generally consistent with public safety.

(e) The use is consistent with goals and objectives in an approved refuge–management plan.

This activity is consistent with refuge goals and objectives, specifically the objective to maintain short-grass pastures for the benefit of Canada geese.

(f) This use has not been previously denied on the refuge.

(g) The use requires the issuance of permits and oversight by refuge personnel. The refuge currently has the available budget and staff that would be required to administer this use.

This use is more economical than using refuge personnel and equipment to manage the entire refuge pasture system. It is anticipated that these cost savings would continue into the future.

(h) and (i) Although the use by itself does not necessarily contribute to public understanding of the refuge's natural or cultural resources, the use is definitely beneficial to the refuge's natural resources, providing management of the refuge's grasslands for the benefit of Canada geese.

(j) It is anticipated that this use would not impair existing wildlife-dependent uses or impact other refuge recreational uses.

**Finding of Appropriateness of a Refuge Use**

Refuge Name: Willapa NWR

Use: Research, Scientific Collecting, and Surveys

This exhibit is not required for wildlife-dependent recreational uses, forms of 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? | X | |
| (b) Does the use comply with applicable laws and regulations (federal, state, tribal, and local)? | X | |
| (c) Is the use consistent with applicable executive orders and Department and Service policies? | X | |
| (d) Is the use consistent with public safety? | X | |
| (e) Is the use consistent with goals and objectives in an approved management plan or other document? | X | |
| (f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed? | X | |
| (g) Is the use manageable within available budget and staff? | X | |
| (h) Will this be manageable in the future within existing resources? | X | |
| (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? | X | |
| (j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see Section 1.6D for description) compatible, wildlife-dependent recreation into the future? | X | |

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 __X__

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 __X__

Refuge Manager: _____ Date: 9/28/11

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: _____ Date: 9/28/11

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

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

Finding of Appropriateness of a Refuge Use

Supplement to FWS Form 3-2319

Research, Scientific Collecting, and Surveys

Further Explanation of Answers Provided for the Decision Criteria:

**Project:** Conducting research on refuge lands and waters

**Summary:** The refuge receives requests to conduct scientific research on refuge lands and waters. Research applicants must submit a proposal that would outline: (1) objectives of the study; (2) justification for the study; (3) detailed methodology and schedule; (4) potential impacts on refuge wildlife and/or habitat, including disturbance (short and long term), injury, or mortality; (5) personnel required; (6) costs to refuge, if any; and (7) end products expected (i.e., reports, publications). Research proposals would be reviewed by refuge staff, the Regional Office Branch of Refuge Biology, and others as appropriate prior to the refuge issuing a special use permit (SUP). Projects will not be open-ended, and at a minimum, will be reviewed annually.

For each of the findings listed on FWS Form 3-2319, a justification has been provided below:

(a) Do we have jurisdiction over the use?

Some or all of the proposed activities would take place within refuge boundaries. The refuge has jurisdiction over those research projects that are sited within refuge boundaries.

(b) Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?

Any proposed research activities would comply with all applicable laws and regulations and any restrictions or qualifications that are required to comply with laws and regulations would be specified in the SUP.

(c) Is the use consistent with applicable executive orders and Department and Service policies?

Through the review of individual projects, the refuge would ensure that they are consistent with applicable policies, especially the Research on Service Lands Policy (803 FW 1).

(d) Is the use consistent with public safety?

Through individual project review, the refuge will ensure that each project is consistent with public safety. If necessary, stipulations to ensure public safety will be included in the project's SUP.

(e) Is the use consistent with goals and objectives in an approved management plan or other document?

Research activities are approved in instances where they can provide meaningful data that may contribute to refuge management and public appreciation of natural resources.

(f) Is the use manageable within available budget and staff?

The refuge receives fewer than six requests per year for this activity, and it is manageable with available budget and staff.

(g) Will this be manageable in the future within existing resources?

The proposed activity at current levels would be manageable in the future with the existing resources (see previous point).

(h) 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?

The proposed use is beneficial to the refuge's natural and cultural resources because the types of research projects approved are those that have the distinct likelihood of helping achieve refuge purposes by providing information useful for the management of trust resources and contributing to the public's understanding and appreciation of natural and/or cultural resources.

(i) 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?

The refuge will ensure that the research activities do not impair existing or future wildlife-dependent recreational use of the refuge during individual project review, prior to issuing the SUP for the project.

# Appendix C. Compatibility Determinations

## Introduction

The compatibility determinations (CDs) developed during the CCP planning process evaluate uses projected to occur under the management direction in the CCP for the Willapa National Wildlife Refuge. The evaluation of funds needed for management and implementation of each use also assumes implementation as described in the management direction.

## Uses Evaluated at This Time

The following section includes CDs for all refuge uses that are required to be evaluated at this time. According to Service policy, CDs will be completed for all uses proposed under a CCP. Existing wildlife-dependent recreational uses must also be re-evaluated and new CDs prepared during development of a CCP or every 15 years, whichever comes first. Uses other than wildlife-dependent recreational uses are not explicitly required to be re-evaluated in concert with preparation of a CCP, unless conditions of the use have changed or unless significant new information relative to the use and its effects have become available or the existing CDs are more than 10 years old. However, the Service planning policy recommends preparing CDs for all individual uses, specific use programs, or groups of related uses associated with the proposed action. Accordingly, the following CDs are included in this document for public review.

| Refuge Use | Compatible | Next Year Due for Re-evaluation | Page |
|---|---|---|---|
| Waterfowl Hunting | yes | 2025 | C-4 |
| Big Game and Upland Game Bird Hunting (Elk, Deer, Bear, and Grouse) | yes | 2025 | C-14 |
| Recreational Fishing | yes | 2025 | C-23 |
| Environmental Education, Interpretation, Wildlife Observation, and Photography | yes | 2025 | C-30 |
| Camping | yes | 2020 | C-39 |
| Haying, Silage Harvest, and Cattle Grazing | yes | 2020 | C-44 |
| Research, Scientific Collecting, and Surveys | yes | 2020 | C-51 |

## Compatibility—Legal and Historical Context

Compatibility is a tool refuge managers use to ensure that recreational and other uses do not interfere with wildlife conservation, the primary focus of refuges. Compatibility is not new to the Refuge System; the concept dates back to 1918. As policy, it has been used since 1962. The Refuge Recreation Act of 1962 directed the Secretary of the Interior to allow only those public uses of refuge lands that were “compatible with the primary purposes for which the area was established.” If a general public use is determined to be appropriate, the use must then undergo a compatibility review. A compatibility review is required for all appropriate public uses, including wildlife-dependent recreational uses.

The term *compatible use* is defined as a wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Refuge Manager, will not materially interfere

with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge.

The Administration Act defines *sound professional judgment* as 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 other applicable laws. Included in this finding, determination, or decision is a Refuge Manager's field experience and knowledge of the particular refuge's resources.

Part 603 FW 2 of the Fish and Wildlife Service Manual sets forth the policy and guidelines for determining compatibility of proposed uses and provides procedures for documentation and periodic review of existing uses. In addition, the policy requires an opportunity for public review and comment on all CDs. When prepared in conjunction with a CCP, CDs are distributed for public review along with the Draft CCP/EIS.

Under compatibility policy, each use is defined as a recreational, economic/commercial, or management use of a refuge by the public or a non-refuge System entity. Uses generally providing an economic return (even if conducted for the purposes of habitat management) are also subject to CDs. The Service does not prepare CDs for uses when the Service does not have jurisdiction. For example, the Service may have limited jurisdiction over refuge areas where property rights are vested by others; where legally binding agreements exist; or where there are treaty rights held by tribes. In addition, aircraft over-flights, emergency actions, some activities on navigable waters, and activities by other Federal agencies on "overlay refuges" are exempt from the compatibility review process.

New compatibility policy, developed in response to the 1997 amendments to the National Wildlife Refuge System Administration Act (Administration Act), was adopted by the Service in October 2000 (http://refuges.fws.gov/policymakers/nwrpolicies.html). The policy requires that a use must be compatible with both the mission of the System and the purposes of the individual refuge. This standard helps to ensure consistency in application across the Refuge System.

The Service recognizes that CDs are complex. For this reason, refuge managers are required to consider "principles of sound fish and wildlife management" and "best available science" in making these determinations (House of Representatives Report 105-106). Evaluations of the existing uses on Willapa Refuge are based on the professional judgment of refuge personnel including observations of refuge uses and reviews of appropriate scientific literature.

The Refuge Manager has the authority to determine, by exercising sound professional judgment, what is a compatible use. In addition to determining if a use would materially interfere with or detract from the fulfillment of the System mission or the purposes of the refuge, the Refuge Manager must also evaluate the direct and indirect impacts of a use on refuge resources. Further, the cumulative impacts of the use when conducted in conjunction with other existing or planned uses of the refuge must also be considered. After evaluating the anticipated impacts of a proposed use and determining if any stipulations (terms or conditions) are needed to avoid or minimize potential adverse impacts, the Refuge Manager will determine whether or not the use is compatible. This determination is documented in writing and is available for review by the public.

A proposed use can be denied without determining compatibly under certain circumstances, such as instances in which:

1) a proposed use would conflict with other applicable laws or regulations;

2) the use would result in conflicts with the goals or objectives of an approved CCP; or
3) a use is determined to be inconsistent with public safety.

Refuges are closed to all public uses until officially opened. Regulations require that adequate funds be available for administration and protection of refuges before opening them to any public uses. However, wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation) are to receive enhanced consideration and cannot be rejected simply for lack of funding resources unless the refuge has made a concerted effort to seek out funds from all potential partners. Once found compatible, wildlife-dependent recreational uses are deemed the priority public uses at a refuge. If a proposed use is found not compatible, the use must be modified to be compatible or if the use cannot be modified to be compatible, then the use may not be allowed. Economic uses that are conducted by or authorized by the refuge also require CDs.

**References**

House of Representatives Report 105-106 (on NWRS Improvement Act):
http://refuges.fws.gov/policyMakers/mandates/HR1420/part1.html

Compatibility regulations, adopted by the Service in October 2000:
http://refuges.fws.gov/policymakers/nwrpolicies.html

# C.1 Compatibility Determination for Waterfowl Hunting on Willapa National Wildlife Refuge

**Use:** Hunting (Waterfowl)

**Refuge Name:** Willapa National Wildlife Refuge

**Location:** Pacific County, Washington

**Date Established:** 1936

**Establishing and Acquisition Authorities**

- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715-715s)
- Executive Order 7541, Willapa Harbor Migratory Bird Refuge, Washington, signed January 22, 1937
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a-754c)
- Land and Water Conservation Fund Act of 1965, as amended (16 U.S.C. 4601-4601.11)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1532-1544, 87 Stat 884)
- Refuge Recreation Act of 1962, as amended (16 U.S.C. 460k-460k-4)

**Refuge Purpose(s)**

The purposes for the Willapa NWR have been identified in historic legal documentation establishing and adding refuge lands. The Refuge was originally established to preserve an important wintering and foraging habitat for migratory waterfowl in the Pacific Flyway with refuges purposes specified as follows:

> "... as a refuge and breeding ground for migratory birds and other wildlife ..." (Executive Order 7541, dated January 22, 1937)
>
> "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. 715d, Migratory Bird Conservation Act)
>
> "... suitable for—(1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." (16 U.S.C. 460k-1)
>
> "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." (16 U.S.C. 460k-2, Refuge Recreation Act [16 U.S.C. 460k-460k-4], as amended)
>
> "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4))
>
> "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (16 U.S.C. 742f(b)(1), Fish and Wildlife Act of 1956)

In accordance with 601 FW 1, all lands acquired since the original establishment of the Refuge retain this purpose.

Management priorities are further stated in subsequent land acquisition documents to preserve, protect, and restore newly acquired habitats and provide habitat for other migratory birds, plants and wildlife with special emphasis for marbled murrelets, bald eagles, Aleutian Canada geese, shorebirds, marsh birds, and wading birds.Documentation for additional lands also identified the following habitats, wildlife, public opportunities, and management priorities to support a diverse assemblage of native fish, wildlife, and plants which includes: eelgrass beds, gravel bars, old-growth/mature forests, riverine habitats, intertidal mudflats, sand dune habitat, fish species (coho, Chinook, chum salmon, steelhead, sea-run cutthroat trout), amphibian diversity, compatible wildlife-dependent recreation, educational/research opportunities, and cultural resource sites.

Management priorities are further derived from various legal and land acquisition documents:

> "… one of the most important concentration points for migratory waterfowl on the Washington Coast. It has a fine supply of natural aquatic foods, especially eel-grass, and thereby has been for years one of the few suitable wintering grounds available for Black Brant … it is essential for the preservation of the Pacific flyway that the Restoration program provide adequate sanctuary facilities for migratory birds in that state." (Migratory Bird Conservation Commission Memorandum, Memo 16, May 7, 1936)
>
> "… as a refuge and breeding ground for migratory birds and other wildlife …" (Executive Order 7541, dated January 22, 1937)
>
> "… in order to effectuate further the purposes of the Migratory Bird Conservation Act (45 Stat. 1222)" and states that "Provided, that any private lands within the area described shall become a part of the refuge upon the acquisition of title thereto or lease thereof by the United States." (Executive Order 7721, October 8, 1937)
>
> "… for use as an inviolate sanctuary. Or for any other management purpose, for migratory birds." (16 U.S.C. 715d, Migratory Bird Conservation Act)
>
> "… To preserve and protect unique ecosystems associated with Willapa Bay … To provide for maximum use and production by migratory birds other than wintering waterfowl, with special emphasis on bald eagles and marsh and wading birds." (Long Island Land Exchange; September 1983)
>
> "… protect habitat for old growth dependent species including the threatened marbled murrelet and threatened northern spotted owl … protect and restore upland forest and associated stream habitat in order to protect and enhance declining fish populations, including coastal cutthroat trout, and Chinook, coho, and chum salmon runs … protect and restore coastal wetlands to provide a diversity of habitats for migratory waterfowl, shorebirds, wading birds, and songbirds … protect the intertidal mudflats along Willapa Bay by consolidating spartina infested lands for better management of control and eradication efforts on existing Refuge lands and on adjacent tidelands.… provide large scale habitat management through linking existing Refuge lands in a contiguous Refuge boundary, and provide wildlife-dependent public use opportunities compatible with Refuge purposes." (Willapa Addition Environmental Assessment/Land Protection Plan, and Conceptual Management Plan 1999)

**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.

**Description of Use**

This CD examines existing and proposed hunting for waterfowl on designated units of the Refuge under the management direction of the CCP. The Refuge currently provides 3,128 acres (2,884 acres of waterfowl and 244 acres of regulated goose) available for waterfowl hunting on Leadbetter Point and the South Bay Units. Under the management direction, waterfowl hunting will be expanded to 5,670 acres (5,570 acres of waterfowl and 100 acres of regulated goose) once the proposed estuarine restoration project is completed in the South Bay. For additional details about the hunt program see Appendix M, Hunt Plan, in the CCP.

Existing Waterfowl Hunting Program

Portions of the Leadbetter Point Unit are open to walk-in duck and goose hunting. Access is by Stackpole Road. Hunting is prohibited in the snowy plover closure area. The Stanley, Potshot, and North Potshot Units are also open during the Washington State hunting season for waterfowl.

Selected areas of the South Bay Units (Riekkola, Tarlatt, Porter Point) are open for waterfowl hunting. The Riekkola and Tarlatt Units are open to goose hunting only from eight assigned blinds including one that provides barrier free access to disabled hunters. Blind selection is done by lottery early the morning of each hunt. There is a small fee for use of the blinds. Funds from the fee go to help maintain the blinds. Although dogs are normally not permitted on the Refuge, they are allowed when actively engaged in hunting waterfowl and must be kept under control at all times.

The Porter Point Unit is suitable for car-top boats and small craft that can be easily moved. No gas-powered engines are allowed in the freshwater wetland. Parking for the car-top boat ramp is available across the Riekkola Unit pastures in a delineated graveled parking area with 10 sites for waterfowl hunters. The freshwater wetland can be accessed by the Porter Point Unit dike or by boating in the wetland. The saltwater marsh of Willapa Bay can be reached from the existing footbridge on the east end of Porter Point Unit or by walking into the bay from the dike on the west end of the unit. Signs are placed on the east and west boundary of the Porter Point Unit, extending into the bay, to delineate the hunt area.

The schedule for the waterfowl hunt has been designed to best accommodate multiple users on adjacent areas throughout the week. A regulated goose hunt occurs on an adjacent pasture on the Riekkola Unit on Wednesdays and Saturdays. To reduce impacts to the goose hunt, waterfowl hunting is open on Sundays, Mondays, and Thursdays on the Porter Point Unit. Gates are open from 6 am until 5 pm. The Porter Point Unit is open for other wildlife observation on Tuesday and Friday during the waterfowl hunt season. All users other than waterfowl hunters walk in through the pedestrian gate at the main Riekkola Unit entrance by way of 67th Street.

Changes to Waterfowl Hunting Program

The proposed expanded waterfowl hunt area identified in the management direction of the CCP includes opening an additional 2,542 acres to waterfowl hunting, all newly restored areas in the South Bay (see Map 4 in Chapter 2). Three blinds will be available for goose hunting on the south half of the Riekkola Unit (100 acres). Two of these blinds will be pit blinds and one will be an aboveground barrier-free accessible blind for hunters with disabilities. Two additional blinds will be created for waterfowl hunting. One of these waterfowl blinds will also provide barrier-free access. Exact placement of the goose and waterfowl blinds will be determined at a later date to allow for input from hunter working groups and local hunters. Boat access to the South Bay Units will be provided by a new car-top boat ramp at Dohman Creek. Access to these blinds will be provided on a first-come, first-served basis from a parking area located near Dohman Creek. In addition, a trail from the parking area will provide walk-in hunter access to Porter Point. According to State regulations, waterfowl hunting will be allowed seven days a week and goose hunting will be allowed two days a week (Wednesdays and Saturdays).

The parking area, car-top boat launch, and trail to Porter Point will be open year round to all refuge visitors. The blinds will be open only to hunters during the hunting season; however, during the non-hunting season, these blinds may be used by any refuge visitor. This will provide access to additional areas for wildlife observation, photography, environmental education, and interpretation on the Refuge.

Waterfowl Closure Areas

The Refuge maintains the Presidential Proclamation Boundary specifically prohibiting waterfowl hunting around Long Island. The Tarlatt Unit will be closed to waterfowl hunting as well as the area east of Dohman Creek and north of the Riekkola dike.

**Availability of Resources**

This expanded hunt opportunity would not require any new infrastructure or personnel. Administration of the hunt and annual coordination with the State of Washington would be required as would some law enforcement patrols. However, refuge staff is in place and capable of conducting these additional duties. The annual revision and printing of the refuge brochure and updates to the Refuge's website and other outreach information would be required at an estimated cost of $14,800. Refuge base funding is available to cover these costs.

**Anticipated Impacts of Described Use**

The number of hunters expected to use the South Bay and Leadbetter Point Units for hunting would be small. Waterfowl hunting already occurs on portions of the Refuge, State-owned waters, and tidelands in adjacent waters.

Bird species that could be temporarily disturbed include bald eagles, great blue herons, shorebirds, and other birds that reside within the riparian and saltwater estuary habitat of Willapa Bay. No effects are expected for fish populations of Willapa Bay or the Refuge.

It is the policy of the Service to protect and preserve all native species of fish, amphibians, reptiles, birds, mammals, fish, invertebrates, and plants, including their habitats, which are designated, threatened, or endangered with extinction. This includes protecting their habitats. Endangered,

threatened, proposed, and candidate species that occur on or near the Refuge include marbled murrelet, northern spotted owl, western snowy plover, streaked horned lark, and pink sandverbena. Under Section 7 of the Endangered Species Act of 1973, the Service is required to complete an evaluation of the proposed activity to ensure that the action does not unacceptably affect listed species such as those identified above. A Section 7 consultation about hunting on the Refuge will be completed

Effects to other public uses are expected to be minimal due to the time of year waterfowl hunting takes place. Public use of the South Bay Units is minimal during the fall and winter due to inclement weather. Other recreational uses such as kayaking or boating in Willapa Bay have ceased by this time of year or are at minimal levels in the fall and winter months.

Although hunting directly impacts individuals, the amount of waterfowl harvest is not expected to change or to have a measurable effect on refuge, Willapa Bay, or Pacific Flyway populations, as waterfowl hunting is already occurring on the shorelines and in the estuarine sloughs of Willapa Bay and waterfowl hunting activity is not extremely high. Hunting may be either compensatory or additive to natural mortality (Anderson 1995). Compensatory mortality occurs when hunting substitutes for other forms of mortality (disease, competition, predation, severe weather, etc.) Additive mortality occurs when hunting compounds the total mortality. In some cases, hunting can be used as a management tool to control populations. In concert with Canada, Mexico, and multistate flyway councils, the Service and state wildlife agencies regulate hunting so that harvest does not reduce populations to unsustainable levels.

Direct effects of hunting on waterfowl are mortality, wounding, and disturbance (DeLong 2002). Hunting can alter behavior (e.g., foraging time), population structure, and distribution patterns of wildlife (Bartelt 1987; Cole and Knight 1990; Madsen 1985; Owens 1977; Raveling 1979; Thomas 1983; White-Robinson 1982). In Denmark, hunting was documented to affect the diversity and number of birds using a site (Madsen 1995). Avian diversity changed from predominantly mute swan and mallard to a more even distribution of a greater number of species when a sanctuary was established. Hence, species diversity increased with the elimination of hunting. There also appears to be an inverse relationship between the numbers of birds using an area and hunting intensity (DeLong 2002). In Connecticut, lesser scaup were observed to forage less in areas that were heavily hunted (Cronan 1957). In California, the numbers of northern pintails on Sacramento NWR non-hunt areas increased after the first week of hunting and remained high until the season was over in early January (Heitmeyer and Raveling 1988). Following the close of hunting season, ducks generally increased their use of the hunt area; however, use was lower than before the hunting season began.

Human disturbance to wintering birds and other wildlife using the open waters of the Willapa Bay and associated tributaries would occur as a result of hunting activity. Migratory and wintering waterfowl generally attempt to minimize time spent in flight and maximize foraging time because flight requires considerably more energy than any other activity, other than egg laying. Human disturbance associated with hunting includes loud noises and rapid movements, such as those produced by shotguns and boats powered by outboard motors. This disturbance, especially when repeated over a period of time, compels waterfowl to change food habits, feed only at night, lose weight, or desert feeding areas (Madsen 1995; Wolder 1993). Disturbance levels from hunting activity outside Chincoteague NWR were found to be high enough to force wintering black ducks into a pattern of nocturnal feeding within the surrounding salt marsh and diurnal resting within refuge impoundments (Morton et al. 1989a, 1989b). Unhunted populations have been documented to behave differently from hunted ones (Wood 1993).

These impacts can be reduced by the presence of adjacent sanctuary areas where hunting does not occur, and birds can feed and rest relatively undisturbed. Sanctuaries or non-hunt areas have been identified as the most common solution to disturbance problems caused from hunting (Havera et al 1992). Prolonged and extensive disturbances may cause large numbers of waterfowl to leave disturbed areas and migrate elsewhere (Madsen 1995; Paulus 1984). In Denmark, hunting disturbance effects were experimentally tested by establishing two sanctuaries (Madsen 1995). Over a five-year period, these sanctuaries became two of the most important staging areas for coastal waterfowl. Numbers of dabbling ducks and geese increased four- to 20-fold within the sanctuary (Madsen 1995). The 11,000-acre Presidential Proclamation Boundary area surrounding Long Island in south Willapa Bay is closed to all migratory bird hunting and acts as a sanctuary during the waterfowl season. Willapa Bay is tidally influenced and encompasses over 72,000 acres. In addition to the Presidential Proclamation Boundary area, vast portions of Willapa Bay's tidal estuary act as de facto sanctuaries due to the limited accessibility thus reduction to waterfowl hunting pressure.

Intermittent hunting can be a means of minimizing disturbance, especially if rest periods in between hunting events are weeks rather than days (Fox and Madsen 1997). It is common for refuges to manage hunt programs with non-hunt days. At Sacramento NWR, 3 to 16 percent of pintails were located on hunted units during non-hunt days but were almost entirely absent in those same units on hunt days (Wolder 1993). In addition, northern pintails, American wigeon, and northern shovelers decreased time spent feeding on days when hunting occurred on public shooting areas, as compared to non-hunt days (Heitmeyer and Raveling 1988). However, intermittent hunting may not always greatly reduce hunting impacts. The intermittent hunting program of three hunt days per week at Sacramento NWR results in lower pintail densities on hunt areas during non-hunt days than non-hunt areas (Wolder 1993). In Germany, several studies reported a range from a few days to approximately three weeks for waterbird numbers to recover to pre-disturbance levels (Fox and Madsen 1997). The proposed hunt would not be intermittent in order to provide consistent management with the existing refuge waterfowl hunt program as well as on adjacent State lands and waters.

**Public Review and Comment**

Open-house style public meetings were held, and verbal and written comments were solicited from the public during public scoping for the CCP for the Willapa NWR. Appendix E of the CCP contains further details of public involvement during development of the CCP. Additional public review and comment were solicited during the Draft CCP/EIS comment period.

**Determination**

_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

**Stipulations Necessary to Ensure Compatibility**

The refuge hunt program is designed to provide a safe, quality experience with reasonable harvest opportunities, while avoiding significant impacts to other users and non-target wildlife resources. The Refuge has developed the following stipulations to reduce impacts and promote safety:

- Waterfowl hunters would be expected to comply with all current and applicable State and refuge regulations. This will be achieved through a combination of printed information,

signing, outreach efforts, and enforcement of regulations by State and Refuge Law Enforcement Officers.

- The South Bay, Potshot, North Potshot, Stanley Peninsula, and Leadbetter Point Units will be opened to waterfowl hunting.
- Geese, ducks, coots, and snipe will be allowed to be taken. Limits and hunting periods will be set by the WDFW to match adjacent areas open to waterfowl hunting.
- Refuge and WDFW staff will consult on issues regarding law enforcement and any significant changes in the number or behavior of wildlife. Refuge regulations will be in accord with State regulations. Refuge and WDFW officers will patrol to ensure hunters are complying with all regulations and restrictions.
- An Endangered Species Act Section 7 Consultation must be completed.
- Access to the hunting areas will be by boat and/or foot access only.
- Hunters may set up temporary blinds along the shoreline, which must be removed at the conclusion of each hunting period.
- Hunters may use dogs to aid in retrieval of birds but dogs will need to be kept under control at all times.
- Only approved nontoxic shot will be allowed for the hunt.
- Camping, overnight use, and fires are prohibited except in the designated campsites on Long Island.

**Justification**

Hunting is one of the six designated wildlife-dependent public uses of the National Wildlife Refuge System. Refuges grant these six uses special consideration in planning and management. When on a refuge-specific basis one or more of these uses is determined compatible with the refuge purpose(s) and the NWRS mission, the refuge is to strongly encourage (facilitate) the use(s). Providing a quality hunting program contributes to achievement of refuge goals and purposes. By expanding the existing waterfowl hunt program after tidal restoration is complete, no habitat degradation would be anticipated, disturbance to other birds and wildlife, if any, would be temporary and localized, and ample amounts of additional quality habitat for waterfowl and other wetland birds exists on the Refuge and in Willapa Bay. Thus, it is anticipated that wildlife populations would find sufficient food resources and resting places such that their abundance and use of the Refuge and local area would not be measurably lessened from waterfowl hunting activities. The relatively limited number of individuals expected to be removed from waterfowl populations due to hunting would not cause wildlife populations to materially decline, the physiological condition and production of hunted species would not be impaired, their behavior and normal activity patterns would not be altered dramatically, and their overall welfare would not be negatively impacted. The areas of refuge lands designated for waterfowl hunting complements activities permitted by Washington State on adjacent waters and tidelands and provides distinct, manageable hunt units that can be more easily delineated, posted, and enforced, resulting in less confusion for the waterfowl hunting public. In addition, due to the time of year and the limited access, no conflicts among refuge user groups are anticipated.

The waterfowl hunt program as described is determined to be compatible because potential impacts from waterfowl hunting within these specified units on other area waterfowl, and wildlife would be minimal and not materially interfere with or detract from achievement of the NWRS mission or from the Service's ability to achieve refuge wildlife, habitat, or other public-use-related purposes and goals.

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**Mandatory Re-evaluation Date (provide year for "allowed" uses only)**

__2025__ Mandatory 15-year Re-evaluation Date (for priority public uses)

_____ Mandatory 10-year Re-evaluation (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

_____ Environmental Assessment and Finding of No Significant Impact

__X__ Environmental Impact Statement and Record of Decision

**Signatures approving and concurring with Compatibility Determination for C.1 Hunting (Waterfowl) (use is compatible with stipulations).**

**Refuge Determination**

Prepared by: _____ (Signature) 9/28/11 (Date)

Refuge Manager/ Project Leader Approval: _____ (Signature) 9/28/11 (Date)

**Concurrence**

Refuge Supervisor: _____ (Signature) 9/28/11 (Date)

Regional Chief, National Wildlife Refuge System: _____ (Signature) 9-28-11 (Date)

# C.2 Compatibility Determination for Big Game and Upland Bird Hunting on Willapa National Wildlife Refuge

**Use:** Hunting (Big Game and Upland Game Bird)

**Refuge Name:** Willapa National Wildlife Refuge

**Location:** Pacific County, Washington

**Date Established:** 1936

**Establishing and Acquisition Authorities**

- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715-715s)
- Executive Order 7541, Willapa Harbor Migratory Bird Refuge, Washington, signed January 22, 1937
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a-754c)
- Land and Water Conservation Fund Act of 1965, as amended (16 U.S.C. 4601-4601.11)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1532-1544, 87 Stat 884)
- Refuge Recreation Act of 1962, as amended (16 U.S.C. 460k-460k-4)

**Refuge Purpose(s)**

The purposes for the Willapa NWR have been identified in historic legal documentation establishing and adding refuge lands. The Refuge was originally established to preserve an important wintering and foraging habitat for migratory waterfowl in the Pacific Flyway with refuge purposes specified as follows:

> "... as a refuge and breeding ground for migratory birds and other wildlife ..." (Executive Order 7541, dated January 22, 1937)
>
> "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. 715d, Migratory Bird Conservation Act)
>
> "... suitable for—(1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." (16 U.S.C. 460k-1)
>
> "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." (16 U.S.C. 460k-2, Refuge Recreation Act [16 U.S.C. 460k-460k-4], as amended)
>
> "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4))
>
> "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (16 U.S.C. 742f(b)(1), Fish and Wildlife Act of 1956)

In accordance with 601 FW 1, all lands acquired since the original establishment of the Refuge retain this purpose.

Management priorities are further stated in subsequent land acquisition documents to preserve, protect, and restore newly acquired habitats and provide habitat for other migratory birds, plants, and wildlife with special emphasis for marbled murrelets, bald eagles, Aleutian Canada geese, shorebirds, marsh birds, and wading birds. Documentation for additional lands also identified the following habitats, wildlife, public opportunities, and management priorities to support a diverse assemblage of native fish, wildlife, and plants which includes: eelgrass beds, gravel bars, old-growth/mature forests, riverine habitats, intertidal mudflats, sand dune habitat, fish species (coho, Chinook, chum salmon, steelhead, sea-run cutthroat trout), amphibian diversity, compatible wildlife-dependent recreation, educational/research opportunities, and cultural resource sites.

Management priorities are further derived from various legal and land acquisition documents:

> "… one of the most important concentration points for migratory waterfowl on the Washington Coast. It has a fine supply of natural aquatic foods, especially eel-grass, and thereby has been for years one of the few suitable wintering grounds available for Black Brant … it is essential for the preservation of the Pacific flyway that the Restoration program provide adequate sanctuary facilities for migratory birds in that state." (Migratory Bird Conservation Commission Memorandum, Memo 16, May 7, 1936)
>
> "… as a refuge and breeding ground for migratory birds and other wildlife …" (Executive Order 7541, dated January 22, 1937)
>
> "… in order to effectuate further the purposes of the Migratory Bird Conservation Act (45 Stat. 1222)" and states that "Provided, that any private lands within the area described shall become a part of the refuge upon the acquisition of title thereto or lease thereof by the United States." (Executive Order 7721, October 8, 1937)
>
> "… for use as an inviolate sanctuary. Or for any other management purpose, for migratory birds." (16 U.S.C. 715d, Migratory Bird Conservation Act)
>
> "… To preserve and protect unique ecosystems associated with Willapa Bay … To provide for maximum use and production by migratory birds other than wintering waterfowl, with special emphasis on bald eagles and marsh and wading birds." (Long Island Land Exchange; September 1983)
>
> "… protect habitat for old growth dependent species including the threatened marbled murrelet and threatened northern spotted owl … protect and restore upland forest and associated stream habitat in order to protect and enhance declining fish populations, including coastal cutthroat trout, and Chinook, coho, and chum salmon runs … protect and restore coastal wetlands to provide a diversity of habitats for migratory waterfowl, shorebirds, wading birds, and songbirds … protect the intertidal mudflats along Willapa Bay by consolidating spartina infested lands for better management of control and eradication efforts on existing Refuge lands and on adjacent tidelands.… provide large scale habitat management through linking existing Refuge lands in a contiguous Refuge boundary, and provide wildlife-dependent public use opportunities compatible with Refuge purposes." (Willapa Addition Environmental Assessment/Land Protection Plan, and Conceptual Management Plan 1999)

**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.

**Description of Use**

This CD examines existing and proposed hunting for elk, deer, bear, and grouse on designated units of the Refuge under the management direction (see Map 4). The Refuge currently has 6,980 acres available for big game hunting and proposes to expand big game hunting to 10,716 acres. Under the management direction, Long Island (5,451 acres) will continue as currently opened to archery only for the take of grouse, bear, deer, and elk. All mainland properties and existing open portions of the Teal Slough, Headquarters, and Bear River Units will also continue as they are now open to the take of deer and elk in accordance with WDFW regulations. Expansion of elk and deer hunting opportunities on the Refuge will include approximately 2,397 acres on the Leadbetter Point Unit (permit-only muzzleloader hunt and as necessary an expanded permit-only elk hunt); South Bay Units and East Hills Units will include elk and deer hunting as refuge expansion opportunities occur. For additional details about the hunt program see Appendix M, Hunt Plan, in the CCP.

All existing and proposed hunting areas are located within Pacific County, Washington. Under this CD, elk, deer, bear, and grouse hunting will be allowed consistent with Washington State regulations except as specifically noted herein.

Existing Big Game and Upland Game Bird Hunting Opportunities

The Long Island Unit is annually open to archery hunting of elk, deer, bear, and grouse hunting only; a specific refuge hunting permit is required. Hunters must obtain a refuge hunt permit by visiting the Refuge Headquarters. Hunters that are camping must register their campsite during the early hunt season at the parking lot kiosk prior to travelling to the island. Camping is on a first-come, first-served basis. Groups are limited to five people per campsite. Individuals and groups are limited to 14 consecutive nights camping on the island. Elk/deer/bear/grouse hunters must report success/failure and any hit-but-not-retrieved animals when they turn in their refuge permit tag each trip. Use of bicycles is permitted on Long Island logging roads/trails, except for the Cedar Grove Trail.

Existing elk and deer hunting areas include designated portions of the East Hills Unit. Most of the refuge lands on the mainland between Bear River and Teal Slough with the exception of the quarters (Q88) and headquarters area are open for those interested in hunting Roosevelt elk or black-tailed deer using modern firearms or archery. The East Hills Units are not open to bear hunting. Use of bicycles is permitted on East Hills Units logging roads/trails, except for the Teal Slough and Willapa Art Trails.

Proposed Elk and Deer Hunt on South Bay Units

Proposed elk and deer hunting areas include portions the South Bay Units (Lewis, Porter Point, and Riekkola) once tidal restoration activities are complete in the South Bay. All of the existing South Bay Units and any future acquisitions are located in the same muzzleloader zone as the Leadbetter

Point Unit and therefore will typically be open for approximately five days in early October. The South Bay Units will not be open to bear hunting.

Proposed Elk and Deer Hunt Nemah/Naselle Unit and East Hills Additions

Currently, the land owners allow elk and deer hunting on these proposed refuge acquisition areas. The Refuge would continue this wildlife-dependent public use activity for any new acquisitions in the future. Elk and deer hunting opportunities would be considered upon acquisition of any new areas in the future and would resolve potential problems over the exact position of the refuge boundary and complement local hunting activities on adjacent lands. The Nemah/Naselle Unit and East Hills additions would not be open to bear hunting.

Proposed Elk Hunt on the Leadbetter Point Unit

The entire unit will be open to the regulated (permit-only) early elk muzzleloader season, which typically lasts approximately five days in early October. The public would be notified that the entire unit would be closed to all other uses including hiking and waterfowl hunting. Public use of the trails during this time is minimal, due to the inclement weather and seasonal rains that regularly flood the trails. The proposed hunt falls outside the general tourist season. Since the waterfowl hunting season is much longer than the elk muzzleloader season, there would be little, if any, impact on this user group. In keeping with existing elk hunting regulations on adjacent private property and for safety purposes, the use of muzzleloader firearms only would be authorized.

The Refuge proposes a special elk hunt to be offered sometime between October and February on this unit only. If elk are not found within the unit during the early muzzleloader hunt season, or the elk hunt proves unsuccessful due to weather or other uncontrollable influences, the special permit hunt could then be implemented. Opening the special permit hunt would offer an opportunity to assist the State in management of the expanding elk herd. This additional hunt would draw from a pool of hunters who have applied for a muzzleloader permit through WDFW. The number of permits in this additional hunt would be determined after consultation with WDFW after the early season hunt.

Issuing the special permit for the muzzleloader elk hunt provides the refuge staff with an opportunity to control the number and timing of hunters in a specific area, thereby reducing potential hunter impacts to the resource and/or other refuge users. Providing permits addresses the elk management issue by limiting the amount of animals taken or not taken in the area. Due to the size and shape of the unit and limited access points, the number of hunters would be regulated. There is the potential for elk hunters to disturb waterfowl and waterfowl hunters at certain times of the year. The permit system offers staff the opportunity to monitor take and potential impacts to resources while providing an opportunity for a quality and safe hunting experience.

Areas Closed

Areas closed to hunter access include the current Refuge Headquarters, housing quarters, the proposed area for the new Refuge Headquarters (Tarlatt Unit), and portions of the Riekkola Unit (see Map 4).

**Availability of Resources**

This expanded hunt opportunity would not require any new infrastructure or personnel. Administration of the hunt and annual coordination with the State of Washington would be required as would some law enforcement patrols. However, refuge staff is in place and capable of conducting these additional duties. The annual revision and printing of the refuge brochure and updates to the Refuge's website and other outreach information would be required at an estimated cost of $14,800. Refuge base funding is available to cover these costs.

**Anticipated Impacts of Described Use**

This proposed use would result in temporary displacement of bald eagles, songbirds, and other resident wildlife that reside in and near refuge uplands. Hunters can be expected to disturb resident wildlife, migratory birds, and other wildlife species by their movements and/or shooting activities in the field. The hunt season's limited duration (daylight hours only) and limitations on access to the upland areas of the Refuge should limit the disturbance factor. The Long Island hunting program is an archery hunt only, which reduces impacts to migratory birds and resident wildlife of the island.

Nearby resting and feeding areas would be available for use by bald eagles, migratory birds, and other resident wildlife species that are disturbed by hunting activities. These species would likely move to other areas of the Refuge which are less accessible to the hunters. A Section 7 evaluation about hunting on the Refuge will be completed.

Anticipated impacts to vegetation are expected to be limited due to the short duration of the hunt season, as well as the limited hunting and refuge use hours (daylight hours only). There is no camping allowed except in designated camp sites on Long Island. In addition, no effects are expected to refuge fish populations because activities would not take place in environments used by fish.

Effects to other public uses are expected to be minimal due to short duration of the hunt season. To further minimize impact to other user groups, the Refuge provides trails in areas where no hunting is occurring,

The big game hunting program is based on healthy, sustainable populations of the species hunted. The numbers of elk, deer, bear, and grouse that populate the Refuge may vary from year to year. As described in the Refuge's Hunt Plan (Appendix M), the elk, deer, bear, and grouse populations are monitored annually.

Roosevelt elk are native to western Oregon and Washington, northwestern California, and Vancouver Island, British Columbia. The Willapa Hills, which surround the Willapa Refuge, support one of the highest concentrations of elk in Washington. The elk and deer populations currently range throughout all of the units of the Refuge and also range into adjacent properties including Washington State Park and private property on the Long Beach peninsula, Willapa Hills, Nemah/Naselle, and South Bay areas.

Elk reproduction continues to add to the estimated population of 40 to 70 animals on the Leadbetter Point Unit. Outside recruitment into the herd may also add to this population annually. Impacts from the proposed hunt to the elk population would be monitored by issuing the special permit for the muzzleloader elk hunt; it provides the refuge staff an opportunity to control the number and timing of hunters in a specific area thereby reducing potential hunter impacts to the resource and/or other

refuge users. Providing permits addresses the elk management issue by limiting the amount of animals taken or not taken in the area. Due to the size and shape of the unit and limited access points, the number of hunters would be regulated. The permit system offers staff the opportunity to monitor take and potential impacts to the local herd while providing an opportunity for a quality and safe hunting experience. It is anticipated that on the Leadbetter Point, East Hills and South Bay Units the population may fluctuate due to hunting pressure. Overall impacts to the elk populations either locally or regionally, from elk hunting on the current and proposed refuge lands are not expected. At the Leadbetter Point Unit, the reduction in herd size may have a positive effect by protecting essential habitat for western snowy plovers, streaked horned larks, and pink sandverbena, which may be impacted by the large herd in the area.

The black bear is the most common and widely distributed species of bear found in North America. The black bear population in Washington State may exceed 25,000 animals. Systematic surveys of black bear are not conducted on the Refuge. However, (according to WDFW and observations by refuge staff) the Willapa Hills and the Long Beach Peninsula support healthy populations of black bear. This species has been observed routinely throughout the Refuge. Bear would continue to be hunted only on Long Island. A small number of bear are harvested annually due to the archery only hunt, and the impact of the hunt on the existing population would not have an impact on the overall populations of black bear.

Based on the very limited number of individuals which are harvested, hunting impacts to the overall populations of these species are not expected to impact future recruitment or reproduction.

**Public Review and Comment**

Open-house style public meetings were held, and verbal and written comments were solicited from the public during public scoping for the CCP for the Willapa NWR. Appendix E of the CCP further details public involvement undertaken during development of the CCP. Additional public review and comment were solicited during the Draft CCP/EIS comment period.

**Determination**

_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

**Stipulations Necessary to Ensure Compatibility**

Law enforcement patrols to ensure compliance with hunting regulations would be conducted. State fish and wildlife officers also patrol the Refuge. Harvest and season lengths are established by the State of Washington.

Hunters would be expected to comply with all current and applicable State and refuge regulations. This would be achieved through a combination of printed information, signing, outreach efforts, and enforcement of regulations by State and Refuge Law Enforcement Officers.

Limited areas of the Refuge (portions of Riekkola, Porter Point, Lewis, Bear River, Headquarters, Teal Slough and Long Island Units) would be opened to public deer and elk hunting to minimize human disturbance and impacts. Long Island Unit would continue to be an archery hunt only and include bear and grouse hunting.

During the Leadbetter Point Unit regulated (permit only) elk hunt, the unit would be closed to other public uses for any hunt period opened (generally one week in early October and a potential special permit hunt) and only muzzleloader hunting would be permitted.

Refuge staff and WDFW staff would consult on issues regarding law enforcement and any significant changes in the number or behavior of wildlife.

Camping, overnight use, and fires are prohibited except in the designated campsites on Long Island.

Hunters may set up temporary tree stands, which must be removed at the conclusion of each hunting period.

Access to the hunting areas would be by boat and/or foot access only. Use of bicycles is also permitted on logging roads/trails on Long Island and in the East Hills Units, except for the Cedar Grove, Teal Slough, and Willapa Art Trails.

**Justification**

The proposed use is one of the priority wildlife-dependent uses that refuges are encouraged to facilitate, where compatible, in the National Wildlife Refuge System Improvement Act of 1997. Hunting is one of the six designated wildlife-dependent public uses of the National Wildlife Refuge System. Refuges grant these six uses special consideration in planning and management. When on a refuge-specific basis one or more of these uses is determined compatible with the refuge purpose(s) and the NWRS mission, the Refuge is to strongly encourage (facilitate) the use(s). Providing a quality hunting program contributes to achieving the Refuge's goals and purposes. The program as described has been determined to be compatible. Potential impacts from proposed and existing deer, elk, bear, and grouse hunting within these specified units on other birds and wildlife would be minimal and not materially interfere with or detract from achievement of the NWRS mission or from the Service's ability to achieve refuge wildlife, habitat, or other public-use-related purposes and goals.

By implementing the big game and upland bird hunt program, no habitat degradation would be anticipated; disturbance to birds and other wildlife, if any, would be temporary and localized; and ample amounts of additional quality habitat for these wildlife species exists on the Refuge. Thus, it is anticipated that wildlife populations would find sufficient food resources and resting places such that their abundance and use of the Refuge and local area would not be measurably lessened from hunting activities. The relatively limited number of individuals expected to be removed from the deer and elk populations due to hunting would not cause overall wildlife populations to materially decline; the physiological condition and production of hunted species would not be impaired; and their behavior and normal activity patterns would not be altered dramatically. Expanded hunt opportunities in the South Bay Units, East Hills Units, and Leadbetter Point Unit may reduce elk populations in these areas. The elk hunt at Leadbetter Point would have the effect of reducing the herd size at that site and may result in positive effects for the western snowy plover, which may be impacted by the large elk herd in the area.

The areas of refuge lands designated for deer and elk hunting complements activities permitted by Washington State on adjacent uplands and provides distinct, manageable hunt units that can be more easily delineated, posted, and enforced, resulting in less confusion for the deer/elk hunting public. In addition, due to the time of year and the limited access, minimal conflicts among refuge user groups are anticipated.

**Mandatory Re-evaluation Date (provide year for "allowed" uses only)**

__2025_ Mandatory 15-year Re-evaluation Date (for priority public uses)

_____ Mandatory 10-year Re-evaluation (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

_____ Environmental Assessment and Finding of No Significant Impact

__X__ Environmental Impact Statement and Record of Decision

**Signatures approving and concurring with Compatibility Determination for C.2 Hunting (Big Game and Upland Game Bird) (use is compatible with stipulations).**

**Refuge Determination**

Prepared by: _____ (Signature) 9/28/11 (Date)

Refuge Manager/
Project Leader
Approval: _____ (Signature) 9/28/11 (Date)

**Concurrence**

Refuge Supervisor: _____ (Signature) 9/28/11 (Date)

Regional Chief,
National Wildlife
Refuge System: _____ (Signature) 9/28/11 (Date)

# C.3 Compatibility Determination for Recreational Fishing on Willapa National Wildlife Refuge

**Use:** Recreational Fishing

**Refuge Name:** Willapa National Wildlife Refuge

**Location:** Pacific County, Washington

**Date Established:** 1936

**Establishing and Acquisition Authorities**

- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715-715s)
- Executive Order 7541, Willapa Harbor Migratory Bird Refuge, Washington, signed January 22, 1937
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a-754c)
- Land and Water Conservation Fund Act of 1965, as amended (16 U.S.C. 4601-4601.11)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1532-1544, 87 Stat 884)
- Refuge Recreation Act of 1962, as amended (16 U.S.C. 460k-460k-4)

**Refuge Purpose(s)**

The purposes for the Willapa NWR have been identified in historic legal documentation establishing and adding refuge lands. The Refuge was originally established to preserve an important wintering and foraging habitat for migratory waterfowl in the Pacific Flyway with refuge purposes specified as follows:

> "... as a refuge and breeding ground for migratory birds and other wildlife ..." (Executive Order 7541, dated January 22, 1937)
>
> "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. 715d, Migratory Bird Conservation Act)
>
> "... suitable for—(1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." (16 U.S.C. 460k-1)
>
> "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." (16 U.S.C. 460k-2, Refuge Recreation Act [16 U.S.C. 460k-460k-4], as amended)
>
> "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4))
>
> "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (16 U.S.C. 742f(b)(1), Fish and Wildlife Act of 1956)

In accordance with 601 FW 1, all lands acquired since the original establishment of the Refuge retain this purpose.

Management priorities are further stated in subsequent land acquisition documents to preserve, protect, and restore newly acquired habitats and provide habitat for other migratory birds, plants and wildlife with special emphasis for marbled murrelets, bald eagles, Aleutian Canada geese, shorebirds, marsh birds, and wading birds. Documentation for additional lands also identified the following habitats, wildlife, public opportunities, and management priorities to support a diverse assemblage of native fish, wildlife, and plants which includes: eelgrass beds, gravel bars, old-growth/mature forests, riverine habitats, intertidal mudflats, sand dune habitat, fish species (coho, Chinook, chum salmon, steelhead, sea-run cutthroat trout), amphibian diversity, compatible wildlife-dependent recreation, educational/research opportunities, and cultural resource sites.

Management priorities are further derived from various legal and land acquisition documents:

> "… one of the most important concentration points for migratory waterfowl on the Washington Coast. It has a fine supply of natural aquatic foods, especially eel-grass, and thereby has been for years one of the few suitable wintering grounds available for Black Brant … it is essential for the preservation of the Pacific flyway that the Restoration program provide adequate sanctuary facilities for migratory birds in that state." (Migratory Bird Conservation Commission Memorandum, Memo 16, May 7, 1936)
>
> "… as a refuge and breeding ground for migratory birds and other wildlife …" (Executive Order 7541, dated January 22, 1937)
>
> "… in order to effectuate further the purposes of the Migratory Bird Conservation Act (45 Stat. 1222)" and states that "Provided, that any private lands within the area described shall become a part of the refuge upon the acquisition of title thereto or lease thereof by the United States." (Executive Order 7721, October 8, 1937)
>
> "… for use as an inviolate sanctuary. Or for any other management purpose, for migratory birds." (16 U.S.C. 715d, Migratory Bird Conservation Act)
>
> "… To preserve and protect unique ecosystems associated with Willapa Bay … To provide for maximum use and production by migratory birds other than wintering waterfowl, with special emphasis on bald eagles and marsh and wading birds." (Long Island Land Exchange; September 1983)
>
> "… protect habitat for old growth dependent species including the threatened marbled murrelet and threatened northern spotted owl … protect and restore upland forest and associated stream habitat in order to protect and enhance declining fish populations, including coastal cutthroat trout, and Chinook, coho, and chum salmon runs … protect and restore coastal wetlands to provide a diversity of habitats for migratory waterfowl, shorebirds, wading birds, and songbirds … protect the intertidal mudflats along Willapa Bay by consolidating spartina infested lands for better management of control and eradication efforts on existing Refuge lands and on adjacent tidelands.… provide large scale habitat management through linking existing Refuge lands in a contiguous Refuge boundary, and provide wildlife-dependent public use opportunities compatible with Refuge purposes." (Willapa Addition Environmental Assessment/Land Protection Plan, and Conceptual Management Plan 1999)

**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.

**Description of Use**

Recreational fishing commonly occurs in the State-owned waters of Willapa Bay, including the Bear River and Naselle River, and along the mainland shoreline. The Refuge generally has jurisdiction over the land base, including shorelines to mean high water, but not the water in these areas. Anglers accessing the fishing opportunities on the Refuge do so by fishing from the shoreline or from boats launched using the Refuge's boat ramp located across from the southern tip of Long Island, the Nahcotta boat ramp located on the Willapa Bay side of the Long Beach Peninsula, or the Naselle boat ramp located east of the Refuge Headquarters. Anglers are also expected to launch boats from the proposed car-top boat ramp at Dohman Creek, once it is built. Access to the shoreline from the mainland is gained from the adjacent U.S. Highway 101. All fishing is conducted in accordance with State regulations. Fish species caught here are coho salmon, Chinook salmon, chum salmon, and sturgeon.

This CD reassesses and re-evaluates recreational fishing from all shorelines and Willapa Bay areas within the refuge boundary. Under this use fishing would be allowed consistent with State regulations. Specific species/numbers to be taken and open periods will be set by WDFW to match adjacent areas open to fishing.

Recreational fishing (a wildlife-dependent activity) has been identified in the National Wildlife Refuge System Administration Act, as amended, as a priority public use, provided it is compatible with the purpose for which the Refuge was established.

**Availability of Resources**

The proposed recreational fishing program would not require any new infrastructure or personnel. Administration of a fishing program would require coordination with the State of Washington and require some law enforcement patrols; however refuge staff is in place and capable of conducting these additional duties. Revision and printing of the refuge brochure, as well as updating the Refuge's website and other outreach information, would be required at an estimated cost of $6,000. Base funding is available to cover these costs.

**Anticipated Impacts of Described Use**

As a solitary and stationary activity, fishing tends to be less disturbing to wildlife than hunting or motorized boating (Tuite et al. 1983). It is well recognized that fishing can give many people a deeper appreciation of fish and wildlife and a better understanding of the importance of conserving habitat, which has ultimately contributed to the Refuge System mission. A goal of Willapa National Wildlife Refuge is to provide opportunities for wildlife-dependent recreation. Fishing is one of the six priority public uses in the National Wildlife Refuge System. Of key concern, then, is to manage the activity to keep any potential adverse impacts within acceptable limits.

Any angler activities on the Refuge are and will remain consistent with State guidelines. Related impacts for fish stocks associated with recreational fishing in Willapa Bay, Naselle River, and Bear River are estimated annually and taken into consideration by the State of Washington in the development of annual fishing agreements and associated regulations. Because fishing regulations are established to provide a sustainable fish resource, impacts to fish populations from recreational fishing activity are expected to be minor.

Additional disturbance would be caused to birds and other wildlife using the open waters and where fishing would occur. Fishing activities may influence the composition of bird communities, as well as abundance, and productivity of waterbirds (Bell and Austin 1985; Bouffard 1982; Cooke 1987; Edwards and Bell 1985; Tydeman 1977). Anglers often fish in shallow, sheltered bays and creeks that birds prefer, negatively impacting distribution and abundance of waterfowl, grebes, and coots (Cooke 1987). Increases in anglers and associated shoreline activity discouraged waterfowl using otherwise suitable habitat (Jahn and Hunt 1964). Anglers influenced the numbers, behavior, and diurnal distribution of avian scavengers present at sites in Washington, when compared to non-fishing days (Knight et al. 1991). Shoreline activities, such as human noise, would cause some birds to flush and go elsewhere. In addition, trampling of vegetation and deposition of sewage or other chemicals are expected to commonly occur (Liddle and Scorgie 1980). Disturbance and destruction of riparian vegetation, bank stability, and water quality may result from high levels of bank fishing activities.

Boating associated with fishing can alter bird distribution, reduce use of particular habitats or entire areas by waterfowl and other water-birds, alter feeding behavior and nutritional status, and cause premature departure from areas (Knight and Cole 1995). Impacts of motorized boating can occur even at low densities, given their noise, speed, and ability to cover extensive areas in a short amount of time. Anglers accessing the refuge shoreline at high tides by boat may fish from the Refuge in the State waters.

Although fishing activity can result in disturbance to local wildlife, it is important to note that large acreages of undisturbed habitat are adjacent to areas open to public fishing, thereby affording disturbed wildlife more than adequate escape cover and sanctuary.

**Public Review and Comment**

Open-house style public meetings were held, and verbal and written comments were solicited from the public during public scoping for the CCP for the Willapa NWR. Appendix E of the CCP further details public involvement undertaken during development of the CCP. Additional public review and comment were solicited during the Draft CCP/EIS comment period.

**Determination**

_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

**Stipulations Necessary to Ensure Compatibility**

Law enforcement patrols to ensure compliance with fishing regulations would be conducted. State Fish and Wildlife officers also patrol the Refuge. Harvest and season lengths are established by the State of Washington.

**Justification**

Recreational fishing is one of the six priority public uses of the National Wildlife Refuge System. Providing a quality fishing program contributes to achieving one of the Refuge's goals. The fishing opportunities as described were determined to be compatible, despite the potential impacts that fishing and supporting activities (boating) can have on the Service's ability to achieve its purposes. In addition, the majority of waterfowl use on the Refuge occurs in the winter and spring months, with some birds as early as September and October. Because the majority of the fishing activity occurs in the summer and fall (through mid-October), disturbance to waterfowl species is reduced. It is anticipated that an adequate amount of estuary, open water, and riverine habitat would be available to the majority of waterfowl, waterbirds, and other wildlife because of the large area available for fishing and very small numbers of bank fishermen are expected to use the area.

Thus, it is anticipated that wildlife, primarily waterbirds, would find sufficient food resources and resting places and their abundance and use of the Refuge would not be measurably reduced. The fishing pressure received would not cause fish stocks to decline. The physiological condition and production of waterfowl and other waterbirds would not be impaired; their behavior and activity patterns would not be altered dramatically; and their overall welfare would not be impaired. The recreational fishing program as described is determined to be compatible because potential impacts from proposed fishing program within these specified units on other area birds and wildlife would be minimal and not materially interfere with or detract from achievement of the NWRS mission or from the Service's ability to achieve refuge wildlife, habitat, or other public-use-related purposes and goals.

**References**

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Tydeman, C.F. 1977. The importance of the close fishing season to breeding bird communities. Journal of Environmental Management 5:289-296**.**

**Mandatory Re-evaluation Date (provide year for "allowed" uses only)**

__2025__ Mandatory 15-year Re-evaluation Date (for priority public uses)

_____ Mandatory 10-year Re-evaluation (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

_____ Environmental Assessment and Finding of No Significant Impact

__X__ Environmental Impact Statement and Record of Decision

**Signatures approving and concurring with Compatibility Determination for C.3 Recreational Fishing (use is compatible with stipulations).**

**Refuge Determination**

Prepared by: _____ (Signature) 9/28/11 (Date)

Refuge Manager/
Project Leader
Approval: _____ (Signature) 9/28/11 (Date)

**Concurrence**

Refuge Supervisor: _____ (Signature) 9/28/11 (Date)

Regional Chief,
National Wildlife
Refuge System: _____ (Signature) 9-28-11 (Date)

# C.4 Compatibility Determination for Environmental Education, Interpretation, Wildlife Observation, and Photography on Willapa National Wildlife Refuge

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

**Refuge Name:** Willapa National Wildlife Refuge

**Location:** Pacific County, Washington

**Date Established:** 1936

**Establishing and Acquisition Authorities**

- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715-715s)
- Executive Order 7541, Willapa Harbor Migratory Bird Refuge, Washington, signed January 22, 1937
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a-754c)
- Land and Water Conservation Fund Act of 1965, as amended (16 U.S.C. 4601-4601.11)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1532-1544, 87 Stat 884)
- Refuge Recreation Act of 1962, as amended (16 U.S.C. 460k-460k-4)

**Refuge Purpose(s)**

The purposes for the Willapa NWR have been identified in historic legal documentation establishing and adding refuge lands. The Refuge was originally established to preserve an important wintering and foraging habitat for migratory waterfowl in the Pacific Flyway with refuge purposes specified as follows:

> "... as a refuge and breeding ground for migratory birds and other wildlife ..." (Executive Order 7541, dated January 22, 1937)
>
> "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. 715d, Migratory Bird Conservation Act)
>
> "... suitable for—(1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." (16 U.S.C. 460k-1)
>
> "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." (16 U.S.C. 460k-2, Refuge Recreation Act [16 U.S.C. 460k-460k-4], as amended)
>
> "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4))

> "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (16 U.S.C. 742f(b)(1), Fish and Wildlife Act of 1956)

In accordance with 601 FW 1, all lands acquired since the original establishment of the Refuge retain this purpose.

Management priorities are further stated in subsequent land acquisition documents to preserve, protect, and restore newly acquired habitats and provide habitat for other migratory birds, plants and wildlife with special emphasis for marbled murrelets, bald eagles, Aleutian Canada geese, shorebirds, marsh birds, and wading birds. Documentation for additional lands also identified the following habitats, wildlife, public opportunities, and management priorities to support a diverse assemblage of native fish, wildlife, and plants which includes: eelgrass beds, gravel bars, old-growth/mature forests, riverine habitats, intertidal mudflats, sand dune habitat, fish species (coho, Chinook, chum salmon, steelhead, sea-run cutthroat trout), amphibian diversity, compatible wildlife-dependent recreation, educational/research opportunities, and cultural resource sites.

Management priorities are further derived from various legal and land acquisition documents:

> "… one of the most important concentration points for migratory waterfowl on the Washington Coast. It has a fine supply of natural aquatic foods, especially eel-grass, and thereby has been for years one of the few suitable wintering grounds available for Black Brant … it is essential for the preservation of the Pacific flyway that the Restoration program provide adequate sanctuary facilities for migratory birds in that state." (Migratory Bird Conservation Commission Memorandum, Memo 16, May 7, 1936)
>
> "… as a refuge and breeding ground for migratory birds and other wildlife …" (Executive Order 7541, dated January 22, 1937)
>
> "… in order to effectuate further the purposes of the Migratory Bird Conservation Act (45 Stat. 1222)" and states that "Provided, that any private lands within the area described shall become a part of the refuge upon the acquisition of title thereto or lease thereof by the United States." (Executive Order 7721, October 8, 1937)
>
> "… for use as an inviolate sanctuary. Or for any other management purpose, for migratory birds." (16 U.S.C. 715d, Migratory Bird Conservation Act)
>
> "… To preserve and protect unique ecosystems associated with Willapa Bay … To provide for maximum use and production by migratory birds other than wintering waterfowl, with special emphasis on bald eagles and marsh and wading birds." (Long Island Land Exchange; September 1983)
>
> "… protect habitat for old growth dependent species including the threatened marbled murrelet and threatened northern spotted owl … protect and restore upland forest and associated stream habitat in order to protect and enhance declining fish populations, including coastal cutthroat trout, and Chinook, coho, and chum salmon runs … protect and restore coastal wetlands to provide a diversity of habitats for migratory waterfowl, shorebirds, wading birds, and songbirds … protect the intertidal mudflats along Willapa Bay by consolidating spartina infested lands for better management of control and eradication efforts on existing Refuge lands and on adjacent tidelands.… provide large scale habitat

management through linking existing Refuge lands in a contiguous Refuge boundary, and provide wildlife-dependent public use opportunities compatible with Refuge purposes." (Willapa Addition Environmental Assessment/Land Protection Plan, and Conceptual Management Plan 1999)

**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.

**Description of Use(s)**

The Willapa National Wildlife Refuge (Refuge) is a popular destination for local visitors as well as tourists from outside the area. It is difficult to determine exact number of visitors, but it is estimated the Refuge has 128,000 visitor-use days each year. The majority of visitation to the Refuge occurs during the summer months and during the hunting seasons.

This CD examines existing and proposed non-consumptive wildlife-dependent recreational uses on Willapa National Wildlife Refuge. Additional information about these existing and proposed uses is described in Chapter 5 of the CCP.

*Environmental education and interpretation* consist of those activities that seek to increase the public's knowledge and understanding of wildlife and contribute to the conservation of such wildlife. Many members of the public are not familiar with National Wildlife Refuges and confuse them with other Federal land management systems such as National Parks or with State Parks. Providing information through educational programs, written materials, and interpretive panels helps to build an understanding and appreciation of the unique purposes and activities of National Wildlife Refuges. Providing information regarding the mission of the Service and the purposes of the Refuge, along with specific resource information, to refuge visitors may alleviate potential negative impacts on wildlife through education.

Interpretation and environmental education activities generally occur on the mainland units of the Refuge. Activities would include staff and volunteer conducted environmental education programs, teacher workshops, interpretive programs, and interpretive sites (such as displays, waysides and self-guided tours). Over a three-day period in late spring, the Refuge hosts students from regional schools. During this structured field trip, students learn more about the environment and how to be stewards of the natural world. Friends of Willapa National Wildlife Refuge and Willapa National Wildlife Refuge annually co-sponsor this educational event as part of their fourth-grade environmental education program.

Interpretive information and brochures are located at the current refuge headquarters. The refuge headquarters is open to the public Monday through Friday, 8 am to 4 pm except Federal holidays. There are several information kiosks throughout the Refuge offering maps, orientation material, and regulations. The parking lots at both the current refuge headquarters and Leadbetter Point Unit offer restroom facilities. The Leadbetter Point Unit restroom is maintained by the Washington State Parks and Recreation Commission.

The Willapa Art Trail was created to provide visitors with an opportunity to experience nature near the current refuge headquarters. Visitors can currently observe wildlife from a curving, barrier-free boardwalk. Artwork located along the boardwalk tells the story of the stream and the many species who live there. Students from the University of Washington Public Arts Program designed, constructed, and installed the artwork for the trail under the direction of professors. The Willapa Art Trail is about one-quarter mile long and is open seven days a week from dawn until dusk.

*Wildlife observation* is probably the most popular activity on the Refuge. Trails located at the Leadbetter Point Unit, Long Island, Teal Slough, and the existing refuge headquarters provide key areas for refuge visitors to learn about and experience the Refuge. These trails and the photo blind located in the Tarlatt Unit provide opportunities for visitors who wish to view and photograph wildlife, while minimizing disturbance to wildlife. Hiking trails at the Leadbetter Point Unit allow visitors to walk through coastal woodlands, salt marshes, and beaches. Many miles of pedestrian-only trails link the Leadbetter Point Unit with an adjacent Washington State Park. In Willapa Bay, refuge visitors travel by either motorized or non-motorized boats for wildlife viewing and other wildlife oriented activities. Long Island has a 1-mile loop trail and over 10 miles of roads that allows visitors to access forest habitats including a 274-acre old-growth stand.

*Wildlife photography* is a popular activity which occurs year round on the Refuge. Long Island and Willapa Bay provide more limited photographic opportunities because visitors must use boats, kayaks, or canoes to access the island and surrounding estuary. In 2003, the Friends of Willapa National Wildlife Refuge constructed a photography blind on a seasonal freshwater wetland in the Tarlatt Unit. The best time of year to use the blind is during the winter and early spring when the wetland is full of water and feeding waterfowl. The blind is available by reservation only. In addition, the Friends of Willapa National Wildlife Refuge sponsors an annual wildlife photography contest.

Proposed Changes to Non-consumptive Wildlife-dependent Recreational Uses

Under the management direction, the Refuge will improve and expand wildlife observation and photography opportunities. Logging roads and dikes are used as public access trails on both the mainland and Long Island Units which creates conflict since they double as service roads. As part of the forest restoration goal, 10 miles of these roads will be abandoned using techniques described in Appendix K.

Trail development at the proposed new Refuge Headquarters site will provide the public increased viewing and educational opportunities of important coastal habitat types. Walking trail and/or viewpoint development will be limited to areas that do not create wildlife or resource disturbance. Once the new Refuge Headquarters is established, the existing refuge headquarters area will be restored to more natural conditions. The Willapa Art Trail, parking lot, and visitor kiosk will continue to provide the public with interpretive/educational opportunities and refuge access.

A new Visitor/Administrative Building and a Maintenance Area, consisting of seven shop and/or equipment storage buildings (see Site Plan in Appendix P), will serve as the new headquarters for the Willapa Refuge Complex to better manage the Refuges that are part of the Complex and provide increased accessibility for the visiting public. Buildings at the Visitor/Administrative and Maintenance Facility are proposed to be designed and constructed to meet or exceed energy efficiency standards for the Leadership in Energy and Environmental Design (LEED) Green Building Rating System. The site proposed for the new Visitor/Administrative and Maintenance Facility located in the Tarlatt Unit of the Refuge will serve as the main focal point for environmental

educational activities. Although the Tarlatt Unit is the best site at this time, we will continue to consider other sites within the refuge boundary that could best meet all of the visitor and functional needs. The Refuge anticipates an increase in visitors from approximately 128,000 to an estimated 200,000 annually due to the increased visibility of the Refuge Headquarters and visitor use of new facilities. Other portions of the Refuge (including Leadbetter Point, Long Island, and the original headquarters area) will provide additional locations for these approved activities.

The new Riekkola parking area, car-top boat launch at Dohman Creek, and trail to Porter Point will be open year-round to all refuge visitors. The blinds will be open only to hunters during the hunting season; however, during the non-hunting season, these blinds may be used by any refuge visitor. This will provide access to additional areas for wildlife observation, photography, environmental education, and interpretation on the Refuge.

Self-directed site orientation and educational opportunities would increase through additional signage, partnerships with various groups (local schools, Friends of Willapa National Wildlife Refuge, Audubon, The Nature Conservancy, volunteers) and the use of the internet and social media.

**Availability of Resources**

Additional funding for operational costs would be needed to fully implement the environmental education, wildlife observation, and photography programs identified in the CCP. Other funding sources would be sought through strengthened partnerships, grants, and donations to administer and manage a safe and quality environmental education, wildlife observation, and photography program as described above.

**Anticipated Impacts of Described Uses**

Currently, there are few places in the surrounding area to view and interpret the diversity of habitats and wildlife that encompass this unique region. The coastal dune, coastal forest upland, saltwater estuary, riverine, and mudflats provide essential habitat to shorebirds, seabirds, water birds, ducks, geese, other migratory birds, and resident wildlife. The Willapa Refuge offers a variety of opportunities for viewing wildlife on the mainland, within the saltwater estuary and on Long Island. Signs are needed to provide updated orientation to the refuge program and Refuge System information at designated sites. Updating existing waysides and displays to interpret the Refuge's mission, natural resources, and programs would provide the public an opportunity to understand the purposes and resources of the Refuge.

Activities that occur outside of vehicles (e.g., wildlife observation, hiking, and environmental education and interpretation programs) tend to increase disturbance potential for most wildlife species (Klein 1993). Human activities along trails disturb wildlife, often resulting in flushing from roosting, feeding, nesting, or resting areas. Flushing may result in expenditure of energy reserves, abandonment from preferred habitat, and increased exposure to predation during relocation. In riparian habitats, the abundance of bird species requiring shrub cover (e.g., MacGillivray's warbler and lazuli bunting) may be reduced at recreation sites, while species that forage in tree canopies may be unaffected. Trails in riparian areas may encourage the penetration of new animal species, including nest predators, into formerly protected forests (Knutsen and Naef 1997). Wildlife photographers tend to have the largest disturbance impacts because they may remain close to wildlife for prolonged periods (Klein 1993). Casual photographers with low-power lenses may approach wildlife closer than other users.

Wildlife viewing and photography opportunities occur within portions of most of the units of the Willapa Refuge. Wildlife of primary concern consists of the marbled murrelet; western snowy plover; waterfowl species such as Pacific brant, geese, and ducks; shorebirds; water and wading birds; and raptors. To minimize potential disturbance, public uses on the Refuge are limited to designated potions of the Refuge. Closed areas of the Refuge serve as wildlife sanctuaries, including a portion of Leadbetter Point that is closed seasonally (March 15 through September 30) to protect nesting snowy plovers. The majority of the environmental education, interpretation, wildlife observation, and photography use occurs during the summer while peak waterfowl, waterbird, and shorebird use occurs on the Refuge during fall, winter, and spring. In addition, the majority of these uses occur on designated trails, which minimizes wildlife disturbance. Furthermore, the level of wildlife disturbance for these activities is minimal during the fall, winter, and spring.

Access to public use areas are the dike roads, logging roads, and designated trails on the mainland units and Long Island Unit. The new foot trail at the proposed new headquarters site will be designed to maximize quality wildlife-oriented visitor activities and minimize impacts and disturbance to wildlife. The dike's elevation above surrounding terrain allows road/trail users to view wildlife out on the Willapa Bay tide flats at a distance that would not noticeably disturb the wildlife. Logging roads and designated trails provide opportunities for the public that minimize the potential for disturbance.

Impacts from the general public on Long Island are generally self-limiting. Visitors can access Long Island only with personal watercraft, which reduces the number of potential visitors. Daily tidal changes make visitation of the island a challenge. Most visitor impacts come from boating, canoeing, and kayaking in the waters surrounding Long Island. This may cause birds that use the waters of the bay and the forested edges of the island habitat to flush. The disturbance to wildlife is localized and of short duration. Nearby resting and feeding areas would be available for use by any displaced wildlife.

Willapa Refuge provides an existing fourth-grade environmental education program that has been developed to meet Washington State education standards. There is interest from local teachers in the development of other programs. An expanded environmental education program would provide enhanced outreach to educators and youth to facilitate their understanding about the Refuge, its resources, and the importance of these wildlife resources. Creating and developing specific study sites for classes to use on the Refuge would reduce potential disturbance to wildlife, yet allow for students to get hands-on experiences in science and nature.

**Public Review and Comment**

Open-house style public meetings were held, and verbal and written comments were solicited from the public during public scoping for the CCP for the Willapa Refuge. Appendix E of the CCP gives further details of public involvement undertaken during development of the CCP. Additional public review and comment were solicited during the Draft CCP/EIS comment period.

**Determination**

_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

**Stipulations Necessary to Ensure Compatibility**

In order to minimize disturbance to wildlife from human activities, wildlife-dependent public uses have been designed to minimize the potential for disturbance. The majority of refuge visitors will use refuge-specific designated trails, public use facilities, or attend approved guided events. Unguided recreational activity occurring in closed areas would not be allowed unless operating under provisions of a Special Use Permit (SUP) and stipulations set by the Refuge Manager.

Public access to the Refuge is restricted to pedestrian/boat traffic only.

Use of bicycles is permitted on logging roads/trails on Long Island and in the East Hills Units, except for the Cedar Grove, Teal Slough, and Willapa Art Trails.

Designated areas of the Leadbetter Point Unit are closed to all public access from March 15 to September 30 for the protection of nesting and rearing western snowy plover and streaked horned larks.

All public use areas managed by the Refuge would remain open dawn to dusk.

Regulatory and directional signs clearly mark designated routes of travel and areas closed to the public.

Impacts associated with differing levels and types of public use would be evaluated by staff annually. Monitoring information gathered by staff would be critically analyzed and used by the Refuge Manager to develop future modifications, if necessary, to ensure compatibility of wildlife observation, photography, and educational activities in all refuge locations.

**Justification**

The National Wildlife Refuge System Administration Act of 1966, as amended, identified wildlife observation, photography, interpretation, and environmental education as four of the six priority, wildlife-dependent recreational uses to be facilitated in the Refuge System, and the Act encouraged the Service to provide opportunities for these uses.

Relatively few people visit the Refuge, and they mainly use designated trails and public use sites, minimizing disturbance to wildlife. Thus, it is anticipated that wildlife populations would find sufficient food resources and resting places such that their abundance and use of the Refuge and surrounding areas would not be measurably lessened from public use activities. Public visitation would not cause wildlife populations to materially decline; the physiological condition and production of species would not be impaired; their behavior and normal activity patterns would not be altered dramatically; and their overall welfare would not be negatively impacted.

Based on the stipulations noted above that are designed to limit timing and amount of impact, allowing environmental education, interpretation, wildlife observation, and photography to occur on the Refuge would not materially detract or interfere with the purposes for establishment of the Refuge and the mission of the National Wildlife Refuge System.

**References**

Klein, M.L. 1993. Waterbird behavioral responses to human disturbances. Wildlife Society Bulletin 21:31-39.

Knutsen, K.L. and V.L. Naef. 1997. Management recommendations for Washington's priority habitats: riparian. Washington Department of Fish and Wildlife. Olympia, WA. 181 pp.

**Mandatory Re-evaluation Date (provide year for "allowed" uses only)**

__2025__ Mandatory 15-year Re-evaluation Date (for priority public uses)

_____ Mandatory 10-year Re-evaluation (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

_____ Environmental Assessment and Finding of No Significant Impact

__X__ Environmental Impact Statement and Record of Decision

**Signatures approving and concurring with Compatibility Determination for C.4 Environmental Education, Interpretation, Wildlife Observation, and Photography (use is compatible with stipulations).**

**Refuge Determination**

Prepared by: _____ (Signature) 9/28/11 (Date)

Refuge Manager/
Project Leader
Approval: _____ (Signature) 9/28/11 (Date)

**Concurrence**

Refuge Supervisor: _____ (Signature) 9/28/11 (Date)

Regional Chief,
National Wildlife
Refuge System: _____ (Signature) 9-28-11 (Date)

# C.5 Compatibility Determination for Camping on Willapa National Wildlife Refuge

**Use:** Camping

**Refuge Name:** Willapa National Wildlife Refuge

**Location:** Pacific County, Washington

**Date Established:** 1936

**Establishing and Acquisition Authorities**

- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715-715s)
- Executive Order 7541, Willapa Harbor Migratory Bird Refuge, Washington, signed January 22, 1937
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a-754c)
- Land and Water Conservation Fund Act of 1965, as amended (16 U.S.C. 4601-4601.11)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1532-1544, 87 Stat 884)
- Refuge Recreation Act of 1962, as amended (16 U.S.C. 460k-460k-4)

**Refuge Purpose(s):**

The purposes for the Willapa NWR have been identified in historic legal documentation establishing and adding refuge lands. The Refuge was originally established to preserve an important wintering and foraging habitat for migratory waterfowl in the Pacific Flyway with refuges purposes specified as follows:

> "... as a refuge and breeding ground for migratory birds and other wildlife ..." (Executive Order 7541, dated January 22, 1937)
>
> "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. 715d, Migratory Bird Conservation Act)
>
> "... suitable for—(1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." (16 U.S.C. 460k-1)
>
> "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." (16 U.S.C. 460k-2, Refuge Recreation Act [16 U.S.C. 460k-460k-4], as amended)
>
> "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4))
>
> "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (16 U.S.C. 742f(b)(1), Fish and Wildlife Act of 1956)

In accordance with 601 FW 1, all lands acquired since the original establishment of the Refuge retain this purpose.

Management priorities are further stated in subsequent land acquisition documents to preserve, protect, and restore newly acquired habitats and provide habitat for other migratory birds, plants and wildlife with special emphasis for marbled murrelets, bald eagles, Aleutian Canada geese, shorebirds, marsh birds, and wading birds. Documentation for additional lands also identified the following habitats, wildlife, public opportunities, and management priorities to support a diverse assemblage of native fish, wildlife, and plants which includes: eelgrass beds, gravel bars, old-growth/mature forests, riverine habitats, intertidal mudflats, sand dune habitat, fish species (coho, Chinook, chum salmon, steelhead, sea-run cutthroat trout), amphibian diversity, compatible wildlife-dependent recreation, educational/research opportunities, and cultural resource sites.

Management priorities are further derived from various legal and land acquisition documents:

> "… one of the most important concentration points for migratory waterfowl on the Washington Coast. It has a fine supply of natural aquatic foods, especially eel-grass, and thereby has been for years one of the few suitable wintering grounds available for Black Brant … it is essential for the preservation of the Pacific flyway that the Restoration program provide adequate sanctuary facilities for migratory birds in that state." (Migratory Bird Conservation Commission Memorandum, Memo 16, May 7, 1936)
>
> "… as a refuge and breeding ground for migratory birds and other wildlife …" (Executive Order 7541, dated January 22, 1937)
>
> "… in order to effectuate further the purposes of the Migratory Bird Conservation Act (45 Stat. 1222)" and states that "Provided, that any private lands within the area described shall become a part of the refuge upon the acquisition of title thereto or lease thereof by the United States." (Executive Order 7721, October 8, 1937)
>
> "… for use as an inviolate sanctuary. Or for any other management purpose, for migratory birds." (16 U.S.C. 715d, Migratory Bird Conservation Act)
>
> "… To preserve and protect unique ecosystems associated with Willapa Bay … To provide for maximum use and production by migratory birds other than wintering waterfowl, with special emphasis on bald eagles and marsh and wading birds." (Long Island Land Exchange; September 1983)
>
> "… protect habitat for old growth dependent species including the threatened marbled murrelet and threatened northern spotted owl … protect and restore upland forest and associated stream habitat in order to protect and enhance declining fish populations, including coastal cutthroat trout, and Chinook, coho, and chum salmon runs … protect and restore coastal wetlands to provide a diversity of habitats for migratory waterfowl, shorebirds, wading birds, and songbirds … protect the intertidal mudflats along Willapa Bay by consolidating spartina infested lands for better management of control and eradication efforts on existing Refuge lands and on adjacent tidelands.… provide large scale habitat management through linking existing Refuge lands in a contiguous Refuge boundary, and provide wildlife-dependent public use opportunities compatible with Refuge purposes." (Willapa Addition Environmental Assessment/Land Protection Plan, and Conceptual Management Plan 1999)

**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.

**Description of Use**

This CD re-examines camping on the Long Island Unit of Willapa Refuge located in the southern half of Willapa Bay within Pacific County, Washington. Under this proposal, camping will continue to be allowed consistent with refuge-specific regulations. To accommodate this use, the Refuge has five campgrounds on Long Island (three on the west side of the island and two on the east side of the island). Lewis Campground has two campsites, Sawlog Campground has six campsites, Pinnacle Rock Campground has five campsites, Smoky Hollow Campground has four campsites, and Sand Spit Campground has three campsites. Camping on Long Island is allowed only in these 20 designated campsites on a first-come, first-served basis. The only time registration is required is for the week prior to and during the early elk hunt season. No more than five people are allowed per campsite, and maximum stay is 14 days to minimize the impacts on refuge resources. Access to Long Island is by boat, canoe, or kayak only. Willapa Bay is tidally influenced, which further limits access to the island. Because of the limited access to Long Island, almost all recreational camping is associated with other wildlife-dependent activities (hunting, shellfish harvest, wildlife observation, photography, and environmental education).

**Availability of Resources**

The continuation of camping would not require any new infrastructure or personnel. Base funding is available to cover these costs. Refuge staff would be required to occasionally monitor camping activities but because the number of campers is limited, no additional personnel resources are anticipated and the impact on the existing staff should be limited to a few hours a week. It is expected that Refuge and WDFW law enforcement personnel would assist with any enforcement-related problems.

Maps, printed regulations, and other printed materials would be required to administer the camping program. Annual printing is anticipated to cost approximately $500. Signs designating campgrounds and campsites may need to be replaced on occasion.

**Anticipated Impacts of Described Use**

This proposed use would result in limited and temporary displacement of eagles, elk, deer, bear, and other wildlife in the immediate vicinity of the campsites/campgrounds from the activities and movements of the campers themselves. There would be some temporary displacement of waterfowl and waterbirds within the bay from both motorized and non-motorized watercraft. Displaced birds have easy access over short distances to other areas of the bay closed to public use. Minimal impacts to vegetation and soils are expected to result from this activity. Camping results in some vegetation trampling, soil compaction, and localized denuding of vegetation at campsites and where people congregate. Enhanced enforcement is expected to decrease unauthorized camping outside of designated campsites. Campers may have campfires, which are restricted to designated campfire rings. There is the potential for an increase in wildland fire activity if campers are careless with the fires they ignite.

**Public Review and Comment**

Open-house style public meetings were held, and verbal and written comments were solicited from the public during public scoping for the CCP for the Willapa NWR. Appendix E of the CCP further details public involvement undertaken during development of the CCP. Additional public review and comment were solicited during the Draft CCP/EIS comment period.

**Determination**

_____Use is Not Compatible
__X__Use is Compatible with the Following Stipulations

**Stipulations Necessary to Ensure Compatibility**

To ensure compatibility and minimize impacts to refuge resources, camping is allowed in designated campsites only. There are five primitive campgrounds with a total of 20 campsites on Long Island. A maximum of five people are allowed per campsite for up to 14 consecutive days. Fires are allowed in designated campfire rings located in each campsite to reduce potential wildland fires. Only downed wood is allowed to be used for fires. All camping equipment, supplies, and other materials brought to campsites (including trash and garbage) will be packed out of the campsites by the user. Law enforcement patrols will be conducted by refuge officers to ensure compliance with refuge regulations. No powered tools and/or equipment are allowed on the island (this includes chainsaws, generators, etc.) No dogs, except those used while hunting waterfowl, are allowed on the Refuge.

**Justification**

Because tides limit the timing and safety for accessing Long Island for those intending to engage in wildlife-dependent recreation, safe and adequate access cannot be ensured without providing camping opportunities on-site. Thus, campsites are offered for visitors engaging in one or more of the priority wildlife-dependent uses that all refuges are encouraged to facilitate, where compatible. Camping on Long Island has minimal impacts to wildlife resources and provides a unique opportunity for the general public to participate in hunting, wildlife observation, photography, interpretation, and environmental education. Allowing this use on Long Island does not materially detract or interfere with the mission of the National Wildlife Refuge System or the purposes for which the Refuge was established.

**Mandatory Re-evaluation Date (provide year for "allowed" uses only)**

_____ Mandatory 15-year Re-evaluation Date (for priority public uses)

__2020_ Mandatory 10-year Re-evaluation (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

_____ Environmental Assessment and Finding of No Significant Impact

__X__ Environmental Impact Statement and Record of Decision

**Signatures approving and concurring with Compatibility Determination for C.5 Camping (use is compatible with stipulations).**

**Refuge Determination**

Prepared by: _____ (Signature) 9/28/11 (Date)

Refuge Manager/
Project Leader
Approval: _____ (Signature) 9/28/11 (Date)

**Concurrence**

Refuge Supervisor: _____ (Signature) 9/28/11 (Date)

Regional Chief,
National Wildlife
Refuge System: _____ (Signature) 9-28-11 (Date)

# C.6 Compatibility Determination for Haying, Silage Harvest, and Cattle Grazing on Willapa National Wildlife Refuge

**Use:** Haying, Silage Harvest, and Cattle Grazing.

**Refuge Name:** Willapa National Wildlife Refuge

**Location:** Pacific County, Washington

**Date Established:** 1936

**Establishing and Acquisition Authorities**

- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715-715s)
- Executive Order 7541, Willapa Harbor Migratory Bird Refuge, Washington, signed January 22, 1937
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a-754c)
- Land and Water Conservation Fund Act of 1965, as amended (16 U.S.C. 4601-4601.11)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1532-1544, 87 Stat 884)
- Refuge Recreation Act of 1962, as amended (16 U.S.C. 460k-460k-4)

**Refuge Purpose(s)**

The purposes for the Willapa NWR have been identified in historic legal documentation establishing and adding refuge lands. The Refuge was originally established to preserve an important wintering and foraging habitat for migratory waterfowl in the Pacific Flyway with refuge purposes specified as follows:

> "... as a refuge and breeding ground for migratory birds and other wildlife ..." (Executive Order 7541, dated January 22, 1937)
>
> "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. 715d, Migratory Bird Conservation Act)
>
> "... suitable for—(1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." (16 U.S.C. 460k-1)
>
> "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." (16 U.S.C. 460k-2, Refuge Recreation Act [16 U.S.C. 460k-460k-4], as amended)
>
> "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4))
>
> "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (16 U.S.C. 742f(b)(1), Fish and Wildlife Act of 1956)

In accordance with 601 FW 1, all lands acquired since the original establishment of the Refuge retain this purpose.

Management priorities are further stated in subsequent land acquisition documents to preserve, protect, and restore newly acquired habitats and provide habitat for other migratory birds, plants, and wildlife with special emphasis for marbled murrelets, bald eagles, Aleutian Canada geese, shorebirds, marsh birds, and wading birds. Documentation for additional lands also identified the following habitats, wildlife, public opportunities, and management priorities to support a diverse assemblage of native fish, wildlife, and plants which includes: eelgrass beds, gravel bars, old-growth/mature forests, riverine habitats, intertidal mudflats, sand dune habitat, fish species (coho, Chinook, chum salmon, steelhead, sea-run cutthroat trout), amphibian diversity, compatible wildlife-dependent recreation, educational/research opportunities, and cultural resource sites.

Management priorities are further derived from various legal and land acquisition documents:

> "… one of the most important concentration points for migratory waterfowl on the Washington Coast. It has a fine supply of natural aquatic foods, especially eel-grass, and thereby has been for years one of the few suitable wintering grounds available for Black Brant … it is essential for the preservation of the Pacific flyway that the Restoration program provide adequate sanctuary facilities for migratory birds in that state." (Migratory Bird Conservation Commission Memorandum, Memo 16, May 7, 1936)
>
> "… as a refuge and breeding ground for migratory birds and other wildlife …" (Executive Order 7541, dated January 22, 1937)
>
> "… in order to effectuate further the purposes of the Migratory Bird Conservation Act (45 Stat. 1222)" and states that "Provided, that any private lands within the area described shall become a part of the refuge upon the acquisition of title thereto or lease thereof by the United States." (Executive Order 7721, October 8, 1937)
>
> "… for use as an inviolate sanctuary. Or for any other management purpose, for migratory birds." (16 U.S.C. 715d, Migratory Bird Conservation Act)
>
> "… To preserve and protect unique ecosystems associated with Willapa Bay … To provide for maximum use and production by migratory birds other than wintering waterfowl, with special emphasis on bald eagles and marsh and wading birds." (Long Island Land Exchange; September 1983)
>
> "… protect habitat for old growth dependent species including the threatened marbled murrelet and threatened northern spotted owl … protect and restore upland forest and associated stream habitat in order to protect and enhance declining fish populations, including coastal cutthroat trout, and Chinook, coho, and chum salmon runs … protect and restore coastal wetlands to provide a diversity of habitats for migratory waterfowl, shorebirds, wading birds, and songbirds … protect the intertidal mudflats along Willapa Bay by consolidating spartina infested lands for better management of control and eradication efforts on existing Refuge lands and on adjacent tidelands.… provide large scale habitat management through linking existing Refuge lands in a contiguous Refuge boundary, and provide wildlife-dependent public use opportunities compatible with Refuge purposes." (Willapa Addition Environmental Assessment/Land Protection Plan, and Conceptual Management Plan 1999)

**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.

**Description of Use(s)**

This is a re-evaluation of the haying, silage harvest, and cattle grazing program that was initially determined to be compatible with refuge purposes in 1994. The purpose of the program is to manage short-grass foraging habitat for wintering and migrating Canada geese. Grazing/haying is used as a management tool to improve habitat conditions on the Refuge. Privately owned livestock (cattle) would graze, and privately owned equipment would be used to mow/hay on the Refuge to improve vegetative composition by reducing exotic weed species. Grazing/haying would be timed to reduce undesirable vegetation and would be conducted mid-April through mid-October.

Cattle grazing and haying activities are considered refuge management economic activities. These activities have been and are proposed to continue to be conducted under a cooperative land management agreement (CLMA), which has been established between the Refuge and the livestock operator (cooperator). The CLMA is an in-kind program, which means that both parties receive mutual benefits from the land. In this case, the cooperator receives grazing and haying privileges, and the Service receives management actions conducted primarily for the benefit of Canada geese.

Currently one cooperator grazes and hays the Riekkola (199 acres) and Tarlatt (35.2 acres) Units and two cooperators hay the Wheaton Unit (73 acres). The three local cooperators graze and hay introduced reed canarygrass, native grasses, tame pasture grasses, sedges, and rushes on refuge pastures. The grazing program is implemented on the Riekkola Unit, and the haying program is implemented on the Riekkola, Tarlatt, and Wheaton Units.

Under the management direction of the CCP, the refuge haying and grazing programs will be reduced to 93 acres at the Riekkola Unit, following the tidal restoration and the divestment of the Wheaton Unit.

**Availability of Resources**

An estimated $6,000 of refuge staff time is needed annually for planning, oversight, and coordination of this use. Before each field season, the Refuge Manager reviews the annual work plan, discusses it with refuge staff, and makes necessary changes to the plan. Then the Refuge Manager identifies changes with the cooperator prior to initiation of grazing/haying.

Periodically, assistance may be required from refuge maintenance staff to maintain the watering and fencing systems. Refuge staff monitors the grazing and haying operations, and periodically evaluates habitat conditions before, during, and after the grazing season. At the end of the season, refuge staff review the worksheets completed by the cooperator to determine if grazing criteria have been met, as well as the amount of hay removed from the Refuge and the amount of in-kind work provided by the cooperator. The overall cost to the Refuge in terms of labor is considered to be low, especially taking into the consideration the benefits provided to the Refuge in meeting the previously described goal and objectives. Refuge base funding is available to cover the costs associated with this program.

**Anticipated Impacts of Described Use**

Negative impacts from grazing are mostly associated with difficulties in containing the cattle. Cattle are attracted to water and therefore can damage sensitive wetland areas if they gain access to those sites. They can also cause damage in riparian forest sites and waterways by trampling the understory, compacting soils, degrading water quality, and making the areas undesirable for other wildlife. By fencing off any sensitive areas and focusing the grazing in pastures, negative impacts from grazing are minimized. Adverse impacts to wildlife habitats are significantly reduced by restricting livestock use to the spring through early fall time period and by development of site specific watering areas.

All three activities can cause some degree of disturbance to the geese and other migratory bird and other resident wildlife. In addition, haying and silage activities may cause geese and other migratory birds and wildlife to move from the immediate area where the farming equipment is operating. However, because these disturbances are short-term and localized, the geese and migratory birds and wildlife can easily move to an adjacent undisturbed location. Restricting the pasture management activities from spring through early fall provides Canada geese, other migratory birds, and wildlife optimum habitat conditions when they most need it, in the fall through winter seasons. Geese use refuge pastures for foraging, preferring young shoots that are higher in protein and lower in fiber than mature stems (McLandress and Raveling 1981). Pasture grasses serve as an important source of amino acids and carbohydrates to meet the energy and nutrient requirements of geese (Baldassare and Bolen 2006). Grazing by livestock simulates some of the effects of natural disturbances by removing woody vegetation, reducing thatch, and encouraging the production of young shoots, which are preferred forage for Canada and cackling geese (Raveling 1979). To provide high-quality forage for wintering and migrating geese, the Refuge uses grazing and haying to ensure that young shoots between 2 and 4 inches tall are available by early October each year.

Grazing has been demonstrated to impact various grassland birds, nesting waterfowl, and small mammals (Fleischner 1994). Not only are these species subject to injury and mortality from trampling, but the conversion of tall pasture grasses to short-cropped grasses results in habitat loss for some species. The Refuge reduces impacts of pasture management by limiting grazing/haying operations and restricting the introduction of cattle during the breeding season in areas where significant impacts to nesting birds would occur.

**Public Review and Comment**

Open-house style public meetings were held, and verbal and written comments were solicited from the public during public scoping for the CCP for the Willapa Refuge. Appendix E of the CCP further details public involvement undertaken during development of the CCP. Additional public review and comment were solicited during the Draft CCP/EIS comment period.

**Determination**

_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

**Stipulations Necessary to Ensure Compatibility**

Cooperative land management agreements would contain the following special conditions to ensure compatibility:

- Special emphasis is applied to fencing wetlands and riparian zones where cattle tend to try to shift use; fencing and ditching are used to contain cattle and focus grazing on specific pastures during the dry season.
- Season of use is from mid-April through mid-October to avoid disturbance to Canada geese and to avoid grazing under wet soil conditions.
- Permittees are required to leave fields with 2 to 4 inches of grass and forbs growth at season's end.
- The cooperative farmer is required to perform habitat maintenance work to sustain the field conditions for the benefit of wildlife. Work may include mechanical weed control, fertilization, and pasture mowing.
- The agreement does not imply or establish a use precedent. Future use of the area will be based on the most satisfactory use of the land for wildlife benefits, cooperator performance, habitat management needs, and administrative needs.
- The cooperative farmer will exercise care to prevent fire and will assume responsibility for fire, which may result from his/her operations.
- Sub-leasing is prohibited. Animals must be the property of the cooperator.
- At the end of the permit period, cooperator is responsible for removing all his/her equipment and animals from refuge lands.
- The cooperator shall be responsible for repairing damage to refuge facilities or habitat beyond normal wear and tear resulting from his/her operation.
- The discharge or use of firearms or other weapons is prohibited, unless permitted as part of an authorized activity such as hunting,
- Stocking rates of livestock may be altered should pasture conditions warrant, dependent upon judgment of the Refuge Manager.
- The cooperator will notify the refuge manager at least three days in advance of the date cattle are to be turned in or removed from the Refuge. Any changes in the number of animals shall be immediately reported to the refuge manager. Livestock will be contained in assigned units and fences must be maintained by the cooperator.
- The cooperator is responsible for removing dead livestock carcasses from the Refuge within three days of discovery.
- The cooperator shall comply with the livestock regulations of the State of Washington relating to health and sanitation requirements.

**Justification**

The haying, silage, and grazing cooperative land management program contributes to achieving refuge purposes and goals as identified in the CCP and the National Wildlife Refuge System mission by providing valuable foraging areas for wintering and migrating Canada geese. It also contributes by economically providing weed control and other habitat maintenance functions that are not feasible for limited refuge staff to accomplish.

The short-grass pastures complement the marsh habitat on and around the Refuge in providing forage and resting habitat for migrating and wintering Canada geese. Refuge pastures also provide foraging habitat for ducks, raptors, and other resident wildlife. Grazing and haying are desirable means of maintaining this type of habitat because the climate is too wet for prescribed burning, and repeated mowing of the pastures is beyond the capability of the Refuge.

The use of moderate grazing to reduce the build-up of annual introduced grassland biomass is viewed as beneficial to Canada geese. By restricting the intensity and duration of grazing, and by adhering to the stipulations for this use, the environmental health of the Refuge is maintained.

By conducting haying, silage, and grazing as part of the pasture management program under the practices and stipulations described above, it is anticipated that wildlife species that could be adversely affected would find sufficient food resources and resting places, so their abundance and use would not be measurably lessened on the Refuge. Additionally, it is anticipated that monitoring, as needed, would prevent unacceptable or irreversible impacts to fish, wildlife, plants, and their habitats.

The combination of management practices and stipulations identified above would ensure that haying, silage, and grazing contribute to the enhancement, protection, conservation, and management of native wildlife populations and their habitats on the Refuge. As a result, these uses contribute to achieving refuge purpose(s); contribute to the mission of the Refuge System; and help maintain the biological integrity, diversity, and environmental health of the Refuge.

**References**

Baldassare, G.A. and E.G. Bolen. 2006. Waterfowl ecology and management. 2nd edition. Malabar, FL: Krieger Publishing Company.

Fleischner, T.L. 1994. Ecological costs of livestock grazing in western North America. Conservation Biology 8(3):629-644

McLandress, M.R. and D.R. Raveling. 1981. Changes in diet and body composition of Canada geese before spring migration. Auk 98:65-79.

Raveling, D.G. 1979. The annual energy cycle of the cackling Canada goose. Pages 81-93 in: R.I. Jarvis and J.C. Bartonek, eds. Management and biology of Pacific Flyway geese. Corvallis, OR: Oregon State University.

**Mandatory Re-evaluation Date (provide year for "allowed" uses only)**

_____ Mandatory 15-year Re-evaluation Date (for priority public uses)

__2020__ Mandatory 10-year Re-evaluation (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

_____ Environmental Assessment and Finding of No Significant Impact

___X___ Environmental Impact Statement and Record of Decision

**Signatures approving and concurring with Compatibility Determination for C.6 Haying, Silage Harvest, and Cattle Grazing (use is compatible with stipulations).**

**Refuge Determination**

Prepared by: _____ (Signature) 9/28/11 (Date)

Refuge Manager/
Project Leader
Approval: _____ (Signature) 9/28/11 (Date)

**Concurrence**

Refuge Supervisor: _____ (Signature) 9/28/11 (Date)

Regional Chief,
National Wildlife
Refuge System: _____ (Signature) 9-28-11 (Date)

# C.7 Compatibility Determination for Research, Scientific Collecting, and Surveys on Willapa National Wildlife Refuge

**Use:** Research, Scientific Collecting, and Surveys

- **Research:** Planned, organized, and systematic investigation of a scientific nature
- **Scientific collecting:** Gathering of refuge natural resources or cultural artifacts for scientific purposes
- **Surveys:** Scientific inventory or monitoring

**Location:** Pacific County, Washington

**Date Established:** 1936

**Establishing and Acquisition Authorities**

- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715-715s)
- Executive Order 7541, Willapa Harbor Migratory Bird Refuge, Washington, signed January 22, 1937
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a-754c)
- Land and Water Conservation Fund Act of 1965, as amended (16 U.S.C. 4601-4601.11)
- Endangered Species Act of 1973, as amended (16 U.S.C. 1532-1544, 87 Stat 884)
- Refuge Recreation Act of 1962, as amended (16 U.S.C. 460k-460k-4)

**Refuge Purpose(s)**

The purposes for the Willapa NWR have been identified in historic legal documentation establishing and adding refuge lands. The Refuge was originally established to preserve an important wintering and foraging habitat for migratory waterfowl in the Pacific Flyway with refuge purposes specified as follows:

> "... as a refuge and breeding ground for migratory birds and other wildlife ..." (Executive Order 7541, dated January 22, 1937)
>
> "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. 715d, Migratory Bird Conservation Act)
>
> "... suitable for—(1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." (16 U.S.C. 460k-1)
>
> "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." (16 U.S.C. 460k-2, Refuge Recreation Act [16 U.S.C. 460k-460k-4], as amended)
>
> "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." (16 U.S.C. 742f(a)(4))

> "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." (16 U.S.C. 742f(b)(1), Fish and Wildlife Act of 1956)

In accordance with 601 FW 1, all lands acquired since the original establishment of the Refuge retain this purpose.

Management priorities are further stated in subsequent land acquisition documents to preserve, protect, and restore newly acquired habitats and provide habitat for other migratory birds, plants, and wildlife with special emphasis for marbled murrelets, bald eagles, Aleutian Canada geese, shorebirds, marsh birds, and wading birds,. Documentation for additional lands also identified the following habitats, wildlife, public opportunities, and management priorities to support a diverse assemblage of native fish, wildlife, and plants which includes: eelgrass beds, gravel bars, old-growth/mature forests, riverine habitats, intertidal mudflats, sand dune habitat, fish species (coho, Chinook, chum salmon, steelhead, sea-run cutthroat trout), amphibian diversity, compatible wildlife-dependent recreation, educational/research opportunities, and cultural resource sites.

Management priorities are further derived from various legal and land acquisition documents:

> "… one of the most important concentration points for migratory waterfowl on the Washington Coast. It has a fine supply of natural aquatic foods, especially eel-grass, and thereby has been for years one of the few suitable wintering grounds available for Black Brant … it is essential for the preservation of the Pacific flyway that the Restoration program provide adequate sanctuary facilities for migratory birds in that state." (Migratory Bird Conservation Commission Memorandum, Memo 16, May 7, 1936)

> "… as a refuge and breeding ground for migratory birds and other wildlife …" (Executive Order 7541, dated January 22, 1937)

> "… in order to effectuate further the purposes of the Migratory Bird Conservation Act (45 Stat. 1222)" and states that "Provided, that any private lands within the area described shall become a part of the refuge upon the acquisition of title thereto or lease thereof by the United States." (Executive Order 7721, October 8, 1937)

> "… for use as an inviolate sanctuary. Or for any other management purpose, for migratory birds." (16 U.S.C. 715d, Migratory Bird Conservation Act)

> "… To preserve and protect unique ecosystems associated with Willapa Bay … To provide for maximum use and production by migratory birds other than wintering waterfowl, with special emphasis on bald eagles and marsh and wading birds." (Long Island Land Exchange; September 1983)

> "… protect habitat for old growth dependent species including the threatened marbled murrelet and threatened northern spotted owl … protect and restore upland forest and associated stream habitat in order to protect and enhance declining fish populations, including coastal cutthroat trout, and Chinook, coho, and chum salmon runs … protect and restore coastal wetlands to provide a diversity of habitats for migratory waterfowl, shorebirds, wading birds, and songbirds … protect the intertidal mudflats along Willapa Bay by consolidating spartina infested lands for better management of control and eradication efforts on existing Refuge lands and on adjacent tidelands.… provide large scale habitat

management through linking existing Refuge lands in a contiguous Refuge boundary, and provide wildlife-dependent public use opportunities compatible with Refuge purposes." (Willapa Addition Environmental Assessment/Land Protection Plan, and Conceptual Management Plan 1999)

**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.

**Description of Use(s)**

The refuge staff receives periodic requests from non-Service entities (e.g., universities, State or territorial agencies, other Federal agencies, nongovernmental organizations) to conduct research, scientific collecting, and surveys on refuge lands. These project requests can involve a wide range of natural and cultural resources as well as public-use management issues including basic absence/presence surveys, collection of new species for identification, habitat use and life-history requirements for specific species/species groups, practical methods for habitat restoration, extent and severity of environmental contaminants, techniques to control or eradicate pest species, effects of climate change on environmental conditions and associated habitat/wildlife response, identification and analyses of paleontological specimens, wilderness character, modeling of wildlife populations, bioprospecting, and assessing response of habitat/wildlife to disturbance from public uses. Projects may be species-specific or refuge-specific, or they may evaluate the relative contribution of the refuge lands to larger landscapes (e.g., ecoregion, region, flyway, national, international) issues and trends.

The Service's Research and Management Studies (4 RM 6) and Appropriate Refuge Uses (603 FW 1.10D(4)) policies indicate priority for scientific investigatory studies that contribute to the enhancement, protection, use, preservation, and management of native wildlife populations and their habitat as well as their natural diversity. Projects that contribute to refuge-specific needs for resource and/or wilderness management goals and objectives, where applicable, would be given a higher priority over other requests.

**Availability of Resources**

Refuge staff responsibilities for projects by non-Service entities would be primarily be limited to the following: review of proposals, prepare SUP(s) and other compliance documents (e.g., Section 7 of the Endangered Species Act of 1973, Section 106 of the National Historic Preservation Act), and monitor project implementation to ensure that impacts and conflicts remain within acceptable levels (compatibility) over time. Additional administrative, logistical, and operational support may also be provided depending on each specific request. Estimated costs for one-time (e.g., prepare SUP) and annually re-occurring tasks by refuge staff and other Service employees would be determined for each project. Sufficient funding in the general operating budget of the Refuge must be available to cover expenses for these projects. The terms and conditions for funding and staff support necessary to administer each project on the Refuge would be clearly stated in the SUP(s).

The Refuge has staffing and funding to administratively support and monitor research that is currently taking place on refuge lands. Any substantial increase in the number of projects may create

the need for additional resources to oversee the administration and monitoring of the investigators and their projects. Any additional costs may result in finding a project not compatible unless expenses are offset by the investigator(s), sponsoring agency, or organization.

**Anticipated Impacts of Described Use**

Use of the Refuge to conduct research, scientific collecting, and surveys would generally provide information that would benefit fish, wildlife, plants, and their habitats. Scientific findings gained through these projects provide important information regarding life-history needs of species and species groups as well as identify or refine management actions to achieve resource management objectives in refuge management plans (especially CCPs). Reducing uncertainty regarding wildlife and habitat responses to refuge management actions in order to achieve desired outcomes reflected in resource management objectives is essential for adaptive management in accordance with 522 DM 1.

If project methods impact or conflict with refuge-specific resources, priority wildlife-dependent public uses, other high-priority research, wilderness, and refuge habitat and wildlife management programs, then it must be clearly demonstrated that its scientific findings would contribute to resource management and that the project cannot be conducted off refuge lands for the project to be compatible. The investigator(s) must identify methods/strategies in advance required to minimize or eliminate the potential impact(s) and conflict(s). If unacceptable impacts cannot be avoided, then the project would not be compatible. Projects that represent public or private economic use of the natural resources of any national wildlife refuge (e.g., bioprospecting), in accordance with 16 U.S.C. 715s, must contribute to the achievement of the refuge purposes or the National Wildlife Refuge System mission to be compatible (50 C.F.R. 29.1).

Impacts would be project- and site-specific, where they would vary depending upon nature and scope of the fieldwork. Data collection techniques would generally have minimal animal mortality or disturbance, habitat destruction, no introduction of contaminants, and no introduction of non-indigenous species. In contrast, projects involving the collection of biotic samples (plants or animals) or requiring intensive ground-based data or sample collection would have short-term impacts. To reduce impacts, the minimum number of samples (e.g., water, soils, vegetative litter, plants, macroinvertebrates, vertebrates) would be collected for identification and/or experimentation and statistical analysis. Where possible, researchers would coordinate and share collections to reduce sampling needed for multiple projects. For example, if one investigator collects fish for a diet study and another research examines otoliths, then it may be possible to accomplish sampling for both projects with one collection effort.

Investigator(s) obtaining required collecting permits (State, territorial, and/or Federal) would also ensure minimal impacts to fish, wildlife, plants, and their habitats. If after incorporating the above strategies, projects would not be compatible if they would result in long-term or cumulative effects. A Section 7 consultation under the Endangered Species Act (16 U.S.C. 1531-1544, 87 Stat. 884, as amended Public Law 93-205) would be required for activities that may affect a federally listed species and/or critical habitat. Only projects which have no effect or would result in not likely to adversely affect determinations would be considered compatible.

Spread of invasive plants and/or pathogens is possible from ground disturbance and/or transportation of project equipment and personnel, but it would be minimized or eliminated by requiring proper cleaning of investigator equipment and clothing as well as quarantine methods, where necessary. If after all practical measures are taken and unacceptable spread of invasive species is anticipated to occur, then the project would be found not compatible without a restoration or mitigation plan.

There also could be localized and temporary effects from vegetation trampling, collecting of soil and plant samples, or trapping and handling of wildlife. Impacts may also occur from infrastructure necessary to support a projects (e.g., permanent transects or plot markers, exclosure devices, monitoring equipment, solar panels to power unattended monitoring equipment). Some level of disturbance is expected with these projects, especially if investigator(s) enter areas closed to the public and collect samples or handle wildlife. However, wildlife disturbance (including altered behavior) would usually be localized and temporary in nature. Where long-term or cumulative unacceptable effects cannot be avoidable, the project would not be found compatible. Project proposals would be reviewed by refuge staff and others, as needed, to assess the potential impacts (short, long-term, and cumulative) relative to benefits of the investigation to refuge management issues and understanding of natural systems.

At least six months before initiation of fieldwork (unless an exception is made by prior approval of the Refuge Manager), project investigator(s) must submit a detailed proposal using the format provided in Attachment 1. Project proposals would be reviewed by refuge staff and others, as needed, to assess the potential impacts (short, long-term, and cumulative) relative to benefits of the investigation to refuge management issues and understanding of natural systems. This assessment would form the primary basis for allowing or denying a specific project. Projects that result in unacceptable refuge impacts would not be found compatible. If allowed and found compatible after approval, all projects also would be assessed during implementation to ensure impacts and conflicts remain within acceptable levels.

If the proposal is approved, then the Refuge Manager would issue SUP(s) with required stipulations (terms and conditions) of the project to avoid and/or minimize potential impacts to refuge resources as well as conflicts with other public-use activities and refuge field management operations. After approval, projects also would be monitored during implementation to ensure impacts and conflicts remain within acceptable levels based upon documented stipulations.

The combination of stipulations identified above and conditions included in any SUP(s) would ensure that proposed projects contribute to the enhancement, protection, conservation, and management of native wildlife populations and their habitats on the Refuge. As a result, these projects would help fulfill refuge purpose(s); contribute to the mission of the NWRS; and maintain the biological integrity, diversity, and environmental health of the Refuge.

Future projects that are not covered by the CCP may require additional NEPA documentation.

**Public Review and Comment**

Open-house style public meetings were held, and verbal and written comments were solicited from the public during public scoping for the CCP for the Willapa NWR. Appendix E of the CCP further details public involvement undertaken during development of the CCP. Additional public review and comment were solicited during the Draft CCP comment period.

**Determination**

_____ The use is not compatible.

__X__ The use is compatible with the following stipulations.

**Stipulations Necessary to Ensure Compatibility**

Each project would require a SUP. Annual or other short-term SUPs are preferred; however, some permits would be for a longer period, if needed, to allow completion of the project. Every SUP would have a definite termination date in accordance with 5 RM 17.11. Renewals would be subject to Refuge Manager review and approval based timely submission of and content in progress reports, compliance with SUP stipulations, and required permits.

- Projects will adhere to scientifically defensible protocols for data collection, where available and applicable.
- Investigators must possess appropriate and comply with conditions of State, territorial, and/or Federal permits for their projects.
- If unacceptable impacts to natural resources or conflicts arise or are documented by the refuge staff, then the Refuge Manager can suspend, modify conditions of, or terminate an ongoing project already permitted by SUP(s) on a refuge.
- Progress reports are required at least annually for multiple-year projects. The minimum required elements for a progress report will be provided to investigator(s).
- Final reports will be due one year after completion of the project unless negotiated otherwise with the Refuge Manager.
- Continuation of existing projects will require approval by the Refuge Manager.
- The refuge staff will be given the opportunity to review draft manuscript(s) from the project before being submitted to a scientific journal(s) for consideration of publication.
- The refuge staff will be provided with copies (reprints) of all publications resulting from a refuge project.
- The refuge staff will be provided with copies of raw data (preferably electronic database format) at the conclusion of the project.
- Upon completion of the project or annually, all equipment and markers (unless required for long-term projects) must be removed and sites must restored to the Refuge Manager's satisfaction. Conditions for clean-up and removal of equipment and physical markers will be stipulated in the SUP(s).
- All samples collected on refuge lands are the property of the Service even while in the possession of the investigator(s). Any future work with previously collected samples not clearly identified in the project proposal will require submission of a subsequent proposal for review and approval. In addition, a new SUP will be required for additional project work. For samples or specimens to be stored at other facilities (e.g., museums), a memorandum of understanding will be necessary.
- Sampling equipment as well as investigator(s) clothing and vehicles (e.g., ATVs, boats) will be thoroughly cleaned (free of dirt and plant material) before being allowed for use refuge lands to prevent the introduction and/or spread of pests. Where necessary, quarantine methods provided by the Refuge Manager will be used.
- The NWRS, the specific refuge, and the names of refuge staff and other Service personnel that supported or contributed to the project will be appropriately cited and acknowledged in all written and oral presentations resulting from projects on refuge lands.
- At any time, refuge staff may accompany investigator(s) in the field.
- Investigator(s) and support staff will follow all refuge-specific regulations that specify access and travel on the Refuge.

**Justification**

Research, scientific collecting, and surveys on refuge lands are inherently valuable to the Service because they expand scientific information available for resource management decisions. In addition, only projects that directly or indirectly contribute to the enhancement, protection, use, preservation, and management of refuge wildlife populations and their habitats generally would be authorized on refuge lands. In many cases, if it were not for the refuge staff providing access to refuge lands and waters along with some support, the project would never occur and less scientific information would be available to the Service to aid in managing and conserving the refuge resources. By allowing the use to occur under the stipulations described above, it is anticipated that wildlife species that could be disturbed during the use would find sufficient food resources and resting places so their abundance and use would not be measurably lessened on the Refuge. Additionally, it is anticipated that monitoring, as needed, would prevent unacceptable or irreversible impacts to fish, wildlife, plants, and their habitats. As a result, these projects would not materially interfere with or detract from fulfilling refuge purpose(s) (including wilderness); contributing to the Mission of the NWRS; and maintaining the biological integrity, diversity, and environmental health of the Refuge.

**Mandatory Re-evaluation Date (provide year for "allowed" uses only)**

_____ Mandatory 15-year Re-evaluation Date (for priority public uses)

__2020_ Mandatory 10-year Re-evaluation (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

_____Environmental Assessment and Finding of No Significant Impact

___X__Environmental Impact Statement and Record of Decision

**Signatures approving and concurring with Compatibility Determination for C.7 Research, Scientific Collecting, and Surveys (use is compatible with stipulations).**

**Refuge Determination**

Prepared by: _____ (Signature) 9/28/11 (Date)

Refuge Manager/ Project Leader Approval: _____ (Signature) 9/28/11 (Date)

**Concurrence**

Refuge Supervisor: _____ (Signature) 3/28/14 (Date)

Regional Chief, National Wildlife Refuge System: _____ (Signature) 9-28-11 (Date)

# Attachment 1

## FORMAT FOR PROPOSALS TO CONDUCT RESEARCH OR LONG-TERM MONITORING ON NATIONAL WILDLIFE REFUGES

*A Special Use Permit (SUP) is required to conduct research and/or long-term monitoring on refuge lands. To receive a SUP, a detailed project proposal using the following format must be submitted to the Refuge Manager approximately six months prior to the start of the project.*

**Title:**

**Principal Investigator(s):**

*Provide the name(s) and affiliation(s) of all principal investigator(s) that will be responsible for implementation of the research and/or long-term monitoring described in the proposal. In addition, provide a brief description or attach vitae of expertise for principal investigator(s) germane to work described in the proposal.*

**Background and Justification:**

*In a narrative format, describe the following as applicable:*

- *The resource management issue (e.g., decline in Pisonia rainforest) and/or knowledge gap regarding ecological function that currently exists with any available background information.*
- *Benefit of project findings (e.g., management implications) to resources associated with refuge.*
- *Potential consequences if the conservation issue and/or knowledge gap regarding ecological function is not addressed.*

**Objectives:**

*Provide detailed objective(s) for the proposed project.*

**Methods and Materials:**

*Provide a detailed description of the methods and materials associated with field and laboratory work (if applicable) to be conducted for the project. Methods should include the following:*

- *study area(s)*
- *number of samples;*
- *sampling dates and locations*
- *sampling techniques*
- *data analyses including* ***statistical methods*** *and* ***significance levels***

*Previously published methods should be cited without explanation, whereas new or modified techniques should be described in detail. Include number of personnel as well as all facilities and*

*equipment (e.g., vehicles, boats, structures, markers) required to collect samples/data. Provide a clear description of the relationships among study objectives, field methods, and statistical analyses.*

**Permits:**

*Identify all State or territorial and Federal permits required if applicable.*

**Potential Impacts to Refuge Resources:**

*Describe potential impacts to threatened or endangered species as well as other refuge plants, wildlife, and fish species that could result from the implementation of project activities on the refuge. Consider the cumulative impacts associated with this project.*

**Animal Welfare Plan:**

*If appropriate, attach a copy of the Institutional Animal Care and Use review and/or animal welfare plans that are required by the principal investigator's affiliation.*

**Partnerships and Funding Sources:**

*List other participating institutions, agencies, organizations, or individuals as well as the nature and magnitude of their cooperative involvement (e.g., funding, equipment, personnel).*

**Project Schedule:**

*Provide estimated initiation and completion dates for field sampling, laboratory work, data analyses, and report/manuscript preparation. If the project is divided into phases to be accomplished separately provide separate initiation and completion dates for each phase.*

**Reports and Raw Data:**

*Establish a schedule for annual progress and final reports; include adequate time for peer review of the final report/manuscript. Draft reports/manuscripts should be submitted to the Refuge Manager for review prior to submission for consideration of publication. At the conclusion of a research study (manuscripts accepted for publication), an electronic copy of the data (e.g., GIS vegetation layers, animal species composition and numbers, genetics) should be provided to the Refuge Manager. For long-term monitoring projects, the Service also requires raw data for management and planning purposes for the refuge(s).*

**Publications:**

*Describe the ultimate disposition of study results as publications in scientific journals, presentation at professional symposiums, or final reports.*

**Disposition of Samples:**

*If the project entails the collection of biotic and/or abiotic (e.g., sediment) samples, then describe their storage. Although the samples may be in the possession of scientists for the purposes of conducting the project in accordance with the SUP, the Service retains ownership of all samples collected on refuge lands. If the samples will be used for subsequent research activities that are not described within the original proposal, a new proposal must be submitted to the Refuge Manager to obtain a SUP before initiation of the follow-up project. After conclusion of the research activities, consult with the Refuge Manager fieldworking the final disposition of the samples. If specimens will be curated at a museum, then prepare an MOU using the format provided by the Refuge Manager.*

# Appendix D. CCP Team Members

The following Service personnel served as core team members on the Willapa National Wildlife Refuge Comprehensive Conservation Plan planning team.

| Name | Position | Degree(s) | Years of Exp. |
|---|---|---|---|
| **U.S. Fish and Wildlife Service** | | | |
| Charlie Stenvall | Project Leader | BS, Wildlife Biology | 22 |
| Marie Fernandez | Wildlife Biologist | MS, Biology and Wildlife, and Range Mgt.<br>BS, Zoology, BS, Geology | 27 |
| David Gonzales | Refuge Manager | BS, Wildlife Science<br>BS, Fishery Science | 13 |
| William Ritchie | Wildlife Biologist | BS, Environmental Science | 22 |
| Mariana Bergerson | Visitor Services Manager | MS, Biology<br>BS, Biology and Environmental Studies | 13 |
| Terri Butler-Bates | Private Lands Biologist | BS, Biology | 22 |
| Khem So | Geography | MS, Resource Ecology and Mgt.<br>BS, Environmental Science, BA, English | 9 |
| Rebecca Young | Conservation Planner | BS, Natural Resource Management | 22 |
| Jackie Ferrier | Deputy Project Leader | MS, Wildlife Biology<br>BS, Environmental Science | 18 |
| Nancy Holman | Visitor Services Manager | BS, Biology/Marine Biology | 18 |

Early in the planning process, the core team presented the issues to an extended team of Tribal, State, and Federal professionals who served as a peer review for the issues, goals, objectives, and strategies for their respective agencies. We would like to thank the following individuals for their interest and assistance throughout this planning process:

Mr. Mike Shipman, Tribal Vice-Chair, Shoalwater Bay Indian Tribe
Mr. Gary Burns, Environmental Director, Shoalwater Bay Indian Tribe
Mr. Dave Hays, Wildlife Biologist, Washington Department of Fish and Wildlife
Ms. Lisa Lantz, Resource Stewardship Manager, Washington State Parks
Mr. Scott Pearson Senior Research Scientist, Washington Department of Fish and Wildlife
Ms. Ginger Phalen, Coastal Programs Coordinator, U.S. Fish and Wildlife Service
Mr. Jack Smith, Regional Wildlife Program Manager (Retired), Washington Department of Fish and Wildlife

Mr. Max Zahn, Area Wildlife Biologist, Washington Department of Fish and Wildlife
Dr. Sam Lohr, Ph.D., Fisheries Biologist, U.S. Fish and Wildlife Service

Special thanks for assistance and collaboration with the Forest Management Plan goes to Mr. Tom Kollasch, Ellsworth Creek Manager, with The Nature Conservancy.

# Appendix E. Summary of Public Involvement and Response to Comments

## Introduction

This appendix summarizes all the public involvement that occurred during the Comprehensive Conservation Plan (CCP) for Willapa National Wildlife Refuge (Refuge).

## E.1 Public Scoping

The Service began the process of developing a CCP for the Refuge in 2008. On April 9, 2008, the Notice of Intent to Prepare a Draft CCP/EIS was published in the Federal Register. Planning Update 1 was published, with a comment form, and was distributed in March 2008 to a mailing list of approximately 400 recipients. A press release advertising the public meetings was distributed to eight western Washington and Oregon newspapers, six state and federal congressional members, five regional television stations, and one local radio station, approximately one week before each meeting scheduled in the respective area of the coast. The press release was published in three local newspapers: *The Daily Astorian*, *Chinook Observer*, and *The Daily News*. The Service also maintained CCP information and Planning Updates throughout the process on the Refuge website.

During the months of March, April, and May, 2008, over 12 specific individual briefings were presented by the Refuge Manager and staff to county, state, and federal elected officials, including the Shoalwater Bay Tribe, Washington Department of Fish and Wildlife, community groups, and nonprofit organizations. CCP partners were also notified by email or phone of the upcoming public meetings and the availability of the Planning Update 1. Throughout the planning process, CCP updates to these groups were provided.

The Refuge held two public meetings for the CCP: one in South Bend, Washington, and one in Ilwaco, Washington. A total of 61 private citizens and representatives from various organizations attended the public meetings (20 at South Bend and 41 at Ilwaco) and provided verbal comments on the issues and opportunities presented. Comment forms were made available at each public meeting. All of the public comments heard during the meetings were recorded on easel paper and transcribed to a written document after the final meeting. During the scoping period from March 27, 2008, through May 16, 2008, a total of 36 responses were received from individuals or organizations in writing.

## E.2 Summary of the Oral and Written Comments Received During Public Scoping

### E.2.1 Tidal Marsh Restoration Comments

A comment was received asking that the recently acquired farmland/pasture remain at least in part grassland habitat for waterfowl, because large tracts of this land are diminishing in the Willapa Bay area and because a change in landscape would mean a downturn in hunting by placing waterfowl in areas not accessible to hunters. A comment was made on breaching a dike and eliminating an established community. In a follow-up remark, a commenter wondered whether the loss of grassland

habitat would result in a loss of Canada geese and what would happen if the numbers of Canada geese go down after salt marsh restoration. A remark from a public participant in favor of salt marsh restoration was noted, as were questions about the tidal elevation of potential restored areas and whether there could there be multiple uses of these restored areas. A commenter suggested examination of climate implications and sea level rise. A commenter also suggested that grazing cattle to maintain pastures, which are beneficial for geese and other species that avoid tall vegetation due to predators, is effective. Another commenter noted that anything the Refuge does to enhance tidal marsh habitats is good. Remarks were submitted with strong encouragement to restore diked areas to tidal salt marsh. A follow-up comment was concerned about the costs and personnel hours spent maintaining the dike and water control structures to the detriment of numerous species. Another comment suggested that the Service learn more about restoration from other projects that have succeeded or failed. A comment noted that waterfowl need fresh water and pastures for feeding, not saltwater marshes.

## E.2.2 Land Acquisition Comments

Concerns were expressed that when land is purchased, “no trespassing” signs go up; that there is less land for all outdoor activities; and that more trails and access should be allowed and planned. Another comment that was in favor of land acquisition expressed concern that the primary use could be perceived to be hunting. A commenter asked whether the Refuge has identified areas in the proximity that would be beneficial to acquire for habitat. An additional suggestion stated that Willapa Bay is an incredible place and the commenter would like to see as much done as possible to keep land acquisition a priority for the Refuge, particularly when the land acquired includes sensitive habitats in need of protection. The comment noted that over time, things can be done to enhance or restore existing lands in the Refuge but that the available land will continue to increase in price and become more developed, so the time is now to buy as much land as possible. Another comment suggested that lands around Bear River should be considered for acquisition as valuable areas for salmon and other anadromous fish. Top priorities for one commenter are expanding the Refuge’s territory and controlling invasive species. A remark stated that the Refuge should strive for continued acquisition of lands that would create a more efficient land pattern to manage. Another comment strongly supported expansion of the Refuge boundary and acquisition of lands in fee title and easements to protect habitat in Willapa Bay. Another comment expressed that the Refuge should seriously consider the land base it will need to effectively conserve its trust species within functional landscapes long into the future.

## E.2.3 Wildlife and Species Management Comments

Several comments were received regarding specific wildlife species and their management and protection. One attendee inquired about threatened and endangered species, especially Western snowy plover and marbled murrelet, specifically, regarding the strategies currently in place to protect these species. A comment was made that the respondent did not want another tern nesting site up at the Leadbetter Unit with the removal of all the grasses. A comment was made that terns consumed up to 14 million salmon smolts in the Columbia River last year. One commenter suggested elk exclusion from nesting areas should be considered. A remark was made that there is only one effective measure to prevent elk from continually affecting the resources of the snowy plover habitat restoration area: building an elk-proof fence around it. One commenter suggested the expansion of exotic beach grass removal and lethal removal of corvids and elk.

## E.2.4 Leadbetter Point Unit: Elk Management Comments

Comments were in favor of a hunt to decrease the number of elk at the Leadbetter Point Unit but not to remove them completely. Several comments suggested special hunting permits or tags for an elk hunt be established in conjunction with Washington State Department of Fish and Wildlife (e.g., provide five tags). One commenter suggested a specific number of tags be given to master hunters and youth hunters. A suggestion was made that an early hunt season would have too many conflicts with other users (birdwatchers, hikers, wildlife observers). Another comment was recorded regarding the sound of gunshots, specifically that when shots are heard at nearby residences, it is unnerving. An observation was made that elk seem to be flourishing in the Leadbetter Point Unit. A comment also noted that most visitors at the Leadbetter Point Unit are walking the beaches and trails and may be at odds with hunting in this unit. It was asked whether netting and relocating the elk at the Leadbetter Point Unit have been considered. There was also concern that the elk will move out of the Leadbetter Point Unit if hunt is activated and move onto adjacent lands, specifically cranberry fields.

**Service Response/Change**

After further evaluation of the hunting program during the planning process, it was determined that the proposed elk hunt at the Leadbetter Point Unit should be considered as part of the overall Refuge's big game hunting program. The details of the proposed expanded elk and deer hunt may be found in Chapter 5 and Appendices C and M.

## E.2.5 Forest Management Comments

A commenter was in favor of habitat restoration but was concerned about road removal and access into forest areas for hunting. Another comment suggested the Refuge not allow any major timber harvesting to occur on its lands. Comments were made that the welfare of endangered species such as marbled murrelet and spotted owl should be considered, and that surveys should be conducted periodically for insect infestations or other destructive organisms injurious to trees. Another comment indicated this is a major issue for the Refuge as we have much more forested land than any other Refuge, so we should consider adding a biologist position dedicated to forestry/silviculture as there is plenty of meaningful work to be conducted. A suggestion was made to continue partnerships with adjacent landowners to restore forest and streams.

## E.2.6 Wildlife-Dependent Recreation and Public Use Comments

Some comments were in favor of increasing opportunities for hunting and suggested that the Service increase these opportunities through Refuge expansion and/or in coordination with Washington Department of Fish and Wildlife. Additional comments were supportive of current hunting opportunities, and a recommendation was made to provide bulletin board announcements at the Lewis Unit for clear hunting regulations and access. One individual commented that he/she would like to be able to walk dogs on Refuge trails. One suggestion is to have a trail from the Leadbetter Point parking lot along the north side of Willapa Bay to Grassy Island. A comment was received about airboats in Willapa Bay disturbing wildlife in the bay and on Long Island, with a follow-up comment that the airboats detract from the hunt experience on Long Island. Some commenters asked what the USFWS is doing to get the word out about airboat disturbance of wildlife, and it was suggested that the Service increase signage to inform the public about the sensitivity of coastal

wildlife resources. Additional feedback indicated concern about too much focus on hunting and not enough on other public uses. A respondent indicated unease with primary acquisition and use of Refuge lands for hunters before other users. A suggestion was made to continue to expand environmental education to young people. Another comment suggested that the Willapa Art Trail and its extension, Cutthroat Climb Trail, be open more than the current Monday through Friday 7:30 am to 4 pm. An additional comment on hunting and other public uses on the Refuge suggested that there should be clearsigns when hunters may be on the Refuge. A commenter remarked that signs at the Leadbetter Yellow Trail are in need of attention and there are some additional signage needs at the Leadbetter Point Unit. It was noted that there seems to be some inconsistency, including unclear, confusing signage, regarding mushroom picking at Leadbetter Point, because it is prohibited on the Refuge but allowed in the State Park adjacent to the Refuge. Another remark was made concerning garbage on beaches and the commenter wondered about seasonal crews conducting beach cleanup when snowy plover nesting was not at risk. A respondent indicated that the Refuge should provide safe and accessible dock facilities.

## E.2.7 Goose Hunting Comments

Several comments were related to the goose hunt at Riekkola Unit and the maintenance of the pasture for the hunt. It was requested that there be more goose blinds at the Tarlatt/Shier Unit (two blinds). It was also requested that blinds be repositioned and new blinds put in. A user group/nearby hunt club offered to assist with this. A question was raised as to the dollar amount needed for maintaining the pasture for a goose hunt that does not attract many hunters or geese. Suggestions were made that the Refuge should work with the traditional hunters on blind placement and management of pastures. A written suggestion was made to (1) eradicate all non-grasses within 80 to100 yards of all blinds especially blinds 1 and 2, (2) mow all bulrushes regularly throughout the year or mow them prior to goose hunting season, (3) paint all pit blinds olive drab on the outside, (4) paint the inside of the entrance tube but leave directions legible, (5) change box blind 5 to three pit blinds, and (6) move the old box blind 5 to the west of blind 7. Another remark indicated that the goose hunt should remain as it is, with no expansion.

## E.2.8 Big Game Hunting Comments

Over half of the hunters in attendance at the Ilwaco meeting on March 26 used muzzleloaders. A comment stated that muzzleloader hunters should be allowed to hunt the Porter Point and Tarlatt/Shier Units of Willapa NWR and that the limited range would not impact the nearby residential area; the comment further stated that the Long Beach Unit is the only area where muzzleloaders can hunt elk, but that other users (archery and modern firearm hunters) are not restricted. Requests were made to open the Tarlatt/Shier Unit to muzzleloaders; historically this area was used by muzzleloader hunters until it was acquired by the Refuge. A request was made for more bear hunting, because there are too many black bears on Long Beach Peninsula. The continuation of archery hunting and camping on Long Island is extremely important to one respondent, who has enjoyed many trips to Long Island.

## E.2.9 Invasive Species (*Spartina* Control) Comments

A comment noted that there is a long list of non-native threats to the Refuge and the bay—*Spartina*, Scotch broom, gorse, tussock, knotweed, Himalayan blackberries, bullfrogs, green crabs, ghost shrimp, and more—all of which will need to be controlled and eliminated (if possible). Top priorities

for one commenter are expanding Refuge territory and controlling invasive species. A comment expressed that the Refuge staff needs to be commended for the huge undertaking of *Spartina* removal. A question was asked about whether the Refuge will have an active monitoring program.

### E.2.10 Research/Studies Comments

Comments in this category primarily emphasized the need for more collaborative biological research on the Refuge, noting that the USFWS needs better baseline data for management and determining potential methods for accomplishing this research. One attendee recommended that the USFWS partner with universities and other agencies to conduct research that currently is not being done due to limited staff time and funding. A number of meeting attendees had ideas about how the USFWS could work with community groups, federal and state agencies, and other entities to assist the USFWS in accomplishing its mission.

### E.2.11 Other Comments

Comments placed into this category covered many aspects of general Refuge management. Several comments about funding were received, including the need for more funds to manage refuges adequately and to implement ideas and projects resulting from the CCP process. One attendee requested that the Refuge consider camouflaging the outhouses on Long Island as they are visible all around the island and offensive to see from a distance. One commenter wants the Service to increase advertisement of National Wildlife Refuges along the Coast, thus improving the Refuge's identity. A question was asked about the significance of wilderness designation. A comment was made about having a check-in station at the boat launch to monitor Long Island hunting. A suggestion was made to provide facilitation for conservation easements around Willapa Bay. An additional comment was made in support of recovery efforts for threatened species but not at the expense of other species.

## E.3 Public Involvement for the Remainder of the CCP Process

As part of the overall CCP public outreach, the Service provided newsletters or Planning Updates at strategic points during the planning process to keep the public updated on the planning process. The mailing list grew from the initial scoping of 400 recipients to over 600 recipients. Planning Updates were also available on the Refuge website. The four Planning Updates to date included:

Planning Update 1 (March 2008): Announced the start of public scoping for the CCP.

Planning Update 2 (August 2008): Provided information on public comments received during public scoping.

Planning Update 3 (July 2009): Provided the Preliminary Management Alternatives.

Planning Update 4 (January 2011): Announced the availability of the Draft CCP/EIS.

During the release of Planning Update 3, identifying the preliminary management alternatives, the Refuge Manager and staff provided briefings to a number of agencies, organizations, and groups throughout the local community.

The Draft CCP/EIS was released for public comment and review on January 21, 2011, and announced in the Federal Register. Planning Update 4 was subsequently mailed to over 600

recipients. Due to increased public interest, the 45-day comment period was extended to 60 days and comments on the Draft CCP/EIS were accepted from January 21, 2011, through March 21, 2011. A public hearing was held in response to public concerns on March 13, 2011; the meeting generated 56 comment letters regarding the draft plan, 31 of these from new commenters.

Between public scoping and the comment period for the Draft CCP/EIS, Refuge staff and staff provided over 20 individual briefings regarding the Draft CCP/EIS to: Shoalwater Bay Tribe, local, county, state, and federal elected officials or their staff, state agencies, organizations and nonprofit groups, and interested individuals.

Comments received during the comment period and the Service's responses are included in the following sections.

The Land Protection Plan will be signed by the Director of the U.S. Fish and Wildlife Service. A Record of Decision on the CCP will be signed by the Regional Director for the Pacific Region approximately 30 days after the availability of the Final CCP is announced in the Federal Register.

## E.4 Response to Comments

We received comments from 213 entities regarding the Draft Comprehensive Conservation Plan/Environmental Impact Statement (CCP/EIS) for the Willapa National Wildlife Refuge during the 60-day comment period (Table E-1). This number of comments suggests a moderate level of interest in Willapa NWR. All written comments were reviewed and organized so that an objective analysis, summary, and presentation of the comments could be made.

Each original piece of correspondence was assigned an identification number and identified with the last name and first initial of the individual commenter who signed the letter. Note that for simplicity's sake, the word "letter" is generally used throughout this appendix to refer to any comment or reference document received, whether by letter, fax, email, or comment form. Some individual commenters mailed a number of letters and/or reference materials to the regional headquarters as well as the Refuge headquarters, planning office, and various staff email addresses.

Multiple correspondences from a commenter are counted as one comment letter. Telephone calls from the public were also received. All callers were encouraged to put their comments in writing so they could be included in the public record.

A database was created to log correspondence from each of the commenters, and letters were placed in one file. To help analyze the nature and extent of comments received, a number of themes and subthemes were identified within the letters. Comments were coded manually and electronically with the identified themes.

Due to the volume and similarity of written comments received, most comments have been summarized, but in some cases we have included specific language from a letter that best summarized similarly written comments. The comments and responses listed in this section are categorized under specific Refuge goals relating to the CCP. Comments that fell outside the specific goals of the CCP were also considered and were responded to as appropriate.

**Table E-1. Source of Comments.**

| Affiliation/Entities | Number of Commenters January 21, 2011 through March 21, 2011 |
|---|---|
| Tribal Governments | **1** |
| Federal Agencies | **1** |
| State Agencies | **3** |
| Local/Other Agencies | **2** |
| Elected Officials (Federal) | **1** |
| Organizations | **16** |
| General Public | **189** |
| **Total** | **213** |

## E.5 Changes Made to the Final CCP

We received many comments regarding the dike removal and restoration of 749 acres of historical estuarine habitats (open water, intertidal flats, and salt marsh). The management direction has been modified to restore only 621 acres and the Service will only restore a portion of the short-grass fields at the Riekkola Unit to estuarine habitat.

Many comments emphasized the importance of the short-grass field (pasture) habitat at the Riekkola Unit for the dusky Canada goose and elk and pointed out how habitat changes resulting from the proposed tidal restoration would be detrimental to those species and cause depredation to private property owners. The management direction has been modified to include 93 acres of short-grass fields on the Riekkola Unit that will be managed for Canada geese and Roosevelt elk.

We also received several comments regarding the impact of estuarine restoration on private property. The management direction has been modified based upon these concerns. This modification eliminates the need for raising a county road (67th Place), a designated tsunami evacuation route for Pacific County, and eliminates the impact on private landowners' freshwater wetlands (see Map 6 in the Draft CCP/EIS).

A number of comments expressed concern regarding changes to waterfowl hunting opportunities. The management direction has been modified to include three blinds for goose hunting (including one barrier-free blind) and the addition of two blinds for waterfowl hunting (including one barrier-free blind) on the Riekkola Unit. Walk-in access to these blinds would occur according to state hunting regulations.

Suggestions and issues were raised about Refuge access, the car-top boat launch, trails, and parking. The management direction has been modified to provide additional wildlife-dependent recreation opportunities, and the parking area, car-top boat launch, and new trail to Porter Point will be open year-round to all Refuge visitors. The blinds will be open only to hunters during the hunting season; however, during the non-hunting season, these blinds may be used by any Refuge visitor.

Table E-2 shows the major changes between the draft and the final CCP. For additional information, see Chapter 2 and Maps 5-10 in the Draft CCP/EIS.

**Table E-2. Summary of Changes to Management Direction between the Draft and Final CCP.**

| Theme | Alternative 2 in Draft CCP | Management Direction in Final CCP |
|---|---|---|
| **Forest Habitat** | | |
| **Late-successional Sitka spruce zone forest*** | Protect and maintain 557 acres of late-successional Sitka spruce forest, and accelerate development of late-successional conditions in 6,178 acres of second-growth Sitka spruce forest, where necessary. | Same as draft plan except increase late-successional forest by 2 acres to 6,180 acres. |
| **Estuarine Habitats** | | |
| **Open water** | Protect and maintain 878 acres of open water and channel habitat annually, and increase open water on Lewis, Porter Point, and Riekkola Units to the County Road (0.2 acre). | No change from draft plan. |
| **Intertidal flats** | Protect and maintain 4,178 acres of intertidal flats annually and increase the flats by 11 acres. | Same as draft except increase the intertidal flats by only 9 acres. |
| **Salt marsh** | Annually protect and maintain 1,636 acres of salt marsh and increase salt marsh by 749 acres. | Same as draft except increase salt marsh habitat by only 611 acres. |
| **Freshwater Aquatic Habitats** | | |
| **Riverine** | Protect, maintain, and conduct restoration in 27 miles of habitat. | No change from draft plan. |
| **Wetlands, seasonally managed** | Protect and maintain 17 acres of seasonal, managed freshwater wetland annually on the Tarlatt Unit. | No change from draft plan. |
| **Wetlands, naturally occurring** | Protect and maintain 545 acres of permanent and semi-permanent naturally occurring freshwater wetlands annually. | No change from draft plan. |
| **Coastal Habitat** | | |
| **Coastal dune** | Maintain and protect 1,581 acres of coastal dune at Leadbetter Point Unit (not including wetlands) and restore 220 acres. | No change from draft plan. |
| **Upland Field Habitats** | | |
| **Short-grass fields** | Maintain 0 acres of short-grass fields. Restore pasture on the Riekkola Unit to salt marsh habitat. | Maintain 93 acres of short-grass fields on the Riekkola Unit for Canada geese and Roosevelt elk. |
| **Grassland** | Establish 33 acres of Oregon silverspot butterfly habitat on Tarlatt and Leadbetter Point Units. | No change from draft plan. |
| **Federally and State-Listed Species** | | |
| **Western snowy plover** | Protect Western snowy plover and its habitat from human disturbance, nest predation, invasive species, and avian and mammalian predators, as necessary. | No change from draft plan. |
| **Oregon silverspot butterfly** | Reintroduce Oregon silverspot butterfly to suitable host plant habitat (33 acres). | No change from draft plan. |
| **Recreation** | | |
| **Wildlife observation and photography** | Maintain opportunities for self-guided wildlife observation and photography on the Leadbetter Point, Long Island, and Mainland Units. Expand opportunities at Tarlatt Unit, by adding a new trail and South Bay observation deck concurrent with tidal restoration. | Provide more opportunities. The parking area, car-top boat launch at Dohman Creek, and new trail to Porter Point would be open year-round to all visitors. The Riekkola Unit blinds would be open to all visitors during non-hunting season. |
| **Interpretive trails** | Maintain existing trails and add 1.1-mile interpretive trail and South Bay observation deck concurrent with tidal restoration. | Add 0.6 mile trail from Riekkola Unit parking area to Porter Point concurrent with tidal restoration. |

| Theme | Alternative 2 in Draft CCP | Management Direction in Final CCP |
|---|---|---|
| **Waterfowl hunting** | Expand waterfowl hunting on South Bay Units (6,058 acres), and remove goose hunting blinds on Riekkola and Tarlatt Units concurrent with tidal restoration. | Expand waterfowl hunting on South Bay Units (5,570 acres) and regulated goose hunting on Riekkola Unit (100 acres) to include three goose hunting blinds (including a barrier-free blind) and two waterfowl hunting blinds (including a barrier-free blind) concurrent with tidal restoration. |
| **Big game hunting (archery only on Long Island)** | Maintain opportunities on 6,980 acres of Long Island and East Hills Units (excluding Headquarters and Quarters area); expand elk and deer hunting in South Bay Units and permit-only elk hunting in Leadbetter Point Unit (10,716 acres). | No change from draft plan. |
| **Fishing** | Maintain Refuge portion of Willapa Bay and channel portion of Bear River for fishing. | No change from draft plan. |
| **Environmental education and interpretation** | Provide on- and off-site environmental education and increase interpretation activities with new visitor facilities and a staff position. | No change from draft plan. |
| **Camping** | Maintain 5 campgrounds with 20 campsites on Long Island. | No change from draft plan. |
| **Headquarters/ visitor facility** | Construct new office/maintenance and visitor facility at Tarlatt Unit. | No change from draft plan. |
| **Cultural Resources** | | |
| **Cultural resource protection** | Protect cultural resource sites through best management practices. | No change from draft plan. |
| **Refuge Boundary Modifications** | | |
| **Divestments** | Divest the 808-acre Shoalwater Unit, which has eroded to subtidal lands, and 132-acre Wheaton Unit, a Farm Services Agency donation that detracts from Refuge conservation purposes. | No change from draft plan. |
| **Nemah/Naselle** | Proposed expansion 1,909 acres. | No change from draft plan. |
| **East Hills** | Proposed expansion 4,339 acres. | No change from draft plan. |
| **South Bay** | Proposed expansion 561 acres. | No change from draft plan. |

*Please note: Acreages used in development of the CCP are derived from geographic information systems (GIS) and include areas of accretion on the Leadbetter Point Unit. Acreage variations occur between the draft and final plans.

# E.6 Summary of Comments Received

This section provides a summary of the individual comments received on the Draft CCP/EIS followed by the Service's responses to those comments. The comments are organized into 12 sections based upon the goals of the CCP.

## E.6.1 Goal 1: Comments and Responses

*Goal 1. Protect, maintain, and restore ecologically functional late-successional forest habitats (mature and old-growth forest) characteristic of the low-elevation temperate forests in the southwest Washington coastal region for the benefit of endangered and threatened species, migratory and resident birds, and a diverse assemblage of other native species.*

***Comments:***

- "[We] support the Refuge's active approach to restoring second growth forests toward complex late successional conditions across large portions of the forestland within Refuge ownership and on any additional forestland it may acquire as well as on adjacent conservation ownerships through the Private Lands Program."

- "In favor of continued management of timber to achieve an old growth type mix of species, with appropriate spacing."

- "Active restoration of forest habitat will take many decades, but research suggests that it can accelerate the development of habitat complexity. During that time, active restoration (in contrast to passive forest development) has the added benefit of generating jobs within the local logging industry on an ongoing basis."

***Service Response*:** Comments noted, no response necessary.

***Comments:***

- "I believe there is a long and strong track record that demonstrates the capacity of the Refuge to conserve and manage late seral stage forests. Managing younger, intensively managed forest stands to restore forest ecosystem functions requires a substantially different set of capabilities. What I have observed is that the Refuge does not have the technical capabilities, infrastructure, nor mission to complete this type of work and with its current ownership of such timberlands it must rely heavily on the resources of The Nature Conservancy to manage them."

- "It is still far too soon to tell how effective this strategy has been with the timberlands currently under its ownership, but even further, I assert that it is more prudent for a timberland owner to have a well-developed management capability of its own developed before acquiring lands that it is responsible for managing."

- "While I fully support the goal of conserving forest ecosystems, I believe that in the case of intensively managed and currently working forests in Willapa, a more effective approach to outright conservation is to help the private sector change how they manage these lands. The reason I believe this is three fold. First, reducing the amount of forestlands producing timber puts increased harvest pressure on the remaining timberlands, further exacerbating the loss of functioning forest ecosystem. Second, at some point this loss of productive timberlands will result in a loss of the economic framework required to operate the infrastructure needed (i.e., mills and loggers) to maintain a functional timber economy. If this occurs, pressure to convert timberlands to other less ecologically compatible uses could be great. At the very least, the type of management that needs to be carried out on such lands to promote the development of ecologically functioning forests and protect against environmental degradation from forest roads will likely be curtailed. Lastly, there is simply not enough money to conserve all, or even a significant amount of, the forestland habitat that needs to be conserved in order to protect forest ecosystem functions in the Willapa Ecosystem. While it may be possible to purchase and protect the most intact and individually important "islands" of forest habitat, this does not provide for an intact forest ecosystem."

***Service Response:*** In 2003, the USFWS and The Nature Conservancy (TNC) signed a Memorandum of Understanding for the purpose of "collaborating to accomplish forest management goals and objectives" on the properties managed by both parties in Pacific County, Washington. This action provided the framework for a partnership to restore young-managed forestlands at a landscape scale. A draft management plan was completed to provide specific goals and management guidance over the next 20 years of this restoration effort (Appendix K).

TNC staff that is dedicated to restoration efforts across both properties includes a Program Director, Project Ecologist, Forester, and Forest Technician. This group forms the expert core that guides efforts across both ownerships, including planning and directing thinning efforts on young-managed forests with the goal of setting this degraded habitat on a trajectory toward a late-successional forest habitat. Thinning is an important first step in speeding the development of a suitable marbled murrelet nesting habitat, so this action is indeed within the mission of the USFWS and the Refuge in addressing the needs of this federally threatened species as well as other wildlife dependent on late-successional forest habitats. Due to the collaboration with this expert group, the Refuge is able to tap the technical capabilities needed to carry out the program. Assistance with other aspects of forest restoration, especially road decommissioning, is provided by Refuge heavy equipment operators using Refuge heavy equipment. Grants and funding to carry out the program is pursued by both entities.

Because of the collaborative nature of this program at the landscape level, the Refuge and TNC feel that this strategy, within the context of adaptive management, has been and will continue to be effective over time.

Loss of high-quality nesting habitat and increased forest fragmentation are the main threats in the reduction of marbled murrelet populations and continue to threaten their recovery (USFWS 1997). Purchasing higher quality "islands" of habitat that still may be available within the approved acquisition area, in combination with concentrating forest restoration efforts adjacent to these areas, is an important strategy to improve microhabitat quality and reduce predation pressures for marbled murrelets. An important goal of the Refuge's Land Acquisition Program is to acquire these lands and adjacent areas from willing sellers to ensure adequate habitat remains in place and is thus protected from development for all species of forest-dependent wildlife. This allows landscape-level restoration actions to take place before it is too late.

Additionally, the Refuge has employed a private lands biologist who will work with willing members of the private sector, including forest managers, in encouraging and developing forest management options that will emphasize, where possible, conservation techniques that promote a healthy, high-functioning forest ecosystem. However, the goals of the Refuge (resource values) and those of commercial timberland (economic values) differ. Therefore working with the private sector will be most productive when both resource and economic values are sought. For more information, see Chapter 2, Goal 1.

## E.6.2 Goal 2: Comments and Responses

> *Goal 2. Protect, maintain, and restore estuarine habitats historically characteristic of the southwest Washington coastal region for the benefit of salmonids, Pacific brant, other waterfowl, shorebirds, seabirds, and a diverse assemblage of other native species.*

## RESTORATION OF ESTUARINE HABITATS

***Comments:***

We received many comments in support of tidal restoration, some with specific rationale. A representative sample of the comments received follows:

- "We especially support Alternative 2's additions to estuarine habitat because we agree with the DEIS's conclusion that such additions, combined with other ongoing programs to restore/improve estuarine habitat in the coastal region, would represent significant positive cumulative effects for fish and wildlife. In particular, we agree that Alternative 2's estuarine habitat additions would result in significant positive effects because they would: offset historical losses of estuarine habitat in Willapa Bay (estimated as a 64% loss of estuarine wetlands; create additional opportunities for eelgrass to colonize restored intertidal mudflats; benefit juvenile salmon and waterbirds such as the Pacific brant; likely lead to increased duck and the same or increased goose usage; increase habitat for shellfish, and, benthic and other invertebrates; and, reduce or eliminate highly invasive reed canarygrass and tussock infestations."

- "The proposed plan to remove the Bear River/South Bay dikes would provide substantial ecological benefits for the Willapa Ecosystem. This will significantly improve primary productivity, aquatic rearing habitat for many marine organisms, particularly salmonids, and restore a self-sustaining and fully functioning estuarine wetland system. The importance of these estuarine wetlands for all aquatic life in Willapa Bay cannot be overstated."

- "This alternative provides the highest level of protection and restoration of important rare and declining salt marsh, mudflat, estuarine and late seral stage forest habitats. Willapa Bay and much of the Washington coastline have lost untold acres of saltmarsh habitat through diking and grazing. This alternative would remove the man-made dikes and restore the natural hydrology of this important system."

- "For the last two years, the Bear River Estuary Restoration Project -first as a conceptual, design-only project and then as the initial phase of construction -has received the highest recognition from the SRFB Technical Review Panel as one of the "projects that, to the greatest extent, have the potential to protect or restore natural watershed processes for a significant amount of high priority habitat in the most cost-effective manner," otherwise known as a "noteworthy" or "wow" project. In the 2010 round, the Bear River Estuary Restoration Project was considered important enough in the coast region that undesignated funds from the other Lead Entities were redirected to Pacific County to help support this exceptional project."

- "Restoration of 749 acres of estuarine habitats (open water, intertidal flats, and salt marsh) proposed in Alternative 2 are strongly supported. Floodplain and intertidal restoration projects through the removal of levees and water modification structures are increasingly seen as a key habitat for rearing and refuge for migrating juvenile salmonids."

- "Also, the natural estuarine wetlands provide much better habitat for waterfowl, allowing them to thrive. People will also benefit, whether they enjoy wildlife watching or hunting."

- "The scale of the ideas and goals stated for restoration in Alternative 2 are appropriate for Willapa NWR to re-establish its salt-water wetlands and ecosystems, to protect and sustain its wildlife, and are consistent with the Refuge purposes and the Refuge Improvement Act of 1997."

- "We likewise support improving of salmon breeding habitat by the restoration of intertidal salt marsh due to the proposed, carefully researched and controlled breaching of existing dikes."

- "Restoring natural processes to the maximum amount of currently diked habitat at the Refuge will increase the Bay's and Ecosystem's resilience to potential sea level rise by allowing the natural processes to transport sediment into subsided areas, allowing full nutrient exchange between various marine and terrestrial systems, and provide improved food web connectivity between bay/salt marsh/freshwater wetland/upland interfaces."

- "Habitat improvements proposed under Alternative 2 provide the best possible long-term benefits to a greater diversity of species. Dike removal, restoration of wetlands, intertidal zones, and salt marsh is imperative to maintaining clean water in Willapa Bay and providing resting and feeding habitat to the millions of shorebirds that migrate through the region annually."

- "The potential gains to salmonid populations, particularly chum, which are critically endangered, from the preferred alternative cannot be understated. The current exclusion of these populations from near shore areas has led to dramatic declines in a culturally and economically important fishery. With the restoration of these near shore and estuarine areas, habitat for these fish is greatly expanded, making recovery of these populations possible. Without restoration of these areas, there is serious risk of losing these populations entirely from future development and other human impacts. I encourage you move forward with the preferred alternative for the betterment of all in the region."

- "I believe these studies clearly show shorebirds and waterfowl given a choice prefer salt marshes habitat. After observing the Lewis, Porter, and Riekkola units for the past 18 years, after the *spartina* was removed in the mid 2000's, these studies are consistent with my observations of a definite decline in then use of waterfowl in the fresh water/pasture lands of these three units, and an increase in usage in the salt-water marsh."

***Service Response*:** Comments noted, no response necessary.

***Comment:***

- "If alternative two is established, there should be potholes scattered throughout the project area. Shallow potholes approximately 50′ × 50′ will benefit all wildlife and will expand all user groups' access and utilization. In order to mitigate federal liability due to past logging practices that resulted in deep sediments deposits throughout Willapa Bay constructed potholes will offer a safe alternative for conservationists and hunters

recreating in the saltwater estuary. Potholes would also provide a sheltered point of access for disabled stakeholders."

***Service Response:*** Please see the changes to the management direction (Chapter 2, Goal 8), which address access and improvements for waterfowl hunters hunting the bay. In addition, there is a projected deficit of material as the dikes are removed to completely fill the borrow ditches that were created when the dikes were constructed. Due to this fact, the improvements that are part of the plan, and the natural subsidence that has occurred, there will in all likelihood be small, tidally influenced open water areas throughout the restoration area.

***Comment:***

- "Dike removal- Porter Point Unit: I support dike removal; however, I propose that overall ecosystem service might be improved if small sections of the dike would be left intact in order to provide diversity in elevation. These could be 100' sections of islands which would provide structural habitat for various species. It would also mean less fill to remove. I am not sure there is any biological data to support this suggestion, but I would encourage your biologists to review the scientific literature in this regard."

***Service Response:*** Small island features have been shown to be beneficial habitat components for waterfowl and waterbirds (Erwin et al. 1995; Erwin 1996); however, they were not natural features historically found in south Willapa Bay. The intertidal and salt flats of the bay provide similar feeding, roosting, and nesting habitat afforded by small islands. Tidal restoration would involve complete removal of dikes instead of partial breaching in part to minimize the effects of erosion due to water velocity and bed shear. Fixed breaches would be extremely difficult to protect from widening and erosion, and would require costly periodic maintenance. Remnant dikes could also interfere with natural tidal circulation patterns by confining flood flows and increasing their erosive energy (Hood 2004). Also, due to the linear nature of dikes, any remaining sections would result in an unnatural configuration of islands that may not support the establishment of native vegetation because of differences in soil type and hydrology, and elevation. Previous studies have suggested that surrounding vegetated land may enhance wetland wildlife habitat value (Golet and Larson 1974; Burke and Whitfield 1995). McKinney et al. (2006) found waterfowl to be more abundant in vegetated estuarine habitats. These artificial islets could also result in creation of a reproductive sink by focusing avian and mammalian predation pressure in areas supporting unusually high waterbird nesting or roosting densities.

***Comments:***

- "More emphasis that you have good solid science backing you up, rather than simple anecdotal "evidence" as opposed to the 7% figure used by several regarding the Nisqually Refuge restoration as stated by waterfowl hunters."

- "We also believe that good science supports breaching of dikes, and have trust in the Refuge personnel to use the best science for management of habitat."

***Service Response:*** In undertaking this estuary restoration, the Service conducted a rigorous environmental analysis and prepared an environmental impact statement. An extensive literature review of fish and wildlife research and monitoring, and of estuarine restoration techniques and efficacy monitoring, has been an integral component in this process. The best available science will

be incorporated into the design and implementation of this restoration project, using an adaptive management approach to make adjustments as needed and as new information becomes available.

***Comment Summary:***

- There were several comments that discussed the lack of vegetation and appearance of the recent tidally restored project outside of South Bend.

***Service Response Addressing Vegetation Issues:*** Under Alternative 2 of the CCP for the Willapa NWR, intensively managed pastures and impoundments would be restored as closely as possible to historical estuarine conditions, creating open water, intertidal flats, and salt marsh habitats. Restoration would be accomplished by removing the artificial dikes and tide gates and reconnecting estuarine channels. This action will dramatically change vegetative communities in the project area from pasture and freshwater marsh plant associations to estuarine vegetative communities. Restored marsh would result from the increased tidal prism, which is the difference in water level between high and low tide. Restoring natural processes will also increase resilience to future stressors on the Willapa Bay estuary, such as sea level rise, and will facilitate sediment transport and deposition into subsided areas currently behind the dikes, which will allow estuarine vegetation to become established in these low-lying areas.

The Lewis, Porter Point, and Riekkola Units, located on the southwestern shore of Willapa Bay, currently contain pasture and diked freshwater marshes. The Riekkola pastures contain a variety of introduced forage plants including orchardgrass, ryegrass, timothy, red clover, and white clover, as well as non-native invasive species including tussock, Himalayan blackberry, and reed canarygrass and weedy species such as sheep sorel, dandelion, creeping buttercup, sow thistle, bull thistle, and Canada thistle. Since the 1980s, the Lewis and Porter Point Units were completely converted to freshwater marsh impoundments from poorly drained pastures. Native emergent and submerged aquatic plants are present, as are non-native invasive species. Native marsh plants include bulrush, cattail, sedges, spikerush, bur-reed, beggarticks, juncus, smartweed, mannagrass, water pennywort, Pacific silverweed, pondweed, and duckweed. Non-native invasive plant species include reed canarygrass, Eurasian water-milfoil, tussock, and bog loosestrife. Non-native wildlife species that are associated with the freshwater impoundments include bullfrogs and nutria. In addition to vegetation management via water manipulation, chemical control and mowing and/or discing are utilized to control reed canarygrass and tussock. Water level manipulation is used to encourage seed set and proliferation of smartweed, beggarticks, and bur-reed as waterfowl foods.

Reed canarygrass is a state-listed noxious weed. This species outcompetes other plant species and forms monocultures. The following are excerpts from the Washington State noxious weed list web site: “Reed canarygrass forms dense, highly productive single species stands that pose a major threat to many wetland ecosystems. The species grows so vigorously that it is able to inhibit and eliminate competing species (Apfelbaum and Sams 1987). In addition, areas that have existed as reed canarygrass monocultures for extended periods may have seed banks that are devoid of native species (Apfelbaum and Sams 1987). Unlike native wetland vegetation, dense stands of reed canarygrass have little value for wildlife. Few species eat the grass, and the stems grow too densely to provide adequate cover for small mammals and waterfowl (Maia 1994).

Although reed canarygrass is planted as a forage crop in some areas, the Washington State Noxious Weed Control Board feels the species poses a significant threat to the state’s wetlands. Reed canarygrass is extremely aggressive and often forms persistent monocultures in wetlands and riparian

areas. Infestations threaten the diversity of these areas, since the plant chokes out native plants and grows too densely to provide adequate cover for small mammals and waterfowl. The grass can also lead to increased siltation along drainage ditches and streams. Once established, reed canarygrass is difficult to control."

Reed canarygrass is very difficult to eradicate as it reproduces both by seed and by rhizomes that are stimulated when the plant is uprooted. Lewis impoundment aquatic surveys in 2002 and 2004 documented a 4 percent frequency of reed canarygrass in the southern portion and a 44 percent frequency in the northern portion in 2002, and a 40 percent frequency in the southern portion and 59 percent frequency in the northern portion in 2004. A terrestrial survey in the Lewis impoundment yielded a 73 percent frequency in the southern portion and a 70 percent frequency in the northern portion in 2003. The Porter Point impoundment contains a much smaller percentage of reed canarygrass. With dike removal and subsequent tidal flow, freshwater plant associations will revert over time to primarily low salt marsh and high salt marsh.

According to Olympic Natural Resources Center (ONRC) calculations, Willapa Bay originally contained approximately 14,620 acres of saltwater wetlands. Now there are 5,277 acres. This represents a 64 percent loss of estuarine wetlands (Coastal Resources Alliance 2007).

In contrast, the 120 acres of Refuge pasture habitat that would be converted to estuarine habitat by the restoration project represents 1 percent of the approximately 11,500 acres of pasture found in the Willapa Bay watershed.

Hood (2004) found that diked tidelands not only affect the area landward of the dikes but also the area seaward. His study of the Skagit River delta marshes indicated that dikes in the area are directly and indirectly responsible for habitat loss for threatened Chinook salmon and other aquatic organisms because the dikes caused seaward and landward channel habitat loss.

Salt marsh occurs in the estuary where the ground is high enough (not flooded too deeply for too long) to support emergent herbaceous plants, but too low and wet to support shrubs or trees. Salt marshes are generally found from elevations of about mean lower low water to mean higher high water.

Salt marsh grasses, algae, and phytoplankton are major producers in estuaries. Halophytes (plants that are adapted to salty conditions), including pickleweed (*Salicornia*), seashore salt grass, jaumea, alkali grass, sea arrow grass, sand-spurry, seaside plantain, and salt marsh wort, are found in the low to high marsh zones. Low marshes are those nearest the low-tide line, which may be covered with each high tide. High marshes are generally only covered by the tide on very few occasions. Tufted hairgrass (*Deschampsia*), Pacific silverweed, saltmarsh bulrush, and Lyngby's sedge are found in high salt marshes.

With tidal wetlands, it is difficult to reliably predict rates and patterns in the ecological structure and function of restored landscapes (Zedler 2010). The trajectory and timing toward full restoration of the saltwater habitat for the Willapa NWR project will similarly be difficult to predict.

Some insight into these processes is revealed through an examination of previous restoration efforts:

Thom et al. (2002) studied changes in plant assemblages in a salt marsh after tidal reconnection. This occurred in the Elk River marsh (Grays Harbor, Washington), which had been diked for about

70 years. The reed canarygrass–dominated pasture converted to low salt marsh habitat within 5 years. Reed canarygrass itself was eliminated within 2 to 3 years of dike breaching. Major changes in plant species occurred between years 1 and 4, with the system continuing to develop through the 11 years of the monitoring period. It was estimated that full recovery of the system would take between 75 and 150 years.

Another project breached a dike in the Salmon River estuary, and over the first 11 years the vegetation at the project site shifted from freshwater pasture grasses to tidal brackish marsh plants (Frenkel and Morlan in Thom et al. 2002).

In a 7-year biological monitoring project at the Duwamish River Coastal America Restoration and Reference sites (Cordell et al. 2001), the findings were examined in the context of the stated ecological goals identified by the project partner agencies. These included increasing the acreage and biological function of the following habitats in the waterway: (1) fine-grained low-slope unvegetated flats, (2) salt and brackish marshes, (3) riparian assemblages, and (4) intertidal slough channels. The report states, "By these criteria, the Coastal America Restoration sites have been largely successful. The created flats appear to be stable, and in some cases (e.g., Turning Basin) appear to be actively accreting fine-grained sediment. With the help of goose exclosures, planted *Scirpus* and *Carex* have successfully established themselves at the sites and other plant species have recruited naturally. Although monitoring of survival and expansion of planted riparian areas did not occur, they appear to have become successfully established. Not only has each site contributed acreage of one or more of the listed habitat types, but monitoring data also show significant associated biological function. At the constructed slough channel site, where fish presence could be measured, it was found that salmon and other fish accessed the site. Further, the salmon captured there were feeding on types of prey found in the restored habitat. On-site production of sediment-dwelling invertebrates was comparable to reference sites, and successful colonization of the sites by emergent and riparian vegetation was accompanied by development of marsh and terrestrial insect assemblages. It therefore follows that objectives associated with physical creation of sediment, channel, and riparian habitats were successful."

The following is a USFWS description of vegetative change during the restoration of the Red Salmon Slough by the Nisqually Tribe: "Observations recorded during the restoration process of Red Salmon Slough by the Nisqually Tribe (located east of the Nisqually River) showed that the existing grasses, forbs, and other vegetation die off in months. Seeds and rooting plant pieces from nearby salt marsh plants float into the newly opened lands and enhance vegetation conversion. The Nisqually Tribe reported 20% revegetation (primarily pickleweed) of the Red Salmon Slough restoration area within 11 months" (USFWS 2004).

Tidal connections were restored in an estuarine restoration project area at the Nisqually National Wildlife Refuge in 2009. Monitoring during the first summer after restoration documented that large areas of invasive reed canarygrass had succumbed to tidal inundation and salt marsh vegetation had begun to colonize the site.

Fifteen restored marshes were reviewed in the San Francisco bay area. These marshes were 2 to 29 years of age. This review documented that a vegetated marshplain with a well-developed tidal drainage system can evolve within 5 to 20-plus years, depending on initial site conditions (Williams and Orr 2002).

Other studies in New England have demonstrated rapid colonization of former tidelands by salt marsh vegetation after restoration of tidal flow (Burdick et al. 1997; Warren et al. 2002), although some sites have taken longer. In one case, the vegetation of the tide-restored marsh changed from its pre-restoration condition after only one growing season (Roman et al. 2002).

## CANADA GEESE AND THEIR HABITAT

***Comment Summary:***

- There were many comments received on the importance of the pasture at the Riekkola Unit for dusky Canada goose and how any proposed tidal restoration would be detrimental to that species.

***Service Response:*** Historical accounts describing the wintering range of the dusky Canada goose (*Branta canadensis occidentalis*) date back to the late 1800s. Since the late 1930s, the primary dusky Canada goose wintering area has been the Willamette Valley in western Oregon and the floodplain of the lower Columbia River in western Oregon and Washington. However, small numbers of dusky geese overwinter in Willapa Bay, on the Oregon Coast, and as far south as California (Baird et al. 1884; Moffitt 1937; Bromley and Rothe 2003; Pacific Flyway Council 2008). Dawson (1909) noted that *B. c. occidentalis* migrated through the Washington coast area, but were not a common resident in the Puget Sound. Jewett et al. (1953) reported few dusky goose records in Washington, with sightings restricted to the coastal fringe.

Typically, dusky geese take coastal routes between their breeding and wintering areas, traveling quickly and making very infrequent stops along the way (Bromley and Jarvis 1993). Migration stopovers may partially relate to the birds' overall vigor at the time they leave (Kereki 2007). Hawkings (1982) identified salt marsh as the most important habitat type during dusky spring migration and an important feeding area during the early part of fall migration. Less information is available about the distribution of dusky geese during spring migration. Duskys briefly stage on Sauvie Island, Oregon, in the lower Columbia River Valley as the migration begins, with a subsequent surge in numbers observed at Willapa Bay, Washington, as birds fly north to their breeding grounds (Bromley and Rothe 2003). The changes in vegetative conditions (Sturm et al. 2001) and loss of estuarine habitats (Nicholls et al. 1999; Scavia et al. 2002) due to climate change may result in migrating birds being in poorer body condition. Thus the importance of maintaining and restoring these habitats may increase, since migrating geese may require more frequent feeding stopover sites. Kereki (2007) suggests that variability in the effects of climate warming might warrant protection of a greater number of estuary sites to ensure dusky survival.

A limited number of dusky wintering surveys are conducted in Willapa Bay. Surveys typically occur during the fall, winter, and early spring. The Washington Department of Fish and Wildlife (WDFW) conducted biweekly goose surveys in Willapa Bay, including on Refuge pastures in the South Bay, from December 2009 to March 2010 and November 2010 to April 2011. Washington State University (WSU) conducted biweekly goose surveys of both the pastures and estuarine habitats on the South Bay units of the Refuge from mid December 2010 to February 2011. Both surveys found relatively low numbers of dusky Canada geese, 467 and 51, respectively. Early and late season observations in the WDFW surveys accounted for 82 percent of the total dusky geese counted in their 2009-2010 survey. Most of these birds represent migrants briefly stopping in Willapa Bay to feed before continuing on to the wintering grounds on the Columbia River and in the Willamette Valley. Fewer birds were observed in 2010-2011, with duskys seen in the Refuge on only three survey days

and totaling just 10 birds for the entire season. As with the previous year's observations, a majority of those birds were seen during the first surveys of the season. Chapman et al. (1969, see Figure 1) report data consistent with these findings. In the WSU and the 2009-2010 WDFW surveys, there were only two days when dusky geese were observed. Although the sample sizes were small, no resightings of collared dusky geese were made that could indicate that the birds were spending extended periods of time locally. These data appear to support the belief that a majority of these dusky Canada geese are migrants, briefly stopping in Willapa Bay to feed enroute between their Alaska breeding grounds and primary wintering habitats in the Willamette Valley and in the vicinity of Vancouver, Washington, on the Columbia River. Both survey efforts documented dusky geese's use of estuarine habitats. Analysis by WSU (unpublished data 2011) of data collected at sites around Willapa Bay between 2008 and 2010 found a mean of 42 dusky geese per site, with non-Refuge lands contributing most of the birds observed. Data collected in south Willapa Bay on the Riekkola Unit of Willapa NWR from 1996 to 2004 show an annual mean of 115 dusky geese. A significant reduction in the *Spartina* infestation in south Willapa Bay could at least partially explain the overall decrease in the number of geese seen feeding on short-grass fields in the Refuge, since more birds can now utilize available habitats in the reclaimed estuary.

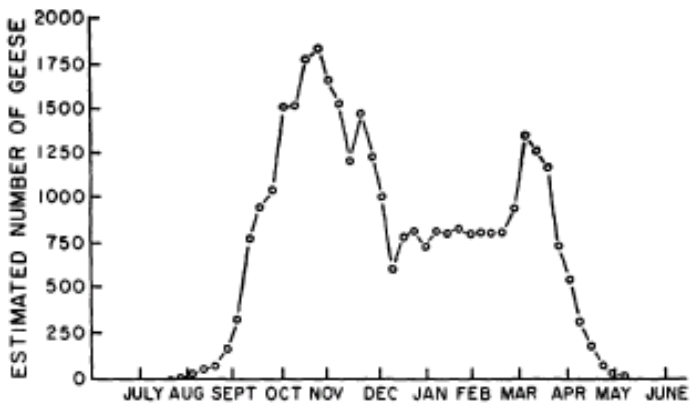


**FIG. 1.** Weekly counts of dusky Canada geese at Willapa Bay National Wildlife Refuge in southwestern Washington, average for 1959 through 1966.

(From Chapman et al. 1969)

Data from these different survey efforts should not be compared since different survey methods were used. Furthermore, to accurately estimate patch occupancy, most mark-recapture methods require a high probability of resighting birds. Enumeration and comparison to prior survey results is complicated by resident western Canada geese that have hybridized with introduced dusky geese. These geese are not Alaska-breeding birds, but instead are descendants of a captive breeding program initiated at Willapa NWR in 1958, when 40 dusky goslings were relocated from the Copper River Delta to the Refuge. The flock grew to about 400 by the mid 1970s, when the program was discontinued. Although recent estimates of flock size are not available, each year on Miller Sands Island in Oregon approximately 40 nests of dark Canada geese are recorded. Since 1999, approximately 1,200 dark Canada geese have been banded and collared on Miller Sands Island (Pacific Flyway Council 2008), some of which have been found wintering in Willapa Bay. Harvest of unmarked hybridized western Canada-dusky geese are tallied as dusky geese at check stations and counted toward unit closure thresholds. Continued marking of this small population would help reduce the unintended inclusion of these birds in permit zone harvest quotas for dusky geese.

The food habits of migrating and wintering dusky Canada geese have been described by a number of studies. Pre-migration diets consist of at least 26 species of plants, with sedges, grasses, arrowgrass, rushes, and horsetail forming 87 percent of the diet for birds on the Copper River Delta (Hawkings 1982). During dusky goose migration, brief foraging stopovers are made in estuaries. The geese also use short-grass fields, especially during adverse weather conditions. Dusky Canada geese, and

Canada geese in general, feed on estuarine plants including saltgrass, glasswort, reeds, eel grass, sea lettuce, and other plants found on tidal flats and salt marshes (Brittell et al. 1975; Angell and Baclcomb III 1982; Craven and Hunt 1984; Buchsbaum and Valiela 1987; Niedowski 2000). The diets of wintering dusky geese consist mostly of agricultural crops (Clark and Jarvis 1978; Pacific Flyway Council 1998). Wintering dusky geese tended to feed on ryegrass most extensively, especially in early and late winter, while there was a preference for tall fescue and pastures in the midwinter periods. Use of pastures was found to be significantly less than any other forage type (Naughton 1993). In addition to the vegetated habitats available to goose foraging in the restored estuary, the management direction would continue to maintained 93 acres of short-grass field in the Riekkola Unit as goose and elk forage. An additional 23 acres would continue to be maintained as upland grassland habitat for elk. The 120 acres of pasture in the Riekkola Unit that would be restored to estuarine habitat represents 1 percent of the total short-grass field habitat currently available within a 25-mile radius of Refuge lands in south Willapa Bay.

Reducing hunting pressure in areas frequented by migrating and wintering dusky geese has been considered as a means of increasing annual survival. The Pacific Flyway Council (2008) states: "Implementing strategies to allow harvest of abundant subspecies of Canada geese, while protecting the dusky goose, is very time-consuming, controversial, and expensive. Dusky geese are more vulnerable to hunting, apparently due to their behavior and habitat use patterns, making control of their harvest difficult. Controlled goose hunts using specific open areas, check stations, stringent harvest permit requirements, hunter education, and law enforcement require substantial commitments of personnel, time, and money." In 2003, Bromley and Rothe concluded that hunting had limited the dusky Canada goose population, but through the successful implementation of effective hunting regulations, it was unlikely that hunting was limiting the population at that time. However, if the Service determines that the habitat in south Willapa Bay is crucial to dusky goose conservation, they could decide to impose a moratorium on all goose hunting in the Refuge to decrease losses incurred from incidental harvest. All of the Refuge lands managed as dusky goose wintering habitat in the Willamette Valley and in the Vancouver vicinity of the lower Columbia River are currently closed to goose hunting.

***Comment:***

- "These short grass fields of the Riekkola Unit also are resting and feeding areas for the closely managed Dusky goose it doesn't make sense that the US Fish & Wildlife Service would spend the money to build a whole Refuge in Oregon for the benefit of this threatened goose and then several years later eliminate some of its needed habitat."

***Service Response:*** Although the dusky Canada goose is not federally listed as a threatened species there is concern that they are below Pacific Flyway population goals and that the population may be continuing to decline. Most of the emphasis on conservation is being focused on issues that will result in increasing breeding success. Improving and maintaining wintering habitats in the Willamette Valley and the lower Columbia River, and managing harvest levels, are also components of a strategy to improve productivity and adult survival. In undertaking this estuary restoration, the Service is conducting a rigorous environmental assessment and preparing an environmental impact statement. An extensive literature review of dusky goose research and monitoring, and of estuarine restoration techniques and efficacy monitoring, has been an integral component in this process. The best available science will be incorporated into the design and implementation of this restoration project, using an adaptive management approach to make adjustments as needed and as new information becomes available.

Refuge lands restored to estuarine habitat under Alternative 2 of the CCP for the Willapa NWR represent just 1 percent of the total short-grass field currently available within a 25-mile radius of south Willapa Bay. Even if the restored estuary is not used during the first several years after tidal reconnection, a reduction of pasture habitat of this magnitude is not significant at the landscape or population levels. Ninety-three acres of short-grass field habitat on the Refuge's Riekkola Unit will be maintained as forage for goose and elk. Over 600 acres of estuary will be restored, providing additional goose feeding, roosting, and nesting habitat.

***Comment Summary:***

- Many comments were received regarding the importance of the Refuge and its current habitat and management practices for geese.

***Service Response:*** On the Washington coast, Canada geese are most abundant in Willapa Bay, where Ducks Unlimited estimates there are up to 1,000 resident birds. Many more use the coastal habitats as feeding and resting sites on their migration between breeding and wintering areas. A number of western subspecies of Canada geese can be found in Willapa Bay at some times during the year. However, according to Mowbray et al. (2002), the American Ornithologists' Union's Checklist of North American Birds has recently split Canada goose into two species: cackling goose (*Branta hutchinsii*) and Canada goose (*Branta canadensis*). The cackling goose subspecies seen in Willapa Bay include Aleutian, cackling, and Taverner's. The Canada geese that are found here are the dusky, western, and lesser geese. All but the western Canada goose occur only locally during migration.

Canada geese depend primarily on grasses, sedges, or other green monocots during periods of increase in lean body mass, primarily the growth period in summer (Sedinger and Raveling 1984) and spring pre-migration and migration periods (Coleman and Boag 1987; McLandress and Raveling 1981). Mowbray et al. (2002) describe migrating and wintering flocks of Canada geese as highly gregarious, often gathering and feeding in large numbers, particularly in refuges. They further mention that almost all populations utilize agricultural crops when they are available and that agricultural grains often dominate their diets; however, Canada geese appear to be equally suited to foraging in coastal or inland sites. This seems to be somewhat substantiated by the findings of Patten and Norelius (2011), who investigated goose use of salt marsh and short-grass fields at Willapa NWR. They found slightly higher densities of geese using salt marsh/tidal mudflats as compared to short-grass fields. Since there are virtually no agricultural grain crops grown in the area, and much more salt marsh habitat than short-grass field habitat, it would seem that geese could attain much of their forage in Willapa estuary.

A limited number of winter goose surveys are conducted in Willapa Bay. Surveys typically occur during the fall, winter, and early spring. Washington Department of Fish and Wildlife (WDFW) conducted biweekly goose surveys in Willapa Bay, including on Refuge pastures in the South Bay from December 2009 to March 2010 and November 2010 to April 2011. Washington State University (WSU) conducted biweekly goose surveys of both the pastures and estuarine habitats on the South Bay units of the Refuge from mid December 2010 to February 2011. The average number of geese counted per survey was about 170. As with the aforementioned dusky goose, Canada goose abundance peaked early and again late in the season when migrating birds, especially cackling geese, passed through Willapa Bay. Daily counts ranged from less than five to 750 (on the Bear River salt marsh) birds per Refuge site and went as high as 2,000 on the Camenzind pasture. The WSU study estimates that there were roughly 5,000 Canada geese utilizing the Willapa Bay and Chinook Valley combined (Patten and Norelius 2011). Although Willapa Bay represents an important stopover for

migrating waterfowl, these numbers represents a fraction of the birds wintering in Oregon's Willamette Valley or in the Central Valley near Sacramento, California.

Overall the WSU study found slightly higher densities of geese using salt marsh/tidal mudflats as compared to pasture (Patten and Norelius 2011). They also observed that goose densities were not entirely driven by forage habitat, because on days that were stormy, geese preferred the sheltered pasture sites over the totally exposed salt marsh site. They explain that extrapolation of their survey data to comparative densities (number/acre) is somewhat misleading because data collected for Porter Point includes native salt marsh, transitional salt marsh, and bare mudflat habitats. The greatest usage of this site by geese was in the transitional salt marsh area. This area is where *Spartina* meadows formerly occurred, reaching their maximum spatial extent in the early 2000s. There was enough change in elevation at these sites to allow for a salt marsh succession to occur once the *Spartina* was eliminated. This area represents about one-third to one-half of the survey area and would reflect the expected habitat of the Riekkola Unit following tidal restoration. A significant reduction in the *Spartina* infestation in south Willapa Bay could also at least partially explain the overall decrease in the number of geese seen feeding on short-grass fields in the Refuge, since more birds can now utilize available habitats in the reclaimed estuary. Patten and Norelius (2011) conclude that goose usage is expected to be the same or higher due to the creation of transitional salt marsh habitat and that there would be little to no loss of sheltering habitat.

In addition to the vegetated habitats available to goose foraging in the restored estuary, Alternative 2 of the CCP for the Willapa NWR would continue to maintain 93 acres of short-grass field in the Riekkola Unit as goose and elk forage. An additional 23 acres would continue to be maintained as upland grassland habitat for elk. The 119 acres of pasture in the Riekkola Unit that would be restored to estuarine habitat represents 1 percent of the total short-grass field currently available within a 25-mile radius of Refuge lands in south Willapa Bay.

***Comment:***

- "Geese will lose another important stop in the Pacific Flyway if the fields are flooded by breaking the dikes. We are overrun by geese on the Ranch already. We will be susceptible to that many more ravaging our fields and cutting grass production that feeds our cattle."

***Service Response:*** In addition to feeding on estuarine vegetation, migrating and resident geese will use short-grass fields for foraging, and will continue to do so regardless of management actions on the Refuge. Refuge lands restored to estuarine habitat under Alternative 2 of the CCP for the Willapa NWR represent just 1 percent of the total short-grass field habitat currently available within a 25-mile radius of south Willapa Bay. Even if the restored estuary is not used during the first several years after tidal reconnection, a reduction of pasture habitat of this magnitude is not significant at the landscape level. The Refuge does not manage wildlife on private property. Landowners who are experiencing crop depredation should contact the Washington Department of Fish and Wildlife. The Pacific Flyway Council's (1998) Northwest Oregon/Southwest Washington Canada Goose Agricultural Depredation Plan also provides guidance for managing goose depredation on agricultural crops in the Pacific Northwest.

***Comment:***

- "Today hundreds of geese are year around resident birds which prefer farmland pastures for daily sustenance. These resident geese are not historical to the area and were originally

encouraged by programs on the refuge years ago to homestead the geese. Keeping geese local is a product of former refuge programs that helped create a burgeoning local goose population that the refuge now has a responsibility to maintain. Breaching the dike would be abrogating this refuge responsibility that originally encouraged the localization of geese in addition to enticing larger migrations of water fowl to stop and fatten a bit before moving on to their historical northern nesting and feeding grounds."

***Service Response:*** Migratory birds use multiple sites along linear routes during their annual migration. A large number of waterfowl use Willapa Bay as a migratory stopover between arctic breeding sites and Oregon and California wintering sites. Many of the Columbia River and Willamette Valley state and federal wildlife refuges were established to protect and manage wintering goose habitat. Willapa NWR currently maintains 250 acres of short-grass field, of which 119 acres in the Riekkola Unit would be eliminated with the tidal restoration project proposed under Alternative 2. This represents only 1 percent of the total short-grass field currently available within a 25-mile radius of Refuge lands in south Willapa Bay. Although the Refuge currently provides some forage for geese, and to a lesser extent for ducks, the food production on the managed short-grass fields at Willapa NWR is not significantly affecting populations of migrating waterfowl.

An undetermined proportion of the local Canada goose population is descendant from a captive breeding program initiated at Willapa NWR in 1958, when 40 dusky goslings were relocated from the Copper River Delta to the Refuge. The flock grew to about 400 by the mid 1970s, when the program was discontinued. Progeny of some of these geese have bred with resident western Canada geese in Willapa Bay. In addition to these birds, some dark-breasted Canada geese captured and tagged in the Columbia River have been found to winter in Willapa Bay. Pacific Flyway data show an overall increase in the Canada goose population, but we are not aware of a significant increase in resident goose numbers in Willapa Bay. There have been suggestions that an effect of climate change may be the modification of migratory patterns. Changes in the winter distribution of migratory fauna in areas with milder winters probably allow birds to take advantage of better feeding conditions while remaining nearer their breeding grounds (Graham and Rehfisch 2005). However, studies to determine these complex, interrelated processes are just beginning to be investigated. At this time we cannot say whether climate change is affecting local migratory waterfowl behavior and movement patterns. Additionally, since about the early 1980s, a major northward shift has occurred in wintering distribution of some populations of Canada geese in inland areas of North America, at least in part as a result of changes in traditional use of habitats in response to changing agricultural practices (Humburg et al. 1985; Krohn and Bizeau 1988; Malecki et al. 1988).

***Comment:***

- "A few of the observation dates were during the goose hunting season. Some of the "scientific" comparison observations while the Riekkola Field was actually being hunted. The duck hunters actually drive through the East side of the Riekkola Field to the Porter Point boat launch. This also disturbs the geese. The salt marsh is the safe area of the refuge for geese, from predators as well as hunters and the geese are well aware of this. This comparison study under these conditions is biased. Shouldn't a Researcher identify any of the sub-species of Canada Geese?"

***Service Response:*** Many variables can affect survey results and their effects should be minimized to the maximum extent practicable. Where they are unavoidable, an effort should be made to discuss them in reporting documentation. Goose surveys in the Refuge were conducted at optimal weather

and tidal conditions over several months during consecutive seasons. The regulated hunting is an obvious disturbance to geese using the Riekkola fields, so surveys conducted during the hunting season were scheduled to avoid hunt days. If geese from Riekkola were in fact displaced to the salt marsh at Porter Point, they would have been exposed to one additional day per week of hunting. The estuary does provide undisturbed refuge for geese, but it also provides foraging and roosting habitat. These are some of the many ecological services that make estuarine habitat so attractive to fish and wildlife, and why the Refuge proposes to restore these vital habitats. Likewise, if an occasional vehicle passing on the access road located on the far eastern edge of the Riekkola fields was creating a significant disturbance, the Refuge would most likely have received complaints from hunters utilizing the goose hunt blinds.

Goose management in northwest Oregon and southwest Washington is one of the most complex wildlife issues in North America (Pacific Flyway Council 1998). Seven subspecies of Canada geese are found in the region during the fall and winter. Nowhere else in the United States are so many different subspecies of Canada geese mixed together on wintering grounds. Goose identification to the subspecies level from remote observation points can often be difficult under ideal conditions, even for highly skilled observers. The survey data necessary to answer management questions do not warrant the extra time and effort to attain this level of specificity regarding subspecies identification.

## DUCKS AND OTHER WATERBIRDS

***Comment Summary:***

- Comments were received that questioned the benefit of proposed tidal restoration to waterfowl and other waterbirds especially when compared to the managed impoundments and short-grass fields.

***Service Response:*** Washington's coastal bays are used by many migrating waterfowl. Several species of dabbling and diving ducks are commonly seen in Willapa Bay. Dabbling ducks constitute a large proportion of these ducks, of which American wigeon, northern pintail, mallards, and green-winged teal are most abundant. Wigeon represent almost 80 percent of waterfowl migrants, which, according to Ducks Unlimited, can number up to 50,000 birds each fall. Scaup, bufflehead, mergansers, and scoters are locally common diving ducks. The most recent North American breeding population trend data from 1955-2010 for ducks show northern pintail, scaup, and American wigeon are all below North American Waterfowl Management Plan population goals (Zimpfer et al. 2010). Pacific Flyway breeding population data from 1994-2009 indicate declining trends for both dabbling (−10.8 percent) and diving (−3.8 percent) ducks (Collins and Trost 2010).

Northern pintail winter in a variety of shallow estuarine and freshwater habitats with minimal emergent vegetation, except at night when they may use dense emergent stands of food plants (Euliss and Harris 1987). They also will use shallowly flooded harvested agricultural fields. Green-winged teal forage in bays, tidal flats, and narrow brackish channels for plant matter such as sedges and eelgrass (Angell and Baclcomb III 1982). Northern pintails and green-winged teal frequently consume seeds of smartweed (*Polygonum* spp.), spike rushes, and various sedges (Gordon et al. 1998). Mallards are omnivorous, opportunistic, and generalist feeders, allowing them to utilize a range of habitats including agricultural lands, urban areas, and coastal marine habitats (Drilling et al. 2002). Mallards feed over mudflats, along sand and gravel shorelines, in shallow estuarine waters, and in salt marshes. They also use islands, spits, and open waters of estuaries as resting areas. In the Northwest, wintering mallard, northern pintail, and green-winged teal feed on seeds of abundant

marsh plants (*Carex* spp., *Scirpus amercanus*, *S. validus*) and on animal matter including insect larva and gastropods (Burgess 1970; Eamer 1985). In the nonbreeding season, American wigeon graze on leafy parts of upland grasses (*Poaceae*) and clovers (*Trifolium* spp.), *Carex* roots, and leafy parts and seeds of various agricultural crops and marsh plants (Bellrose 1980). They also feed on sea lettuce, filamentous algae, and eelgrass in the nearshore over mud and fine sediments. Wintering scaup dive in shallow to deep coastal waters to feed on bottom vegetation, mollusks, and crustaceans (Poole 2005). They also dabble in sea lettuce and eelgrass (Angell and Baclcomb III 1982).

A number of diving duck species regularly use the marine waters of Willapa Bay. These include bufflehead, common goldeneye, and mergansers. All are piscavores, while bufflehead and goldeneye also feed on mollusks and crustaceans. Nonbreeding habitats for loons and grebes consist of coastal bays, coves, channels, inlets, and other shallow estuarine sites (Johnsgard 1987). Smaller species of grebes primarily feed on aquatic invertebrates such as insects and their larvae and crustaceans, but may also consume small fish, amphibians, and aquatic plants. In studies conducted on the Virginia coast, McIntyre (1975) documented wintering loons feeding on prey in the shallow receding waters close to shore during ebb tides. Larger grebes and loons feed primarily on fish. Great blue heron breed locally and forage on fish, invertebrates, and amphibians in freshwater and marine habitats of Willapa Bay. The Birds of North America Online (Poole 2005) has detailed descriptions of waterbird behavior, food habits, and habitat use. A significant reduction in the *Spartina* infestation in south Willapa Bay could at least partially explain the overall increase in the number of ducks seen feeding in tidal areas adjacent to the Refuge, since more birds can now utilize available habitats in the reclaimed estuary.

Slater (2004) conducted a study in the greater Skagit River Delta of western Washington to quantify the abundance of waterbirds with respect to habitat and tide, and examine the relationship between habitat characteristics and waterbird use. The study included two restored marsh sites and potential future restoration sites. This allowed for comparison of waterbird abundance between restored and natural marsh sites, to assess the success of the restoration with regard to waterbirds. Data were also collected from a variety of potential restoration sites that provided baseline information for a more rigorous statistical analysis of the effect of estuarine restoration on waterbird abundance. Overall, duck density was found to be generally lower in agricultural lands than in emergent marsh habitats, with this pattern observed for each of the four most common dabbling ducks: mallard, American wigeon, northern pintail, and green-winged teal. Slater (2004) concluded that these results suggest that any perceived cost to duck populations by marsh restoration is unwarranted, and that marsh restoration would, in fact, be beneficial to ducks. Moreover, he stated, “there was little compelling evidence to support the notion that marsh restoration is detrimental to duck populations.” Although Lovvorn and Baldwin (1996) found that tidal flat habitats alone could not support wintering duck populations, they acknowledge that dabbling ducks can feed in areas of tidal marsh instead of farmland as long as areas are available.

The Refuge currently maintains 290 acres of freshwater impoundments on the Riekkola, Lewis, and Porter Point Units where water levels are seasonally drawn down on a rotational basis. There are 290 acres of freshwater impoundments on the Refuge in the Lewis and Porter Point Units. Although all of these impoundments would be eliminated in the South Bay tidal restoration, there are currently 1,425 acres of freshwater ponds and lakes within a 25-mile radius of the Refuge. The existing Refuge habitat represents approximately 20 percent of the available freshwater ponds and lakes in the landscape. It is thought that ducks use these sites on the Refuge primarily for feeding. However, infrequent observation of ducks during periods when smartweed is unavailable indicates some may be feeding on small amounts of alternative plant matter, or could simply be loafing or resting.

Although most ducks require freshwater areas for breeding, since hatchlings cannot drink salty water due to the lack of fully developed salt glands, most use a mix of freshwater and hypersaline environments (Elphick et al. 2001). The Refuge does not currently conduct waterfowl nesting surveys, but mallard broods have occasionally been observed in the freshwater impoundments.

Ducks using the refuge, especially northern pintails and mallards, but also some American widgeon, green-winged teal, and scaup, are known to feed on smartweed seed in early fall as water levels rise and the plants ripen. This food resource is available for a limited time, approximately 2-8 weeks, depending on conditions. A peak count of 40,000 dabbling ducks was recorded in the fall of 2001 following a wetland rehabilitation project during the previous winter that resulted in an abundant smartweed response. The adjacent estuary had become a vegetated *Spartina* meadow, reaching its maximum spatial extent in the early 2000s. This combination of factors could at least partially explain the record number of ducks seen feeding on the impoundments in 2001. Refuge staff has observed consistent duck use of the Porter Point and Lewis impoundments corresponding to the smartweed crop. Overall, they have seen more use of the bay than any of the managed freshwater habitats. The smartweed forage would be eliminated once tidal influence is restored; however, it would be replaced by salt marsh and intertidal vegetation as the estuary matures. The amount of shallow water habitat available for waterbird foraging would increase and would be available during periods of the year that currently do not support forage plants. A WSU study (Patten and Norelius 2011) investigating goose and duck foraging preference in south Willapa Bay had similar findings. They found significantly more duck use of salt marsh and tidal mudflat habitats than adjacent pastures and freshwater impoundments. They concluded that removal of existing dikes and restoration of the estuary would not result in a net loss of habitat for waterfowl, and that duck usage would likely increase. Wilcox's (1986) data support this assumption. That study found that dabbling ducks responded favorably to an estuarine restoration project in coastal Orange County, California. Dabbling duck use of the project area exceeded that observed in natural mudflats after a period of three years.

## SHOREBIRDS

***Comment Summary:***

- Many of the comments received questioned the value of mudflats, salt marsh, and estuary for wildlife in general and questioned the need to provide any more.

***Service Response:*** The U.S. Shorebird Conservation Plan describes the loss of migration habitats as extensive. Coastal development and human activities have impacted coastal zones, resulting in reduced intertidal habitats at strategic stopover sites vital for foraging and high-tide resting when feeding areas are inundated. Half of all coastally migrating shorebirds have declined, indicating stress in coastal habitats (NABCI 2011). Included in the Plan's habitat management principles is a goal to preserve and restore naturally self-sustaining systems that do not require ongoing maintenance wherever feasible (Brown et al. 2001). In the Northern Pacific Regional Shorebird Management Plan, Drut and Buchanan (2000) outline a habitat goal of restoring natural tidal influence of estuarine marshes through the removal of dikes. Buchanan (2005) asserts that among the greatest threats to shorebirds on the Northern Pacific Coast is the loss or degradation of habitats. Many important shorebird sites have been degraded over the years such that shorebirds rarely, if ever, use the degraded areas. He further states that a priority activity should be habitat management (e.g., removal of dikes) to restore suitable conditions at historical shorebird stopover and wintering sites. Bird Life International and the National Audubon Society have identified Willapa Bay as an

Important Bird Area for wintering and migrant shorebirds. Willapa Bay meets the criteria of an internationally important site because it supports up to 15.5 percent of the Pacific Flyway population of wintering Dunlin (derived from Page and Gill 1994) and an average of over 100,000 total shorebirds in the spring (Buchanan and Evenson 1997).

Dunlin (*Calidris alpina pacifica*) and Black-bellied plover (*Pluvialis squatarola*) are the most common shorebirds seen in Pacific Northwest and Willapa Bay estuarine mudflats during the winter (Buchanan and Evenson 1997; Paulson 1993). Dunlin in some areas of western Washington use non-marine habitats (e.g., agricultural areas), but many birds make substantial or nearly exclusive use of tide flats in marine estuaries (Buchanan 2006; Warnock and Gill 1996). Migrant Western sandpipers (*Calidris mauri*) are typically the most abundant shorebird on the southwest Washington coast as they briefly pass through in the spring and fall. Flocks can number in the tens of thousands, and over half a million were documented in Grays Harbor in April 1981 (Paulson 1993). Red knots (*Calidris canutus*) are another important migrant shorebird that consistently visits Willapa Bay. Paulson (1993) reports that flocks of thousands of knots have historically been seen in Willapa Bay. The preferred habitat of knots is open mudflats, and they are often found in association with Dunlin, Black-bellied plovers, and Short-billed dowitchers (*Limnodromus griseus*). Although Red knots have been typically found in the northern portions of the bay, an increase in available habitat through restoration of the South Bay could result in birds using habitats there as well. A suite of other shorebirds use the Willapa Bay estuary as a migratory stopover, for overwintering, or as year-round residents. Individual species can number in the thousands during migration.

Many shorebirds wade in shallow waters and along unvegetated, moist-substrate coastlines while probing for prey using tactile cues (Colwell 2010). Most shorebirds' diets consist of soft-bodied invertebrates, including *Polychaete* worms, small mollusks and crustaceans, amphipods, and insects. Conservation of coastal waders typically emphasizes management of intertidal feeding areas (e.g., Goss-Custard 1984, 1985). Although feeding areas are crucial, the best feeding areas may be of no use to waders if they aren't associated with adequate roosting habitat (Rogers 2003). This is because shorebirds generally do not forage while roosting (Colwell 2010). Shorebird roosts are almost exclusively a behavior exhibited by nonbreeding birds while they rest between bouts of foraging (Colwell 2010). Roosting can occur during daytime or at night and often serves as a defense against predation.

Landscape factors such as habitat connectivity can also affect shorebird foraging behavior. As wetlands spacing increases, Farmer and Parent (1997) found that Pectoral sandpipers do not respond by making longer foraging flights. Instead just the opposite occurred, and it was noted that spacing wetlands farther apart not only reduced movement frequency, but also reduced the distance moved. Thus they concluded that as the landscape becomes more disconnected, it begins to constrain feeding opportunities by altering movement behavior in favor of a more sedentary nature. From a conservation standpoint, the behavioral response of Pectoral sandpipers to the landscape underscores the importance of landscape connectivity in determining the quality of a migration stopover. Individual wetlands and the invertebrates within them must be distributed so that individuals can achieve relatively high ingestion rates for low energy costs of searching. Improving connectivity of shallow-water estuarine habitats utilized by shorebirds in Willapa Bay is another aspect of our proposed South Bay tidal restoration that addresses migratory bird conservation, one of the purposes for establishing the Refuge.

Although Galbraith et al. (2005) predict that there will be comparatively modest rates of habitat loss in Willapa Bay due to sea level rise associated with climate change when compared with other

estuaries, the combined effects of habitat change on shorebird breeding areas and intertidal habitat loss at their wintering and migratory staging sites could, potentially, have even more severe effects than could be brought about by any one factor. Currently, the diked portion of south Willapa Bay does not allow for the same level of functionality and resilience that natural tide flats afford. Ducks Unlimited has identified waterfowl and waterbird conservation as a Level II priority in the Pacific Northwest. Aquatic beds destroyed or diminished by wetland drainage and diking are among the causes listed for habitat loss. Sea level rise is predicted to reduce the amount of suitable shallow water habitat, and natural shorelines will be more resilient to these changes.

A 2004 study by Slater quantified the abundance of waterbirds in the Skagit River Delta with respect to habitat and tide, and examined the relationship between habitat characteristics and waterbird use. The study included two restored marsh sites and potential future restoration sites. Shorebirds were found to be substantially more abundant in estuarine habitats than in agricultural habitats, but distinct patterns of habitat use between marsh and tidal flat habitats in relation to season were observed. In the marsh, shorebird density was low during the winter period, but high during spring migration when marsh specialists, such as Least sandpipers and Greater yellowlegs, were abundant. In contrast, shorebirds were abundant in tidal flats in the wintering period when large flocks of Dunlin were regularly observed, but they were relatively absent during migration. Wilcox (1986) monitored shorebird use of an estuarine restoration project in coastal Orange County, California. The restoration project resulted in an overall increase in shorebird use of the bay, although the results indicated that shorebirds did not respond immediately to the creation of new intertidal flats. The study concluded that shorebird use increases over time and is probably related to the development of the benthic community.

The tidal flats and salt marsh habitats in Willapa Bay are used by migrant or wintering shorebirds. However, there is virtually no suitable shorebird foraging habitat on the landward side of the existing Lewis and Porter Point dikes. When flooded, the impoundments are too deep for shorebirds to utilize, and during the brief periods of shallow water as levels are rising or being drawn down, the vegetated basins prevent access to moist soils. The current Riekkola pasture may occasionally be used by killdeer and common snipe, or as shelter during severe weather, but is otherwise unsuitable for shorebird use. In addition to the already successful removal of *Spartina* from the mudflats, the South Bay restoration proposed in Alternative 2 of the CCP for the Willapa NWR would restore an additional 120 acres of mudflat habitat as well as important salt marsh and tidal channel habitat to the estuary.

## SALMONIDS

***Comment Summary:***

- Many comments were received that questioned the benefit of proposed tidal restoration to salmonids. Some commenters felt with the fish ladders in place, no further action was required.

***Service Response****:* In the Pacific Northwest, salmon populations continue to decline. Although declines of individual salmon stocks are due to a variety of factors (including overharvest, hatchery programs, and variable ocean conditions), habitat loss stands as the largest single contributing factor (Nehlsen et al. 1991). One of the most common “limiting factors” for the decline of nearshore or estuarine salmon habitat is the loss of saltwater wetlands (Coastal Resources Alliance 2007).

Washington has lost between 45 percent and 62 percent of pre-settlement estuarine habitat. An analysis by the University of Washington Olympic Natural Resources Center (ONRC) calculated that Willapa Bay originally contained approximately 14,620 acres of saltwater wetlands. This has been reduced to 5,277 acres, representing a 64 percent loss of estuarine wetlands (Coastal Resources Alliance 2007). The importance of estuarine habitat to anadromous salmonids has been reviewed extensively and is well documented (Simenstad 1983; USFWS 1985; Thorpe 1994; Aitkin 1998). Estuarine habitat is important to adult salmon as staging areas and also for physiological transition, and to juveniles as foraging habitat, refugia from high flows as well as predators, and for physiological transition (Levy and Northcote 1982; Simenstad et al. 1982; Iwata and Komatsu 1984; Moser et al. 1991; Miller and Sadro 2003; Bottom et al. 2005; Volk et al. 2010). Chum and Chinook salmon are the salmon species most dependent on estuarine habitat (Dorcey et al. 1978; Healy 1982 *in* Shreffler et al. 1990; Simenstad et al. 1982; USFWS 1985). Juvenile salmon prefer vegetated estuarine habitats (e.g., salt marsh) and also estuarine habitats that have a moderate slope, are heavily channelized, and offer a varying range of salinities. Juvenile Chinook and chum salmon move into the marshes on the flooding tides (Healy 1991). Chum fry occupy marshes, sloughs, and tidal creeks within an estuary and feed intensely in upper salt marshes during high tides. An increase in the average length of Chinook and chum fry has been documented and determined to be a result of growth in the estuary (Levy and Northcote 1982). Adult salmon were found to occupy estuaries in every month of the year in Washington State (Simenstad et al. 1982).

A study that estimated salmonid usage of the Skagit estuary yielded approximately 3.1 million chum fry and 1.1 million Chinook fry reared in salt marsh habitat in 1979, which was approximately one-third of all downstream migrants for each of these species (Congleton et al. 1982 *in* Aitkin 1998).

Salmon often account for 80 to 90 percent of the finfish caught in the Willapa Bay area; however, their numbers are declining (The Willapa Alliance 1998b). Along the Washington Coast, the largest chum populations are found within the rivers of Grays Harbor and Willapa Bay (WDFW 2000). Willapa Bay historically supported large chum runs and contained excellent chum habitat (Steward and Associates 2007). However, currently chum runs are critically low (Applied Environmental Services, Inc. 2001; Willapa Alliance 1998a; personal communication with Ron Craig of Willapa Bay Regional Fisheries Enhancement Group). Since 1960, the average return of chum salmon has been approximately one-third of that recorded prior to that year. The majority of the salmon commercially caught in Willapa Bay were chum, historically averaging 50 percent of the total salmon catch. Recently chum account for less than 1 percent of the total commercial catch in Willapa Bay. Returns of Chinook and coho have also fallen to approximately half of the catch levels recorded in the 1900s (The Willapa Alliance 1998b).

An excerpt from the journal *Fisheries* (Rahr et al. 1998) highlights the need for estuarine restoration and protection and specifically recognizes the Bear River Watershed in Pacific County as a watershed with important attributes worthy of restoration and protection. This provides a basis for understanding one of the fisheries-related reasons for pursuing estuarine restoration in the lower Bear River (which is included within the Willapa National Wildlife Refuge) as an integral component of total watershed restoration. Estuarine restoration will be beneficial to adult salmon as well as increase the availability of juvenile salmon estuarine overwintering and rearing habitat.

The Bear River, which has been impacted by previous logging and grazing activities, still retains significant elements that provide the basis for a functioning ecosystem. This system also maintains populations of salmonids, including sea-run cutthroat, Chinook, coho, steelhead, and chum salmon, that are naturally sustaining. These populations appear to be relatively unaffected by hatchery

propagation and are believed to represent some of the most native salmonids in the Willapa Basin. Taking these attributes into consideration, it is believed that conservation and restoration efforts can be highly effective at restoring and maintaining ecological productivity in the Bear River Watershed (Lebovitz 1998).

An analysis of the Bear River Watershed concluded that the loss of river mouth and intertidal salt marsh wetland habitats was limiting salmonid populations and overall ecosystem productivity in the lower Bear River (Lebovitz 1998). Over 500 acres of estuarine wetland, approximately 30 percent of the total estuarine wetlands in the Bear River Watershed, have been lost as a result of diking and draining. This wetland loss is believed to reduce salmonid as well as ecosystem productivity by reducing the amount of important juvenile salmonid rearing habitat available. Previous limited estuarine restoration work involving tidal reconnection has been done at the Willapa National Wildlife Refuge and includes projects at the Refuge headquarters area and Long Island, and a more extensive project on the Bear River. The initial Bear River project area had previously been diked and the associated marsh had been drained and leveled for use as cattle pasture (Lebovitz 1998). It was determined that productivity could be successfully enhanced by wetland restoration. Initially, large woody debris was added to the system, followed by partial dike removal and tidal channel re-creation, which were accomplished in 2000.

Lebovitz (1998) identified conservation and restoration projects to address factors limiting ecosystem health and salmonid productivity in the Bear River Watershed. Under "Near Term Availability of River Mouth Wetlands Habitat" the following project was proposed to maintain the amount of and functions provided by estuarine wetlands:

> *"Permanent acquisition of diked tidal marshes at the mouth of the Bear River*
>
> "The acquisition and management as natural estuarine marsh habitat of diked tidelands which are being offered for sale by private owners is proposed. 230 acres of wetlands are currently available for acquisition. Acquisition is proposed to protect existing habitat values and to make these lands available for restoration activities to restore natural tidal inundation.
>
> "Restoration of ecological functions and processes of estuarine wetlands habitat using breaching of dikes to reinstate hydrologic re-connection and tidal inundation was also proposed in this document. Hydrologic re-connection would permit fish usage of the marsh, re-colonization by native salt marsh vegetation, and the restoration of natural material transport between the uplands, marsh, river, and bay."

The Lewis and Porter Point impoundments on the Willapa National Wildlife Refuge are artificial freshwater wetlands that were created by dikes, ditches, and drains in the early 1950s. Along with the adjacent Riekkola Unit, this was originally undertaken to convert tidelands to pastureland for Canada goose feeding habitat, and later the Lewis and Porter Point pasturelands were developed into freshwater impoundments. The original water control structures had tide gates below flashboard-riser structures and prevented fish passage into the wetlands. The old structures were replaced in the summer of 2001 with pool-weir-chute structures to re-establish passage to anadromous fish that once likely inhabited the streams that feed these two wetland units (Baker and Miranda 2003).

The two streams that drain into the Lewis and Porter Point wetlands are small, with drainage areas of 476 and 397 acres. These streams drain into the Bear River, which enters Willapa Bay. Coho, fall

Chinook, and chum salmon and winter steelhead spawn and rear in the Bear River. Historically, these salmon and steelhead, plus sea-run cutthroat had access to the feeder streams at Lewis and Porter Point and may have used them for spawning and/or rearing. Before construction of the new structures in 2001, resident cutthroat were the only salmonids found within the streams draining into Lewis and Porter Point wetlands (Barndt et al. 2000).

Incubation trays and fry releases of chum and coho salmon have occurred in both these wetlands and feeder streams. A small coho run was documented in the Lewis stream in 2009 and again in 2010. Coho fry have also been observed in this stream.

An extensive body of literature exists on the topic of salt marsh restoration, including fish response. Estuary restoration is considered beneficial in addressing past destruction of this important habitat (Levings and Nishimura 1997). Restoration projects accomplished in other areas have documented salmonid use of recently restored estuarine habitat or population increases that have been linked to increased estuarine habitat quantity and quality (Shreffler et al. 1990; Shreffler et al. 1992; Thorpe 1994; Levings and Nishimura 1997; Miller and Simenstad 1997; Gray et al. 2002; Miller and Sadro 2003). One study that concentrated on tracking the development of the Salmon River estuary marsh ecosystems in Oregon, demonstrated significant fish and invertebrate response in the first 2 to 3 years after marsh restoration efforts (Gray et al. 2002). The authors stated, “This pulse of productivity in newly restored systems is part of the trajectory of development and indicated some level of early functionality and the efficacy of restoring estuarine marshes for juvenile salmon habitat.” Cordell et al. (1998) found that juvenile chum salmon utilized a restored marsh in the Snohomish River estuary in Washington to a considerable extent, and that chum and coho salmon foraging habits in restored intertidal wetlands were similar to chum and coho foraging in natural habitats. Levings and Nishimura (1997) found no difference in the abundance of Chinook and chum salmon between natural, restored, and disturbed marsh sites. They also found that marked chum fry stayed as long in the restored sites as they did at the natural sites, and that fish species composition remained the same between the two sites. Based on studies in the Fraser and Puyallup River estuaries, restored estuarine marsh habitat has been shown to be extensively used by juvenile anadromous salmonids (Aitkin 1998).

Salmonid population model estimates for estuarine restoration in the Nisqually Basin suggest that restoration actions within the estuary (including a project recently undertaken by the U.S. Fish and Wildlife Service at the Nisqually National Wildlife Refuge near Olympia) will double the natural production of fall Chinook salmon in the Nisqually River and provide multi-species benefits throughout the Nisqually Basin (USFWS 2004). An estuarine restoration project at Red Salmon Slough undertaken by the Nisqually Tribe (located east of the Nisqually River) showed immediate post-breaching use of the site, as fish were observed moving into the newly restored site on the very first tidal cycle. Juveniles of both Chinook and chum salmon were documented using the restoration project site the first spring following restoration. Invertebrate prey items utilized by these species were found in the restoration site within a year or less of the reinstatement of tidal influence (USFWS 2004).

Tidal connections were restored in the estuarine restoration project area at the Nisqually National Wildlife Refuge in 2009. Researchers have documented five species of juvenile salmonids that subsequently used a restored slough at the project site. These included Chinook, pink, chum, coho, and cutthroat trout. Studies of diet samples found that these fish were feeding heavily on marine invertebrates that had recently colonized the restoration area.

Under Alternative 2 (Preferred Alternative) of the CCP for the Willapa National Wildlife Refuge, intensively managed pastures and impoundments would be restored as closely as possible to historical estuarine conditions, creating open water, intertidal flats, and salt marsh habitats. This would be accomplished by removing the artificial levees and tide gates and reconnecting estuarine channels.

The Preferred Alternative would positively affect salmonids and other native fish species through an overall improvement to habitat availability and quality, and by improving access. Estuarine habitat would be increased by restoring tidal action to 643 acres.

The Salmon Recovery Funding Board Technical Review Panel has recognized and highly rated the Willapa National Wildlife Refuge estuarine restoration project. Over 100 projects were presented for funding in the state and the Refuge project was rated by the Technical Review Panel as a project of note, one of only seven that received this rating category. Projects of note are "projects that, to the greatest extent, have the potential to protect or restore natural watershed processes for a significant amount of high priority habitat in the most cost-effective manner." This project has received a high level of support from this group of experts.

***Comment:***

- "What happened to the chum salmon in Willapa Bay?"

***Service Response:*** The reason for the decline of chum populations in Willapa Bay is currently unknown. There are many factors that could potentially limit chum populations, including estuarine habitat loss, habitat access, sedimentation, freshwater flow, ocean/climate variability, and interspecies effects. These factors may affect chum in spawning as well as rearing, migration, and adult habitats. Also see the previous response.

***Comment:***

- "Of the projects recommended [in WRIA 24] for estuarine habitat restoration, I do not see Porter, Lewis or Riekkola on this list. Why would this project be picked? This study also recommends that the dikes stay in place for salmon."

***Service Response:*** The Pacific County (WRIA 24) Strategic Plan for Salmon Recovery was completed in 2001. At that time non-native invasive *Spartina* had overtaken much of the intertidal area of Willapa Bay. The large impoundments and pasture at the Refuge would not have been considered for estuarine restoration at that time due to the threat of invasion by *Spartina*. Once *Spartina* had been essentially eradicated after years of effort, estuarine restoration became feasible as well as a high priority for the Refuge.

## OTHER COMMENTS ABOUT DIKES AND TIDAL RESTORATION

***Comment:***

- "Silt and mud that is now contained by the dikes would be washed into the bay impacting the shellfish and burying them as each tide erodes more soil into the bay. The agricultural, fish and shellfish industries generate revenue that sustains a lot of families in our community."

***Service Response:*** As dikes would be completely removed and not breached, the effects of erosion due to water velocity and bed shear would be minimal. Fixed breaches would be extremely difficult to protect from widening and erosion. Remnant dikes could also interfere with natural circulation patterns by confining flood flows and increasing their erosive energy (Hood 2004). During and shortly after construction efforts to remove the Willapa dikes, temporary increases in turbidity are likely to occur. Construction techniques such as dewatering would be implemented to reduce increases in turbidity. These increases are not expected to persist long after construction (McArthur 2010). A restoration project involving much more marsh surface disturbance by deposition of fill material in Oregon (Cornu and Sadro 2002) demonstrated that after 3 years, the fill material had largely remained on the project site and a massive redistribution had not occurred. Also there is no substantial deposition of sediment due to the small, low-energy streams that feed these impoundments.

***Comment:***

- "Has there been a study of the dike habitat itself? Do we want to destroy it without an impact study?"

***Service Response:*** In undertaking this estuary restoration the Service has conducted a rigorous environmental analysis and prepared an environmental impact statement. Removal of the dike structure itself is anticipated to have minimal effect on wildlife. Although there may currently be some garter snake, amphibian, and insect use of the dikes, and occasional use by birds feeding on the latter, the amount and quality of restored habitats will far outweigh any loss in the current use by wildlife. Numerous studies have demonstrated that complete dike removal as opposed to dike breaching or partial removal, is far superior in restoring functional estuarine ecosystems and natural tidal circulation.

***Comment Summary:***

- There were many comments that the areas proposed for tidal restoration were originally purchased with Federal Duck Stamp funds, which were also used to construct the dikes, and therefore tidal restoration should not be considered. Additionally there were comments about Duck Stamp funds and some commenters felt that waterfowl hunting access should remain unchanged.

***Service Response:*** While it is true that much of the Refuge property in the South Bay was acquired under the authority of the Migratory Bird Conservation Act (MBCA) of 1929, nothing in the Act or subsequent amendments to the Act defines or requires specific habitat management action for lands purchased by Duck Stamp monies. The rationale for purchasing properties in the south part of Willapa Bay is probably most explicit in the Narrative Report from November-December 1938, in which it was stated:

> "As the south and southwest end of the Bay constitutes the most important feeding ground for waterfowl in the bay area, at the present time, it seems that this is a problem that does need some consideration."

Other documentation describing the value of the property for waterfowl described it in an unaltered state, and no documentation exists prior to Refuge acquisition that states that development of dikes and water control structures would be necessary for the properties to have some value for waterfowl.

The Porter Point and Lewis dikes were constructed over a five year period (1950-1954) and were constructed by Refuge staff. Rationale for construction of the dikes in South Bay is scant. Only two records exist (Annual Reports February-April and May-August 1942) which state that nesting cover could be improved with the construction of dikes and tide gates, and production of seed foods would make the Refuge more attractive to ducks and geese. No record point to Duck Stamps as being the source of funds for the construction of the dikes. The Riekkola dike was constructed prior to Refuge acquisition in 1960, and while there have been improvements and repairs by the Refuge since owning it, Duck Stamp monies were not the source of funds for such improvements or repairs.

The assertion that lands purchased under the authority of the MBCA are somehow required to be open to hunting or that hunting takes precedence because of the source of funds is inaccurate. The original intent of the MBCA was that the lands purchased under its authority be managed as inviolate sanctuaries for migratory birds in which all hunting is prohibited. Amendments to this MBCA in 1949, 1958, and the Fish and Wildlife Improvement Act of 1978 modified the MBCA to permit hunting on lands purchased with "Duck Stamp" monies with provisions and if certain conditions were met. Nothing in the original MBCA or subsequent amendments requires or mandates hunting on any lands purchased with "Duck Stamp" monies.

***Comment Summary:***

- Comments were received specifying that tidal restoration should not adversely impact private lands adjacent to the Refuge.

***Service Response:*** When the dikes were constructed they were not designed to provide protection to off-Refuge properties or 67th Place. However, the management direction has been modified to address these concerns (see Chapter 2, Goal 8). The existing subdike in the Riekkola Unit will be raised (meeting USFWS standards) and two tide gates will be installed. This modification eliminates the need for raising the county road (67th Place), a designated tsunami evacuation route for Pacific County, and eliminates impact on private landowners' freshwater wetlands (see Map 6 in the Draft CCP/EIS).

***Comment Summary:***

- Many comments were received questioning the costs associated with the tidal restoration proposal, the expenditure of installing the fish ladders, and overall maintenance costs, as well as commenting on the general condition of the existing dike and fish ladder facilities.

***Service Response:*** The Porter Point and Lewis stream fish ladders were constructed in 2001 for a total combined cost of $533,000. Both structures have performed as planned, allowing for water management capabilities behind the dike to occur while at the same time providing some fish access to the wetlands and donor streams during the rainy season. However, one-time construction costs are not indicative of overall costs. The use and operation of the structures has required multiple repairs to slide gate mechanisms, installation of air vents for dewatering pipes, replacement of keyway boards, pressure grouting due to tunneling of water along structures, and concrete repairs to the Porter Point structure. The Porter Point structure is showing structural instability with the dewatering component breaking away from the ladder component. If this occurs, it will result in the failure of the entire structure. Remedial action to correct this problem and any associated costs are unknown at this time. It is expected that both structures will have increased maintenance costs over time, and it is a real possibility that neither structure will be functional in 15 years.

Basic management and maintenance of the dikes, wetlands, and pasture infrastructure is conducted on an annual basis and includes: maintaining fences for grazing program; mowing of pastures; weed control; maintenance of water management facilities (ditches, culverts, tide gates, slide gates, fish ladders); mowing dikes; gravel application to roads, dikes, water gaps, paths; installing and removing signs and hunt blinds; pasture composition surveys; wetland composition surveys; water control structure manipulations; and wildlife response surveys. The annual costs to conduct these activities total approximately $57,000, excluding capital purchases such as tractors, mowers, and/or herbicide applicators. This equates to more being spent on basic management and maintenance over a 10-year period than the initial costs of installing the fish ladders. Major maintenance and repair costs such as replacing water control structures or tide gates and rebuilding failing dikes are regular and recurring, but unscheduled. These items are usually costly and result in one-time expenditures that range from $40,000 for rocking the Lewis and Porter Point dike in 2000 to $533,000 for replacement of existing tide gates with fish ladder facilities.

The existing dikes, tide gates, and fish ladders all have long-term outstanding maintenance issues. The existing Riekkola tide gates have had the gates replaced approximately 10 years ago, but the actual culverts are failing and are in need of complete replacement. The dike itself has subsided and has eroded in many places. This is especially pronounced along the Porter Point and Lewis Units. The majority of the dike is steep-walled and not at the 1:3 height to slope ratio, which leads to stability problems, and this is most pronounced along the Riekkola Unit. Nutria and beaver have tunneled into the dike in several locations, and the dike's stability in some locations is questionable, especially when saturated for prolonged periods as is done by impounding water. Costs for bringing the dike up to general standards as specified by the Army Corp of Engineers were estimated to be $30 million. The cost estimates are the projected costs for a contractor to rehab and bring the existing dikes up to Corp standards for current conditions, not taking into account any sea level rise projections. To remove the Lewis/Porter Point and the outer Riekkola dike with a contractor was calculated to cost 15 million. While both estimates are probably high, the cost of maintaining any dike system over time is continuous and costly and greatly exceeds the one-time cost of removing the dikes.

***Comment:***

- "A question I would like answered by the Army Corps, D.O.E. and E.P.A. pertains to the millions of yards of materials (including gravel) that would be leveled out over the existing salt marsh. The U.S.F.W.S. people told us it would all fit into the hole it came out of, holes that were dug 70 years ago."

***Service Response:*** The engineered plans for tidal restoration incorporated a complete survey of the existing dikes and borrow ditches to determine the volume of material that exists and the amount of area needed to be filled. For the Lewis dike there are 43,226 cubic yards (cy) of material in the dike and a capacity of 46,185 cy in the borrow ditches. For Porter Point there are 44,632 cy of material in the dike and 47,643 cy of capacity in the borrow ditch. For the Riekkola dike there are 39,678 cy of material in the dike and 23,370 cy of capacity in the borrow ditch. Overall, there is a deficit of material to completely fill the existing borrow ditches for the Porter Point and Lewis Units and a surplus of material with respect to the borrow ditches on the Riekkola Unit. To completely fill the borrow ditches on Porter Point and Lewis, material will need to be brought to them or portions of the ditches will have to remain unfilled. The surplus material at the Riekkola dike will be used to bring the wildlife observation overlook trail up to standard. For more details, please refer to Appendix O of the CCP, Estuarine Restoration Plan.

***Comment Summary:***

- Some commenters mention the original purpose of the Refuge (waterfowl) and/or the thought and purpose for why the dikes were installed in the first place as reason enough to not consider tidal restoration.

***Service Response:*** As explained in Section 1.6.1 (Acquisition History and Purposes), one of the rationales for establishing Willapa NWR was the population of wintering black brant and the good habitat conditions for this species. The first Refuge historical records describing brant numbers and behavior were in the January-March 1939 narrative under Waterfowl Observations, wherein it was noted that 10,000 brant were on the bay and that they had changed their feeding habits from eel grass beds to along the shore of the mainland. Subsequent narrative reports in 1940 and 1941 have further observations of up to 6,000 brant foraging on the salt marshes, primarily on *Triglochin*, *Salicornia*, and *Distichlis*. Through 1954, 15 separate notations in the narrative reports discuss brant use of salt marsh, and their timing and numbers. The reports all generally support and have the same observations as this excerpt from the annual narrative dated September-December 1948:

> "The number of Black Brant utilizing the refuge waters is exceptionally heavy for this time of the season. In past they have generally kept to the north end of the Bay until the latter part of December, when they gradually work their way south, timing their arrival on the tidal marsh areas with first plant growth of spring. Already they have been observed on the refuge numbered 66 birds November 8th and on each succeeding weekly census their numbers increased until they numbered 4,000 on December 27th."

The use and importance of salt marsh to foraging black brant in Europe has been documented (Prop 1991; Madsen 1989). While specific studies documenting the importance of salt marsh to foraging brant along the Pacific flyway are lacking, the noted importance of eelgrass to brant and the increased numbers and food intake during the spring for brant in Willapa Bay (Wilson and Atkinson 1995, unpublished data) support Refuge narrative reports of brant utilization of salt marsh in spring when eelgrass beds are depleted.

The first year after the completion of the Porter Point and Lewis dikes in South Bay in 1954, the first notation in the 1955 narrative report stated, "At the beginning of the report period waterfowl populations were low and use of the refuge areas was noticeably less than last year. As the season advanced populations built up to near normal for all species except black brant which showed a decrease in use of refuge areas."

Through 1963, there were 10 observations recorded regarding brant in the narrative reports, all describing use patterns and numbers that were different than what had been reported before the dikes had been constructed. In general, the reported brant use of Willapa Bay changed from large numbers feeding in the salt marsh in south Willapa Bay in the spring to continued use and feeding of eelgrass beds almost exclusively to the north and west of Long Island. Census data from 1999-2000 confirms this continued pattern and in comparison with the 1978-1979 data, show a continuing decrease in brant use in the south Willapa Bay (Jaques 2001).

While there may be a variety of factors that resulted in a shift of brant use from South Bay to the north, waterfowl hunting and oyster industry practices are often cited as factor(s) that alter brant use and distribution (Moore and Black 2006; Wilson and Atkinson 1995). However, neither of these

causes seems likely in this situation as waterfowl hunting does not occur during the spring and oyster industry activities do not take place at all in the far south end of Willapa Bay.

## E.6.3 Goal 3: Comments and Responses

> *Goal 3. Protect, maintain, and restore freshwater habitats historically characteristic of the southwest Washington coastal region for the benefit of migratory birds, salmonids, amphibians, mussels, lamprey, and a diverse assemblage of other native species.*

See responses under Goal 2.

## E.6.4 Goal 4: Comments and Responses

> *Goal 4. Protect, maintain, and restore coastal beach and dune habitats historically characteristic of the southwest Washington coastal region for the benefit of the Western snowy plover, streaked horned lark, pink sandverbena, Oregon silverspot butterfly, and a diverse assemblage of other native species.*

***Comment:***

- "I strongly endorse the recovery of the snowy plover by significantly expanding the exotic beach grass removal program beyond the proposed 229 acres. I also strongly endorse adding at least 33 acres of early-blue violet habitat for reintroduction of the Oregon silverspot butterfly. Additional habitat should be improved to benefit other native vegetation such as the endangered pink sandverbena, beach morning glory and gray beach pea."

***Service Response:*** Comment noted, no response necessary.

## E.6.5 Goal 5: Comments and Responses

> *Goal 5. Provide short-grass fields (improved pastures) and grasslands for the benefit of Canada geese, Pacific jumping mouse, and other grassland-dependent species and restore grasslands for the Oregon silverspot butterfly.*

Many comments related to pastures and short-grass fields were generally related to the loss of dusky Canada goose habitat as related to the estuarine restoration proposal. See Service Response to Canada geese concerns under Goal 2.

In addition, a few comments were received about habitat enhancements for Oregon silverspot butterfly. See CCP Goal 5 Objective 2.4.5.2, Restore Grasslands, and see Service Response under Goal 6 for more information.

## E.6.6 Goal 6: Comments and Responses

> *Goal 6. Promote the recovery of federally threatened and endangered as well as federal candidate and state-listed species.*

***Comments:***

We received many comments supporting recovery actions for threatened and endangered species including support for predator management activities specifically for Western snowy plovers. The comments included below capture the range of concepts provided by commenters:

- "[We are] supportive of the proposed alternatives that would protect, enhance, and restore aquatic habitats, including those used by endangered species, such as the Snowy plover."

- "Procuring future nesting habitat for the federally threatened marbled murrelet is a key driver in this effort, although many other positive outcomes will come from the restoration of healthy forest habitats."

- "Alternative 2 proposes to create 33 acres of improved Oregon silver spot butterfly habitat and to reintroduce this species back into the refuge. This proposed action adds to the refuges diversity."

- "The plan to protect the Western Snowy Plover, Marbled Murrelet, late-successional forest, Pink Sandverbena, and Streaked-Horned Lark and re-introduce the Early-Blue Violet and the Oregon Silverspot Butterfly is a good one for the refuge. The refuge is a perfect place to provide a safe haven for former residents.

- "Despite all efforts, predation meant that no chicks fledged successfully. We understand that killing predators is controversial. However, as the Draft CCP/EIS mentions, elimination of predators has promoted breeding success in Oregon. Since alternative 2 would allow identifying and eliminating both avian and mammal predators, this is the alternative [we] prefer."

***Service Response*:** Comments noted, no response necessary.

***Comment:***

- "I do not support predator control at Leadbetter Point for this species until further data is collected. I believe that the effects of current research, monitoring, and management of the plover on chick survival should be evaluated prior to implementation of a predator management program. I believe that more focus should be placed on improving the ongoing habitat restoration at Leadbetter Point and finding alternate ways to monitor plovers. I hope that there will be an effort to inventory existing predator populations, development of clear objectives for desirable densities of those populations, and continued monitoring to determine effects of predator removal on predator populations as well as snowy plover productivity."

***Service Response:*** Western snowy plover conservation is an objective in all the CCP alternatives for Willapa NWR. Although a predator management strategy is a component under Alternatives 2 and 3 of the Willapa CCP (Appendix L), research data are being gathered and adaptive management actions are currently being implemented. Paramount among measures already in place, are procedures used by Refuge and state biologists while working at or adjacent to plover and lark nests that aim to minimize detection by known predators. Ongoing restoration work is geared toward improving habitat conditions that support the bird's natural defenses for avoiding predation and that enhance

their crypsis in nesting areas. Current and future Refuge objectives for snowy plovers (as described in Objectives 2.4.4.1, 2.4.4.2, and 2.4.6.1 of this CCP) are meant to increase nest success and improve productivity. Monitoring of known predator species through direct observation and with remotely deployed devices has shown that corvids are affecting nest success at Leadbetter Point.

Although human disturbance and trash at Leadbetter Point are much lower than in other areas within the snowy plover breeding range, several significant anthropogenic fixed-point sources of food subsidies lie within a 10-mile radius. These subsidies, as well as other human-caused changes on the landscape, have likely enhanced local corvid populations. Canids are not known to currently pose a significant threat to plovers on the Refuge. However, since the CCP is a 15-year plan for how the Refuge is managed, it must be a dynamic document that addresses potential future conditions. Predator control is but one of the tools that would be available under Alternatives 2 and 3 to help the Refuge meet its CCP goals.

Site-specific data, data from other plover nesting sites, and local predator demographic data will be used to develop population objectives for predator management at Leadbetter Point using a similar approach to that developed for plover recovery objectives. In most cases only problem individuals would be targeted for lethal control, if warranted. Monitoring plover and predator populations, and the response of plants and wildlife to restoration and predator control actions, will be components of the Refuge inventory and monitoring program.

***Comment:***

- "Reclamation as claimed by USFW relating to the blue violet and probably the snowy plover is a misnomer. Until the 1960's the entire Leadbetter area was raw sand left over from the 1700 tsunami. Little grass - no trees - not too ancient drift logs. Violets??? Highly unlikely. I understand this is the Plover's northern most range and when it was more abundant chick survival due primarily to weather was rare."

***Service Response:*** Most of the Pacific Ocean beaches at Leadbetter Point were comprised of sparsely vegetated shifting sand prior to colonization by introduced beach grasses. This was precisely the type of habitat that Western snowy plovers and early blue violets adapted to live in. The reason why restoration is being undertaken by the Refuge is to conserve species reliant on early successional habitats that have been altered by anthropogenic actions. Human activities intent on stabilizing the sand have resulted in ecosystem-level changes to the vegetative character of the landscape. Snowy plover productivity has declined through time in large part due to these habitat changes. As the upper reaches of the beach become less hospitable due to beachgrass encroachment, the birds are forced to nest lower on the beach. This portion of the beach is often overwashed by high tides or storm surges caused by severe weather, which destroy the nests. Beachgrass removal and beach restoration to a natural state will allow species like the plover and early blue violet to flourish under more favorable natural conditions. See Goal 5 Objective 2.4.5.2 for more information.

## E.6.7 Goal 7: Comments and Responses

*Goal 7. Gather scientific information (inventories, monitoring, research, assessments, and studies) in support of adaptive management decisions on the Refuge under Goals 1 through 6.*

***Comment:***

- "The South Bay expansion Area provides scientific opportunities to intensively manage pastures and impoundments restoring historical estuarine habitats and to study restoration to develop lessons learned that can guide restoration in other areas outside the Refuge."

***Service Response:*** Monitoring the efficacy of restoration actions and the response of fish and wildlife would be components of future Refuge inventory and monitoring activities. Information that results from this estuary restoration project will be publicly available, and aspects of the restoration may be presented through a variety of public and professional forums.

***Comments:***

- "The Service acknowledges in the Willapa CCP/EIS that significant sea level rise is expected in Willapa Bay in future decades, but it does not attempt to project the expected range of changes onto the current Refuge habitat. The Service should engage the UW's Climate Impacts Group now to downscale regional sea level rise to the bay to anticipate the potential level of inundation of existing and proposed Refuge habitat and the accompanying consequences for the Refuge. There is a wealth of future climate and hydrologic scenarios from which a climate change vulnerability and impacts assessment can be carried out. The results should inform future planned expansions of the Refuge, especially in areas immediately upland of existing and proposed expansions of the Refuge."

- "Address ocean acidification in the Willapa National Wildlife Refuge: monitor ocean acidification; gather baseline data on marine and estuarine ecosystem and environmental conditions; develop biological criteria to identify the impact of ocean acidification on the Refuge; assess the impacts of ocean acidification on the Refuge; create resilience in the aquatic ecosystem to ocean acidification by curbing other stressors such as pollution and commercial uses; reduce carbon pollution sources within the Refuge and endeavor to reduce other carbon pollution that is impacting the Refuge; make information about ocean acidification and its impacts available to the public both through educational efforts at the Refuge and publishing monitoring data; plan for climate change and ocean acidification impacts."

***Service Response:*** The Service is committed to working with our partners to monitor and address the impacts of climate change on fish and wildlife, and their habitats. Particularly in coastal environments, we are challenged by the large geographic scale and technical complexity required to adequately measure and address climate change impacts, many of which are beyond the scope and scale of the Willapa NWR CCP. Because these challenges cannot be resolved by the Service alone, we will work with our partners (e.g., NOAA) to monitor and address climate change effects on wildlife and their habitats both on and off of Refuge lands. The Service has developed a climate change strategic plan, which will help us direct resources to address the impacts of climate change on natural systems. These combined efforts will provide the framework to gather baseline data on meaningful biological criteria at scales appropriate to monitor, assess, and plan for impacts of ocean acidification.

At the Refuge level, we will continue to implement the management strategies (as described in Section 3.3 of this CCP) that enhance ecological resilience to climate-related stressors. We will work

with our partners (e.g., via the North Pacific Landscape Conservation Cooperative) to encourage similar enhancement of ecological resilience on lands not overseen by the Service. Climate change may have drastic effects on this Refuge, but due to the complexity of the issue and unknown severity of change, the magnitude of effects on native fish, wildlife, plants, and their habitats found on the Refuge, as well as those ecological processes that support them, cannot be predicted during the term of this CCP. Climate change will further exacerbate the impact of any other environmental stressors since it will likely be additive or synergistic.

The Refuge will adhere to Department of Interior and Service policies and initiatives to reduce the carbon footprint of the Refuge by driving fuel-efficient vehicles, upgrading offices to make them more energy efficient, conducting more teleconferencing and recycling, and setting an example for the public and partners.

We agree that ocean acidification as well as other climate change–related processes have the potential to impact Refuge resources. Language has been added to Section 3.3.4 of the Willapa NWR CCP to address ocean acidification's potential effects. As part of the Refuge's outreach and educational efforts we will include information about ocean acidification in our curriculum addressing the impacts of climate change.

## E.6.8 Goal 8: Comments and Responses

> *Goal 8. Foster a connection between Refuge visitors and nature. Visitors will have the opportunity to participate in safe, quality, wildlife-dependent recreation activities located throughout Willapa NWR. These activities and programs include wildlife observation, hunting, fishing, environmental education, interpretation, and photography.*

**NEW ADMINISTRATIVE/MAINTENANCE AND VISITOR FACILITY**

***Comments:***

- "We endorse alternative 2's plans to create a new headquarters in a more accessible location off of Highway 103 and with improved educational and wildlife viewing facilities. We believe that improved public access will bring more support for the Refuge and its mission, and more income to the community through watchable wildlife."

- "Consolidating the refuge outbuildings, currently located on several units, will provide more undisturbed habitat at the respective locations. But even more encouraging is that the refuge will be closer to the schools and community."

- "The construction of a new visitor's center and refuge complex is an economic plus. It also creates a central location for the many activities that engages the population from school children to tourists."

- "The educational impact of building a visitor's center here on the Peninsula, drawing youth and adults to programs offered by the refuge and the Friends of the WNWR is commendable! I am in favor of the program that enhances the opportunity for our children to learn about science and the world around them."

- "The interpretive trail, the wildlife observation deck, the adequate parking lot, the meeting rooms, and other improvements would also draw more visitors to the refuge and provide more access for wildlife viewing opportunities."

- "It also makes sense to move the headquarters, simply because of the septic tank in violation of the Clean Water Act. We need to protect water quality, and we also need restroom facilities, as well as potable water, for refuge visitors and staff."

***Service Response**:* Comments noted. The Refuge will continue to seek opportunities to enhance wildlife-dependent public use and support facilities such as guided activities, signage, trails, and restrooms.

***Comment:***

- "Concerns that a new facility/location for the Refuge headquarters is a wasteful use of taxpayer money. Why not spend a mere percentage of the cost of a new facility and remodel the old one?"

***Service Response**:* Federal funds are appropriated for specific types of projects. For example, funds available for habitat restoration/enhancement come from different sources than funds allocated for construction/renovation and are limited to use only in the allocation area. The economics of renovation to meet building standards and Refuge needs can be debated and weighed against consolidation and new construction. The Service has determined that construction of new facilities allows the Refuge to meet long-term service and mission goals (see CCP Section 1.5, U.S. Fish and Wildlife Service and National Wildlife Refuge System Laws and Directives, and Objective 2.4.8.8, Develop an Administrative/Maintenance and Visitor Facility). The Public Buildings Amendments of 1988, 40 U.S.C. 3312 (formerly Section 21 of the Public Buildings Act of 1959, 40 U.S.C. 619), require that each building constructed or altered by the U.S. General Services Administration or any other federal agency shall, to the maximum extent feasible, be in compliance with one of the nationally recognized model building codes and with other applicable nationally recognized codes. These include standards for structural engineering, fire protection, energy conservation, and accessibility design.

Potable water issues, threatened species concerns, consolidation of equipment and staff, extending priority wildlife-dependent public use opportunities, and other health and safety concerns each play a role in the recommendation to construct a new headquarters complex (see CCP Objective 2.4.8.8, Develop an Administrative/Maintenance and Visitor Facility; Section 5.7.6, Opportunities for Visitor, Administrative, and Maintenance Facilities; and Section 3.9.2, Public Use Effects on Physical Environment in the Draft CCP/EIS). Rainwater collection is already used to provide some of the Refuge's water needs, but the system is frequently overloaded and expensive to maintain. To be used as potable water, collected rainwater must be treated, requiring staff to have additional training and certifications. Costs, as well as health and environmental concerns, must be considered when evaluating the use of bottled water as a potable water source.

The current facility cannot accommodate existing staff and equipment without enlarging the geographic footprint. Planning for the future includes reviewing staff plans, environmental concerns, and short- and long-term effects on wildlife. Alternative sites were considered (see CCP Objective 2.4.8.8, Develop an Administrative/Maintenance and Visitor Facility).

***Comment:***

- "Utilize part of the de-commissioned Ilwaco High School Facility for the headquarters building."

***Service Response**:* The de-commissioned Ilwaco High School Facility is not within the current or expanded Refuge boundary; therefore, it could not be purchased by the Service to be utilized as a new Refuge headquarters. The Service would have to initiate a separate planning and compliance process to acquire the facility. This would require additional funds and staff time in addition to the cost of the facility. In addition, it is likely that the costs to upgrade the school to current federal standards would not be as cost-effective as new construction.

This location would also not meet the Service's needs of providing a centralized location for management activities or for consolidating multiple maintenance facilities located currently in three areas of the Refuge.

Furthermore, the new facilities at the replacement headquarters facility are proposed to be designed and constructed to meet or exceed energy efficiency standards for the Leadership in Energy and Environmental Design (LEED) Green Building Rating System. Site design will strive to incorporate sustainable design concepts such as integrating aboveground stormwater management facilities within existing site contours to minimize overall site grading, and to incorporate native or climate-adaptive (low water consumptive) plant materials into facility landscaping. The site plan combines visitor facilities with habitat restoration efforts to provide the visitor with a natural and educational experience. The new interpretive trail will lead to South Bay and provide unparalleled views of the bay and migratory birds.

***Comment:***

- "The public paid for that land in the Tarlatt Unit to be put into NRCS to protect as a wetland and goose habitat- in perpetuity. Why would you want to put a visitor center/office facility on that property?"

***Service Response**:* In order to build a new visitor center and administrative facilities on the Tarlatt Unit, the Service would work with the Natural Resources Conservation Service (NRCS) to modify the Wetland Reserve Program (WRP) easement on the property. The Service would be required to find replacement acres for the acres removed from the WRP. No net loss of acres would occur.

The Tarlatt Unit is adjacent to Sandridge Road and has access to city water. This location is also closer to the population center on the Long Beach Peninsula, which will allow the Refuge to serve a greater number of visitors. Willapa NWR management would also benefit by consolidating the multiple maintenance facilities (shops, storage, warehouses) located in three separate areas of the Refuge. Having the equipment and staff centrally located would reduce building maintenance and utility expenses, and reduce travel within Pacific County between the various facilities. See CCP Objective 2.4.8.8, Develop an Administrative/Maintenance and Visitor Facility, for additional information.

***Comment:***

- "Why would you want to build in a tsunami zone?"

***Service Response**:* On Pacific County Emergency Management maps, the location for the visitor center and administrative facilities is shown to be within the greatest risk tsunami hazard zone, although a boundary of this zone is just south of the site, near the intersection of Sandridge Road and Pioneer Street. The evacuation route for the site is well established to be southbound on Sandridge Road. The nearest designated assembly area is located south and east of the new headquarters site at 67th Place, east of Sandridge Road. Site planning and design will need to consider the possible need for evacuation in the event of a tsunami.

The Refuge believes that this location will meet the needs of the Service by improving staff productivity, conserving crucial wildlife habitat, reducing annual operations and maintenance costs, and serving as an interpretive area for approximately 200,000 visitors annually.

While the current site identified in the CCP is the best site at this time, we will continue to consider other sites within and outside of the Refuge boundary that could best meet all of the visitor and functional needs. Many of the components, the scale of development, and the concept of consolidating facilities on one site as identified in the CCP will be maintained in the selection and implementation of the headquarters development.

## CHANGES TO REFUGE HUNTING PROGRAM

***Comments:***

- "Per Alternative 2, having 6,058 acres instead of 2,894 acres of refuge lands available to waterfowl hunting should greatly appease the hunters."
- "Although dike removal would change some hunting areas, I understand that Alternative 2 also provides for expanding waterfowl, elk, and deer hunting."
- "The Refuge should implement the permit only elk hunt at Leadbetter and develop ways to monitor its effect on elk movements."
- "I support expanding the special-permit-only elk hunt in the Leadbetter Point Unit, as well as expanding elk and deer hunting in the South Bay Units."

***Service Response**:* Comments noted. See CCP Objective 2.4.8.3, Waterfowl Hunting, Objective 2.4.8.4, Big Game Hunting, and Appendix M, Hunt Plan for additional information.

***Comments:***

- "Based on hunter surveys, interactions with waterfowl hunting organizations, and input from Waterfowl Advisory Groups, we know that quality managed areas with established blinds are a priority for many older and inexperienced hunters. Walk-in access is becoming more limited as upland areas become more developed and leased by hunting clubs. Because of these concerns, we strongly encourage you to maintain and enhance the existing hunting program at the Riekkola Unit. For the same reasons, the managed freshwater wetlands on the Tarlatt, Lewis, and Porter Point units could be reinstated as valuable resources for area hunters."

- "The loss of the short grass habitat and removal of the dikes will eliminate the only ADA accessible hunting blind in the Willapa Refuge (and Pacific County), and the only safe walking access to the South Bay hunting area."

***Service Response**:* Providing walk-in access and blinds for hunters at Riekkola was discussed and considered by the CCP planning team. The final CCP has been modified to include three blinds for goose hunting (including one barrier-free blind) and two blinds for waterfowl hunting (including one barrier-free blind) within 117 acres of short-grass field habitat. Walk-in access to these blinds would be available 7 days a week for waterfowl hunting, and goose hunting would occur according to State hunting regulations. Exact placement of the goose and waterfowl blinds will be determined at a later date to allow for input from hunter working groups and local hunters. Access to these blinds will be provided on a first-come, first-serve basis from a parking area located near Dohman Creek. In addition, a trail from the parking lot will provide walk-in hunter access to Porter Point. See CCP Objective 2.4.8.3, Waterfowl Hunting, Objective 2.4.8.4, Big Game Hunting, and Appendix M, Hunt Plan for additional information.

***Comments:***

- "The regulated goose hunting currently provided on these grass fields is some of the finest quality hunting goose opportunities available to the general public in Washington State. Eliminating this hunting opportunity by flooding the grass fields will certainly provide no benefits to the WA state goose hunters nor will it benefit the wintering population Canada geese that feed freely in those fields for five days of the week."

- "The impact of dike removal on the wildlife observation and hunting is dramatic and negative to the extreme. It will mean total destruction of most popular and highest quality hunting and wildlife observation in the region."

- "The availability of public land for hunting opportunities is dwindling daily, and destroying the already established Riekkola Unit will reduce it that much more."

- "Hunting with a boat is difficult at best. Local experience is needed, as safety becomes a major issue, with strong tides, deep mud, high wind and waves. Many times access on foot is the only safe option."

***Service Response**:* The Service disagrees with the assertion that dike removal will destroy wildlife observation and hunting opportunities. Tidal restoration will improve wildlife habitat for a wide diversity of species (see response for Goal 2). The new trail and overlook will provide unparalleled views of shorebirds, waterfowl, and raptors in Willapa Bay. However, management of short-grass field habitat for elk and geese was discussed and considered by the CCP planning team. The final CCP has been modified to maintain 93 acres of short-grass field in the Riekkola Unit as goose and elk forage. An additional 23 acres would continue to be maintained as upland grassland habitat for elk. The 119 acres of pasture in the Riekkola Unit that would be restored to estuarine habitat represents 1 percent of the total short-grass field currently available within a 25-mile radius of Refuge lands in south Willapa Bay.

The Service also disagrees that hunting the bay with the tides or in a boat is a major safety issue. Refuge hunters currently use the car-top boat launch and foot bridges at Porter Point to safely hunt the tidal marshes in front of the dikes. However, providing walk-in access for hunters was discussed

and considered by the CCP planning team. The final CCP has been modified to include three blinds for goose hunting (including one barrier-free blind) and two blinds for waterfowl hunting (including one barrier-free blind). See CCP Objective 2.4.8.3, Waterfowl Hunting, Objective 2.4.8.4, Big Game Hunting, and Appendix M, Hunt Plan for additional information.

The availability of hunting opportunities on public lands may be dwindling across the state. However, with the changes outlined in the CCP and as new areas are added within the expanded Refuge boundary, hunting opportunities on the Refuge will increase.

***Comments:***

- "Concerned about pushing elk out of the Leadbetter Unit with your proposed hunts. If they get pressured there's only one way for them to go and that's south back in our farms where we don't want them."

- "Having your proposed elk hunts in the Riekkola area, will most certainly chase the elk back towards the Long Beach Peninsula."

- "We rarely see elk around our bogs. However, during hunting season, at times, the elk are scared south and we see them near our bogs. I am concerned that if there is loss of refuge area for the elk during the hunting season, we could get more and more pressure here in our area."

- Concerned that the USFWS wants to eliminate the elk herd at Leadbetter, not control it.

***Service Response****:* Washington Department of Fish and Wildlife is the agency responsible for managing elk populations in the state. WDFW is currently developing or updating management plans for each of the ten elk herds in the state. Herd plans specifically address the unique conservation challenges that face each herd. Objective 16 of the Game Management Plan (WDFW 2008) states that they will update or finalize the Willapa Hills Elk Herd Plan by 2010.

WDFW has a population objective of 7,600 to 8,800 for the Willapa Hills herd (WDFW 2008). One hundred thousand elk hunters harvest approximately 7,000 elk annually in Washington (WDFW 2008). Herd size is estimated by a range of methods including aerial surveys, cow/calf ratio, analysis of harvest data, and so on. Adjustments in season length and the number of antlerless permits issued are used to maintain herd numbers at roughly the population objective.

WDFW (2008) also states that very little is known about the Willapa Hills elk herd. Refuge staff have documented a herd of approximately 70 animals at Leadbetter Point. Approximately 25 elk have been seen occasionally at the pasture edge in the Riekkola Unit and they move on and off the Refuge. In the case of Leadbetter, the general consensus is that the elk herd is expanding.

The Service has no desire to eliminate the elk herd on the Leadbetter Point Unit. The purpose of the regulated elk hunt is to control the expanding herd and protect essential habitat for Western snowy plovers, streaked horned larks, and pink sandverbena, which may be impacted by the large herd.

Proposed elk hunting in the South Bay area of the Refuge and a proposed elk hunt on the Leadbetter Point Unit could help alleviate some of the elk damage that occurs on adjacent lands and help to address some concerns expressed by nearby cranberry bog owners about elk impact on their

properties. There are 94.6 acres of cranberry bogs within a half-mile radius of the Tarlatt and Riekkola Units of the Refuge and 768.5 acres within a 12-mile radius. (This acreage represents only areas south of the Refuge up to the Columbia River and on the Long Beach Peninsula.) See Service Response in Section E.6.12 of this appendix and Appendix M, Hunt Plan, for additional information.

**OPPOSITION TO HUNTING ON THE REFUGE**

***Comments:***

- "None of the alternatives includes expansion of the refuge without expansion of hunting. Hunters make up a small percentage of outdoors people and closing off the Leadbetter Unit for their private use is just wrong. Shouldn't there be one place where the wildlife may be safe year-round?"

- "I have read the 3 proposals and feel that hunting should be disallowed in all proposals. When the word refuge is used it means a safe haven for birds and animals. When one says it is ok to hunt, then it no longer becomes a safe haven. Tax dollars should not be used to promote hunting. As long as you allow hunting the word refuge should be removed."

***Service Response****:* National wildlife refuges exist primarily to safeguard wildlife populations through habitat preservation and management. The word "refuge" includes the idea of providing a haven of safety for wildlife, and, as such, hunting might seem like an inconsistent use of the National Wildlife Refuge System (Refuge System). However, habitat that normally supports healthy wildlife populations, produces harvestable surpluses that are a renewable resource.

One of the five goals of the Refuge System is "To foster understanding and instill appreciation of native fish, wildlife, and plants and their conservation, by providing the public with safe, high-quality, and compatible wildlife-dependent recreational uses. Such uses are hunting, fishing, wildlife observation and photography, and environmental education and interpretation." The Service recognizes hunting as an acceptable, traditional, and legitimate form of wildlife-oriented recreation and, in some instances, as a management tool to effectively control wildlife population levels.

In the 1997 amendments to the National Wildlife Refuge Administration Act of 1966, Congress identified hunting as one of six priority public uses of the Refuge System. These priority uses are to receive enhanced consideration in planning and management over all other public uses. All uses must also be determined to be compatible with refuge purposes before they can be allowed. Appendix C contains the compatibility determinations for all of the uses on Willapa Refuge, including waterfowl hunting; big game and upland game hunting; sport fishing; environmental education, interpretation, wildlife observation, and wildlife photography; camping; haying, silage harvest, and grazing; and research, scientific collecting, and surveys. Each of these uses was found compatible on the Willapa Refuge. The final CCP is designed to restore and manage wildlife habitat and provide quality visitor services including hunting, fishing, wildlife observation, photography, environmental education, and interpretation opportunities in the Refuge.

The Service must coordinate hunting on refuges with other compatible wildlife-dependent public uses to minimize conflicts. We may use time and space scheduling to ensure quality experiences for both hunters and non-hunters. Hunting is monitored, regulated, and designed to ensure that harvest

does not reduce populations to unsustainable levels or have adverse impacts on non-game species, particularly threatened and endangered species.

**OTHER HUNTING COMMENTS**

***Comment:***

- "Re-open the Lewis unit to hunting and other wildlife dependent uses."

***Service Response****:* Entry to the Lewis Unit occurred via a private road, Jeldness Road, off of Highway 101. Jeldness Road is not owned by the Service and was closed by the property owners in 2008. At that time, the Service opened the Porter Point Unit in lieu of the Lewis Unit. Access to Porter Point occurs through the Riekkola Unit off of 67th Place in Long Beach. Currently, the Lewis Unit remains closed to the public, while Porter Point remains open for wildlife observation and waterfowl hunting during the State season.

With the implementation of the CCP, Lewis and Porter Point Units will be restored to estuary, and 5,670 acres will be open for waterfowl hunting 7 days a week and goose hunting according to State regulations. Access to the bay will be through the new car-top boat launch at Dohman Creek as well as the Refuge's current boat launch facilities off of Highway 101. See CCP Objective 2.4.8.3, Waterfowl Hunting, Objective 2.4.8.4, Big Game Hunting, and Appendix M, Hunt Plan for additional information.

***Comment:***

- "Well regulated hunting is probably acceptable. Enforcement is essential."

***Service Response****:* Comment noted. We will continue to utilize law enforcement and hunter education to prevent and resolve hunter issues.

***Comment:***

- "If this project is approved, I believe the US Fish & Wildlife Service should be responsible to develop a like amount of public land that has the access and quality for hunting waterfowl within the boundary of the Willapa NWR."

***Service Response****:* In 2010, the goose hunting program had approximately 18 percent occupancy by approximately 44 individual hunters (119 hunter visits) in the eight blinds in the Riekkola and Tarlatt Units. The waterfowl hunting program had a similar amount of hunters. The final CCP has been modified to include three blinds for goose hunting (including one ADA-accessible blind). This should accommodate the users of the blinds and provide a quality hunting experience. Furthermore, two blinds for waterfowl hunting (including one ADA-accessible blind) will create opportunities for those who want to hunt the tides but may not have access to a boat. Boat access to the bay will be through the new car-top boat launch at Dohman Creek, replacing the car-top ramp at Porter Point. The Refuge's current boat launch facilities off of Highway 101 will also remain.

In addition, as new areas are added within the expanded Refuge boundary, hunting opportunities will increase. Additional improvements/facilities will be created as needed and as funding opportunities arise.

***Comment:***

- "The refuge should be opened to big game hunting and predator hunting to the general public. All user groups should be restricted to short range weaponry (Archery, Shotgun and Muzzleloader). This unit should only be offered as a controlled draw hunt. If ten permits are granted for the game management unit then the hunter has the choice as to what he or she uses. These permits would also allow the hunter to hunt for deer or bear if drawn for an elk tag. Five controlled hunts should be given on Long Island for short range weaponry."

***Service Response****:* Long Island will remain open for elk, deer, bear, and grouse (archery only) hunting. The mainland units (South Bay and Willapa Hills) will be open for elk and deer hunting according to State regulations. The Service is not proposing any predator hunts on the Refuge. The predator control plan identified in Appendix L is directed at recovery actions for threatened and endangered species. See Hunt Plan in Appendix M for additional information about the hunting program.

***Comment:***

- "Goose season in area 2b should go until February 15, waterfowl numbers in this area continue to be strong throughout February. This season would reduce agricultural depredation and provide additional opportunity."

***Service Response****:* The Migratory Bird Treaty Act sets the earliest and latest dates within which states may hold hunting seasons, and stipulates that season lengths may not exceed 107 days. In practice, season lengths tend to fluctuate with bird abundance. They also vary by flyway, usually being longest in the Pacific Flyway and shortest in the Atlantic Flyway, reflecting differences in the abundance of birds, number of hunters, and other factors. Hunting seasons for all migratory birds (including waterfowl) are determined at the state level within the overall frameworks established by treaties and federal regulations. The Washington State Fish and Wildlife Commission sets the hunting seasons in Washington.

***Comment:***

- "The duck hunting on Porter Point has an adverse effect on the geese. The shooting two days a week in Riekkola plus the three days a week in the adjoining Porter Point has combined to 5 days a week disturbance."

***Service Response****:* Currently, goose hunting is allowed on the Riekkola Unit on Wednesdays and Saturdays, while waterfowl hunting is allowed on Porter Point and tidal marsh in front of the dike on Sundays, Mondays, and Thursdays. Currently the State season allows for seven-days-a-week waterfowl hunting. However, waterfowl hunting opportunities at Porter Point are limited to three days a week to reduce disturbance to goose hunting and provide a quality hunting experience.

Wildlife disturbance impacts can be reduced by the presence of adjacent sanctuary areas where hunting does not occur and birds can feed and rest relatively undisturbed. Sanctuaries or non-hunt areas have been identified as the most common solution to disturbance problems caused from hunting (Havera et al. 1992). Prolonged and extensive disturbances may cause large numbers of waterfowl to leave disturbed areas and migrate elsewhere (Madsen 1995; Paulus 1984). In Denmark,

hunting disturbance effects were experimentally tested by establishing two sanctuaries (Madsen 1995). Over a 5-year period, these sanctuaries became two of the most important staging areas for coastal waterfowl. Numbers of dabbling ducks and geese increased four to twentyfold within the sanctuary (Madsen 1995). Thus, sanctuary and non-hunt areas (Lewis Unit and the area within the Presidential Proclamation Boundary) are very important to minimize disturbance to waterfowl populations and ensure their continued use of the Refuge.

The Service will continue to monitor the hunting program to ensure compatibility. See Appendix C, Compatibility Determinations, for additional information.

***Comment:***

- "Recommend a youth controlled hunt within Leadbetter Point for elk and deer using short range weaponry."

***Service Response****:* The Service is not proposing a youth hunt for elk or deer at Leadbetter Point Unit.

**TRAILS AND ACCESS**

***Comments:***

- "Would like to see the five-mile dike made more accessible to the public (birders, hikers, etc.) with convenient parking areas and interpretive signage."

- "Maintain an already existing five mile trail that offers the opportunity to view three types of habitat - salt marsh, freshwater marsh and short grass with fish ladders instead of building a 1 1/2 mile boardwalk costing some hundreds of thousands of dollars that will view only salt marsh habitat."

***Service Response****:* Currently, the entire dike is not open to the public for wildlife observation, photography, and hunting (during State-regulated season). The Lewis Unit is closed to the public.

An additional mile of trail, parking access, and enhanced orientation signage and educational panels will be created as part of the new Visitor/Administrative Facilities. This trail will provide access to a variety of habitats, including restored grasslands and salt marsh, and unparalleled viewing of high concentrations of shorebirds, waterfowl, and raptors. The location will provide ease of access for local and non-local Refuge visitors, including parking, restroom facilities, and enhanced wildlife viewing opportunities (see CCP Section 2.2.2.2, Visitor/Administrative Facilities, and Objectives 2.4.8.1, 2.4.8.2, and 2.4.8.8). The new trail will not be a complete boardwalk, but will be constructed on part of the existing dike, reducing the cost of construction.

In addition the parking area, car-top boat launch, and trail to Porter Point at South Bay (Map 10 in Draft CCP/EIS and Appendix M) will be open year-round to all Refuge visitors. The blinds will be open only to hunters during the hunting season; however, during the non-hunting season, these blinds may be used by any Refuge visitor. This will provide access to additional areas for wildlife observation, photography, environmental education, interpretation, and fishing in the Refuge.

***Comments:***

- "Adding new hiking trails is always a positive thing. I support those actions that assist the refuge visitor obtain an increased knowledge about the resources and the management behind it."

- "Access to the area is important as long as it doesn't interfere with the purpose to provide refuge for wildlife."

***Service Response****:* Comments noted. The Refuge will continue to foster a connection between refuge visitors and nature and will provide wildlife-dependent activities that are compatible with the Refuge's purposes and the Refuge System mission. See Appendix C, Compatibility Determinations, for more information.

***Comment:***

- "A trail should connect Teal Slough and the new visitor center."

***Service Response***: A land route between Teal Slough and the new visitor center site (Tarlatt Unit) traverses lands not managed by the Refuge (see Map 4 in Chapter 2).

***Comment:***

- "The viewing platform at Leadbetter is not ADA accessible, and there is not a truly easy way for a person with certain disabilities to view birds."

***Service Response***: The trail and viewing platform at Leadbetter Point Unit does not provide barrier-free access for disabled visitors. The final CCP includes a new interpretive trail and wildlife observation deck along the South Bay that will be barrier-free. The new trail would tie into our new visitor/administrative/maintenance facility and would provide wildlife viewing opportunities of South Bay.

***Comment:***

- "An alternative to the current planned trail would be a trail/view tower at 113th. Only a short boardwalk would be needed in order to provide great viewing. Regardless of where you build this trail, it must be handicap-accessible."

***Service Response***: The area around 113th is not within the current or expanded Refuge boundary; therefore, a handicap-accessible trail/view tower could not be built in this area in the immediate future. See Appendix A, Land Protection Plan, and previous Service Responses for additional information.

***Comment:***

- "The closure of Jeldness Road to public access has been problematic for refuge visitors who have been used to exploring the forest and marsh at the end of Jeldness Road on foot to watch birds and wildlife. I strongly urge you to find a way to re-establish that access."

***Service Response**:* Entry to the Lewis Unit occurred via a private road, Jeldness Road, off of Highway 101. Jeldness Road is not owned by the Service and was closed by the property owners in 2008. At that time, the Service opened the Porter Point Unit in lieu of the Lewis Unit. Access to Porter Point occurs through the Riekkola Unit off of 67th Place in Long Beach. Currently, the Lewis Unit remains closed to the public, while Porter Point remains open for wildlife observation and waterfowl hunting during the State season. With the implementation of the CCP, Lewis and Porter Point Units will be restored to salt marsh and will be open for wildlife observation and waterfowl hunting 7 days a week. Access to the bay will be through the new car-top boat launch at Dohman Creek. Additional access from the east side of the bay is not being proposed at this time, but the Service is not opposed to developing additional access as funding permits.

**BOAT ACCESS**

***Comments:***

- "We applaud your plans for the car-top boat launch."
- "A small boat landing should be included at Bear River off SR 101 near Jeldness Road."
- "Boat access should be placed on Tarlatt Slough (near end of county road) with the ability to be utilized by all recreational users at all tide levels."

***Service Response**:* The car-top boat launch location has been modified in the final CCP (see Map 4 in Chapter 2). Boat access at this location will be dependent upon the tides. The Refuge's current boat launch facilities off of Highway 101 will remain in place after the visitor center is relocated. Additional boat launches are not being proposed at this time, but the Service is not opposed to developing additional boat access as funding permits. Please note, that the Tarlatt Slough location does not provide boat access at all tide levels.

**FISHING**

***Comment:***

- "Enhancement must include public access to fish to improve overall cost/benefit ratio that returns something directly to the people for the investment."

***Service Response**:* Sport fishing on the Refuge has been determined to be compatible (see Appendix C, Compatibility Determinations). Sport fishing commonly occurs in the state-owned waters of Willapa Bay including the Bear River and Naselle River, within the channels surrounding the Presidential Proclamation Boundary, and along the mainland shoreline. Anglers accessing the fishing opportunities on the Refuge do so by fishing from the shoreline or from boats launched using the Refuge's boat ramp located across the southern tip of Long Island, the Nahcotta boat ramp located on the Willapa Bay side of the Long Beach Peninsula, or the Naselle boat ramp located east of the Refuge headquarters. With the implementation of the final CCP, the new car-top boat ramp at Dohman Creek will also be available for fishing access. Access to the shoreline from the mainland is gained from the adjacent U.S. Highway 101. All fishing is conducted in accordance with State regulations. Fish species caught here are coho salmon, Chinook salmon, chum salmon, and sturgeon.

## VISITOR USE

***Comment:***

- "Coordination with Local Residents -Since local support is crucial for the long-term success of the Refuge, we urge Refuge managers to work closely with all local groups and residents in implementing alternative 2. We are sure that you are aware that transparency and continuous outreach will be necessary at every step."

***Service Response****:* Comment noted. The Refuge will continue to provide information about Refuge management through the use of media and Refuge-sponsored activities.

***Comment:***

- "We also would support continuing and expanding local outreach programs with local groups and residents."

***Service Response:*** Current outreach efforts, including outdoor education, have been requested by school districts and private organizations. Curriculum has been designed and implemented through coordination with local school district staff, members of the Friends of Willapa NWR, and Washington State Park staff. The final CCP will create additional opportunities to partner with local groups to provide an increasing array of wildlife-dependent educational experiences.

***Comment:***

- "Make a better effort to educate the general public that transitions from a freshwater to a saline habitat."

***Service Response****:* Comment noted. The final CCP will expand the Refuge's ability to provide additional educational endeavors.

***Comment:***

- "Ban driving on the beach north of Oysterville Rd year round! (exceptions could be made for clam digs, if necessary.)"

***Service Response****:* Beach driving is administered by Washington State Parks and Recreation Commission, Chapter 352-37 WAC: Rules Designating the Use of Ocean Beaches. In 1988, an amendment to the Seashore Conservation Area Act, RCW 43.51.685-765, created Pedestrian Use Only Areas. These areas include a year-round ban on motor vehicle use from the northern tip of Leadbetter Point to the southern boundary of Leadbetter State Park, which includes the Leadbetter Point Unit of Willapa NWR, with the exception of recreational razor clam seasons.

***Comment:***

- "Camping sites on Long Island would be desirable if measures are taken to prevent damage to old-growth forest and other natural areas of greatest importance (those least disturbed by people)."

***Service Response**:* Refuge visitors may camp in any of the five primitive campgrounds, with 20 campsites on Long Island. The following measures are taken to protect the resources and natural areas on Long Island. A Compatibility Determination has been completed to ensure camping on Long Island is compatible with the mission of the National Wildlife Refuge System as well as the purpose of the Willapa NWR (see Appendix B, Appropriate Use Determination, and Appendix C, Compatibility Determinations). Two of the three state-registered Research and Natural Areas (RNAs) are located on Long Island: Cedar Grove RNA, 264 acres, and Diamond Point RNA, 88 acres. As directed in 8 RM 10.8, RNAs must be reasonably protected from any influence that could alter or disrupt the characteristic phenomena for which the area was established (see Section 1.6.3.1, Research and Natural Areas (Washington State), Section 4.10.1, Designated Natural Area, and Section 5.5.1, Washington State Research Natural Area).

***Comment:***

- "There are too many rules, regulations, boundaries, signs, etc. on the Refuge. An example of this is the new steel poles and signs put throughout the bay to mark the Refuge boundaries. No one hunts in the middle of the bay, and as we talk of making the bay "Natural", we now have unnatural steel poles and signs across the bay."

***Service Response**:* Willapa NWR includes areas closed to migratory bird hunting by Presidential Proclamation (No. 2439) (see CCP Section 1.6.1, Acquisition History and Purposes). This proclamation area was posted soon after its establishment in 1937 and has been maintained or replaced as needed since then. However, many of the old posts and signs had fallen into disrepair, resulting in situations where the public was confused as to what parts of the bay were open to waterfowl hunting. The new steel posts were replacements for existing posts that were creosote-treated timber and were removed when the new posts were installed.

***Comments:***

- "Your own Refuge Administration Act identifies six priority recreational uses. They are listed in this order: hunting, fishing, observation, photography, education and interpretation. Since these are all listed non-numerically or alphabetically, I would assume all are at least equally important, or perhaps they are listed in order of importance."

- Contention was expressed to the use of these migratory bird stamp funds for the construction of trails, boardwalks, viewing platforms, parking lots, restrooms, etc. and for the minimally restricted general public access to this refuge.

***Service Response**:* The National Wildlife Refuge System Improvement Act (Public Law 105-57) amended the Refuge Administration Act (16USC668dd) in 1997, creating a unifying mission for all NWRs as a system and developing a new process for determining compatible uses on refuges. This act lists six wildlife-dependent uses that take priority over all other uses when they are compatible with the refuge's purpose and the mission of the NWRS. These six uses are prioritized over other uses, but not ranked within the six. See CCP Section 1.5.3, National Wildlife Refuge System Administration Act, for more information.

Appendix C contains the compatibility determinations for all of the uses on Willapa Refuge including: waterfowl hunting; big game and upland game hunting; sport fishing; environmental

education, interpretation, wildlife observation, and wildlife photography; camping; haying, silage harvest, and grazing; and research, scientific collecting, and surveys. Each of these uses was found compatible on the Willapa Refuge. The final CCP was designed to restore and manage wildlife habitat and provide quality visitor services including hunting, fishing, wildlife observation, photography, environmental education, and interpretation opportunities in the Refuge.

Duck Stamp funds are specific to the purchase of migratory waterfowl habitat and cannot be used for the construction of facilities. See subsequent Service Response about the Migratory Bird Conservation Act for additional information.

***Comment:***

- "The environmental/outdoor education of children can be done at the local level, such as a school district, or local private or park land. Keep this at the local level."

***Service Response****:* Comment noted. The staff of Willapa NWR and members of the Friends of Willapa NWR will continue coordination and communication efforts to enhance Refuge programs and educate members of the local, state, and national community about Refuge activities.

## E.6.9 Goal 9: Comments and Responses

*Goal 9. Protect and preserve the cultural resources of the Refuge for the benefit of present and future generations.*

No comments received.

## E.6.10 Goal 10: Comments and Responses

*Goal 10. Contribute to the protection of the long-term environmental health of the Willapa Bay ecosystem.*

***Comments:***

We received many comments in support of the Refuge boundary expansion. A representative sample of the comments received follows:

- "I also support the Refuge boundary expansion to include more forested upland habitats. Low land conifer forests in the local landscape (Willapa Hills) are primarily managed for industrial forestry (with the exception of Ellsworth TNC property) and stands with characteristics suitable for species relying on older stands with more diverse tree species, stand structure, and habitats are not well represented in the larger landscape. the Refuge has a unique opportunity provide and protect forests managed for natural values and habitat within one of the most unique landscapes in the lower 48 states."

- "Expanding the Willapa NWR will also benefit nearby protected natural areas which occur on lands managed by The Washington Nature Conservancy, Washington Department of Fish and Wildlife and the Washington Department of Natural Resources by improving ecological connectivity and protecting larger blocks of habitat."

- "I support the acquisition of the most acres to expand the refuge's boundaries—protected lands which will be managed to improve habitat for a variety of wildlife, including shore habitat for migratory birds and (eventually) late succession forest habitat for Marbled Murrelet and Northern Spotted Owl."

- "Acquisition of the properties in the Nemah/Naselle block will also have a positive contribution toward maintaining water quality over the long term for the mariculture industry."

- "The long term protection of the ecological health of Willapa Bay - and the wildlife it supports - depends on conservation of additional lands, especially along the southeast shore of the Bay. It is important that protection for this shoreline includes substantial forested buffers to prevent pollution and degradation of the estuarine environment, and to ensure habitat for birds and other species which live there."

- "The Refuge is pretty spread out and we think expansion into the Nemah/Naselle area, South Bay and East Hills is an excellent idea. The areas planned for expansion are wisely chosen and will definitely further the wildlife protection that the Refuge so importantly provides. The east and south margins of the Bay undoubtedly face land development pressure and it is wise to plan expansion in these areas right now."

- "The land acquisition creates the greatest protection for the watershed and the wildlife surrounding the pristine waters of Willapa Bay. Habitat is the key to plant and animal diversity."

- "A good acquisition example being proposed is adding 4,334 acres of East Hills forest lands to the current Refuge boundary. This action will result in providing protective management to the upper watersheds of Headquarters, North, Chum, Lost, O'Meara and South Creeks eastward on up to the main ridge top in many places. There are so many aquatic species that depend on the required good health of these streams."

- "I support the proposed expansion of the present Refuge boundary under Alternative 2, and believe it to be a necessary component to protect the environment of the Refuge from sedimentation and other degradation, which would result from future uncontrolled multiple uses of the critical habitat and watershed proposed for expansion."

***Service Response:*** Comments noted, no response necessary.

***Comments:***

- "Most of that expansion will come as a donation from conservancy groups or DNR. This is free acquisition of land that is mostly wetland, and therefore doesn't rob the county of future tax revenues. Weyerhaeuser and other timber companies pay taxes only on a 30-year harvest rotation, only on cut timber."

- "The fact that a certain portion of the land to be added to the Refuge is apparently land that will be donated by a non-profit group and is already off the "tax rolls"."

- "Various persons object to removal of timberlands from tax rolls, but we view the addition of the proposed second and third growth parcels to the refuge lands as only a minor decrease in the Pacific County future revenues. We wonder how much of the 4,300+ acres mentioned are really harvestable timber, and how much each of these acres would be worth, on average, to the coffers of Pacific county, spread over several decades of harvest?"

***Service Response:*** Please see Economic Analysis, Appendix R, for information pertaining to timber values and potential contributions to county revenues.

***Comment:***

- "The Refuge should include the Stanley Peninsula, all the land between the bay and highway 101 from the Naselle River to Nemah. It should also include all the undeveloped land between Sand Ridge Road, Highway 101, and Willapa Bay, as well as the already proposed Bear River Ridge addition."

***Service Response:*** In planning the expanded acquisition boundary, a variety of considerations were discussed, which included: identifying landscape features such as the watershed boundary, other lands in conservation status, boundary management issues, and wildlife and habitat factors such as threatened and endangered species protections (see CCP Chapter 2, Section 2.4.10, and Appendix A). The Service is open to discussions regarding opportunities to acquire lands that meet the Service's goals and provide for habitat and wildlife conservation.

Land exchange opportunities are considered by the Service when habitats may be considered threatened. The State of Washington DNR lands or the private holdings at Stanley Point were not considered for the Refuge boundary expansion plan because there is little danger of these lands being developed or sold. We are open to discussions with all landowners regarding our land protection planning and any future potential for conservation of wildlife and habitat resources.

***Comment:***

- "The mission of improving and protecting habitat should be paramount in expanding the Refuge's boundaries, but we urge you to buy easements instead of outright purchase when this mission can be sustained."

***Service Response:*** The Service has various non-purchase methods for acquiring real property rights for Refuge program use. Methods other than purchase that may be considered include donation, exchange, transfer, withdrawal, permit, and cooperative agreement. When appropriate, the Service will consider all opportunities to protect and manage habitats.

The Service could own and manage easements, as is now the case on many refuges with wetland easements, grassland easements, and other conservation easements. Easements are cost-effective conservation. The cost of purchasing and managing a conservation easement on private land is usually less than purchasing the land, although depending on the extent of property rights proposed for an easement, the cost may be essentially equivalent to fee title acquisition.

***Comment:***

- "Any private inholdings in the refuge should be acquired."

***Service Response:*** It is the policy of the Service to acquire lands or easements from willing landowners. Landowners within the approved Refuge boundary who do not wish to sell their property or any other interest in their property are under no obligation to negotiate with or sell to the Service. The Service is open to working with private landowners within the acquisition boundary.

***Comment:***

- "I would also strongly encourage the Service to consider protection of anadromous fish habitat which has been degraded by poor logging practices and development. Stream restoration for their benefit should be a high priority. The Service should consider expansion of Refuge boundaries up the streams that drain into the project study area."

***Service Response:*** The Refuge currently works to improve and restore stream habitats for the benefit of aquatic species both on and off the Refuge. We work with local landowners through the Partners Program (see CCP Chapter 4, Section 4.3.6., and Chapter 2, Section 2.4.11 Goal 11). Within the expanded boundary as presented in the Preferred Alternative, the Service will continue to identify impacted stream habitats and work with partners to restore stream habitats for the benefit of all aquatic species and for the benefit of the watershed.

***Comment:***

- "Acquisition of Nemah-Naselle and East Hills Units. Currently public access to these areas may be limited by the current industrial timber land owners due to fire danger or logging activities. NWR ownership should provide much improved public access as well as an opportunity to manage some of the timberlands toward old growth conditions. It would also preclude development of waterfront or view residential lots of these parcels. This would be especially relevant for the Nemah-Naselle lands. My support here would be conditioned by the following: Public access be maintained. Maintain waterfowl and big game hunting opportunities. Local governments be paid monies in lieu of property taxes."

***Service Response:*** It is the intent of the Service to expand the wildlife-dependent recreation opportunities (hunting, fishing, wildlife observation, photography, environmental education, and interpretation) to any newly acquired lands should the activities be found to be appropriate and compatible. See CCP Chapter 1, Section 1.6.4, which identifies the laws, policies, and orders for management of the Refuge system of lands. The County will continue to receive annual Refuge Revenue Sharing Act payments for lands acquired in fee title. In addition, the County will receive the full timber excise tax for any merchantable timber harvested off Refuge-owned lands (please refer to Appendix R in the CCP).

***Comments:***

- "Alternative 2 proposes to divest the Shoalwater Unit. Logistics support this proposal since it is under water much of the time and so far away from the rest of the refuge. I support this proposed action. Wheaton appears to be an isolated parcel which is difficult

to manage effectively. I believe that some outlying parcels are often ignored due to remoteness alone."

- "These aquatic lands are state-owned and DNR has fee title, as the 1937 Presidential Proclamation did not set aside aquatic lands for the Migratory Bird Refuge. If the divesture alternative is pursued, DNR would continue to own the land and manage the bed-lands. The tidelands would fall under the management of the State Parks Department as a Seashore Conservation Area."

***Service Response:*** Within the Land Protection Plan (Appendix A), the Service identifies two areas, Shoalwater and Wheaton Units, that would be divested from the Refuge.

The Shoalwater Unit (approximately 800 acres) was one of the first large units set aside in 1937. At the time, the habitat of this unit was upland and the beach habitat located in the far north portion of the bay on the mainland. This area of the Refuge has since eroded away due to ocean and bay wave action over the past 73 years and is now, for the most part, submerged.

It is unlikely that DNR owns any of the Shoalwater Unit in "fee title" as these lands were withdrawn from public domain and were never held as private property. The issue of ownership of the Shoalwater Unit is probably moot as we agree that DNR is the best choice for assuming ownership due to their mission and surrounding ownership of the bay bottom.

The Wheaton Unit (132 acres) was given to the Refuge through the Farmers Home Administration and was at one time a privately held farm; it is located approximately 42 miles from the Refuge. Currently there is a contract agreement to maintain the pastures on the Wheaton Unit through a grazing permit with a private farmer. Divestment of this Unit would provide an opportunity to focus management and resources locally.

***Comments:***

- "The proposed refuge area would be expanded by 6,800 acres, more than 4,000 of which would come from working private forest land. This land would be taken out of the tax base – resulting in the loss of local jobs and raising the taxes on the remaining properties and citizens."

- "Expanding the boundaries would have a potential negative impact on jobs, the local economy and services provided to residents by the County."

- "Although the County does receive a small amount of revenue in the form of payment in lieu of taxes (PILT), the amount received is only a fraction of what would be realized if these lands were to continue to be managed as working forest lands."

- "Timberland in Pacific County is some of the most productive timber ground in the world and should be properly managed for timber products. This can only be done by private owners."

***Service Response:*** Refuges enhance the quality of life for local residents by preserving the region's ecological value and aesthetic beauty. Communities also benefit from open space that does not burden the municipal infrastructure, but still provides revenues under the Refuge Revenue Sharing

Act. Landowners within a refuge boundary wishing to sell their properties to the Service benefit from our Acquisition Program. Other benefits include increased opportunities for wildlife-dependent recreation, which may attract visitors to the area, increasing tourism revenues earned by local businesses.

The Service will continue to manage and, when possible, acquire available lands (from willing sellers only) within the current Refuge acquisition boundary. The Service developed a Land Protection Plan that considered and described a broader vision for ecosystem protection beyond the current acquisition boundaries. The purpose of the boundary expansion is specifically identified in Chapter 2, Goal 10 of the CCP: "To contribute to the protection of the long-term environmental health of the Willapa Bay ecosystem." The objective of the goal is "to implement the new Land Protection Plan, recognizing the prioritized lands which provide habitat for endangered and threatened wildlife and the overall protection of the Willapa Bay ecosystem." (see also Appendix A, Land Protection Plan).

National Wildlife Refuges, like other federal-, state-, and county-owned lands are not subject to property taxes. However, under provisions of the Refuge Revenue Sharing Act, the Service annually reimburses counties for revenue lost as a result of acquisition of fee title to private property. Payments are based on the highest value as determined by one of the following three equations: three-fourths of 1 percent of the fair market value of the land; 25 percent of net receipts; or $.75 per acre. Congress may elect through the budget process to appropriate additional supplemental funds to ensure full payment. The Act also requires a reappraisal of acquired lands every 5 years to ensure payments to local governments are based on current land values. Pacific County currently receives annual revenue sharing payments from the Service which have averaged $63,221 over the past eight years. Any new lands purchased as part of the Refuge would be included in payment calculations to the County. The Refuge Revenue Sharing Act is further described within the CCP Chapter 2, Section 2.3.2, and Appendix A, Section A.9.

In addition to the Refuge revenue sharing payments, the County will be receiving a timber excise tax as authorized by state law. Under the program, a 5 percent timber excise tax is levied on harvesters of timber by Washington Department of Revenue (DOR). DOR then pays 4 percent to the County where the timber came from and keeps 1 percent for the state. When timber is harvested from public lands, the first person to acquire title or possessory interest in the timber is required to pay the tax. As most of the Refuge timberland and timberland within the proposed boundary expansion will require active thinning to meet forest restoration goals, a significant amount of revenue will be generated for the County. For more information see Economic Analysis, Appendix R.

***Comment:***

- "Alternate sources of funding besides congressional appropriations will need to be found to expand the refuge size other than federal appropriation which we as a nation cannot afford at this time."

***Service Response:*** Acquisition of land from willing sellers remains a critical tool in safeguarding wildlife and habitat while providing opportunities for wildlife-dependent recreation. However, increasing land costs, limited acquisition funding, and the needs of existing refuges present challenges to continued and timely additions to the Refuge System.

Funding for National Wildlife Refuge land acquisition comes from federal Duck Stamp sales, entrance fees to certain National Wildlife Refuges, import taxes on firearms and ammunition, and

appropriations under the Land and Water Conservation Fund Act and the Migratory Bird Conservation Fund. These are all public funds and programs established to benefit wildlife.

There are other options available to the Service that would allow the Refuge to manage lands within the approved acquisition boundary. These include: conservation easement, long-term lease, cooperative agreement, and memorandum of agreement. (see Appendix A, Land Protection Plan, Section A.5.2.) Landowners sometimes choose to donate all or a portion of their land as a lasting memorial or for tax purposes. Not-for-profit organizations, such as The Nature Conservancy, may work with the Service and donate lands.

***Comment:***

- "We would prefer that USFWS actively manage their current lands and use their financial resources to apply best science practices to keep them healthy for the future."

***Service Response:*** We understand that there can be a conflict between managing what exists and acquiring more that can strain available resources necessary for successful management. In this situation, we took a long-term view that identified areas that would best contribute to the resources of the Refuge as well as areas that could be lost through development or some other means. Much of what was identified within the proposed boundary expansion has a timber component, which will need active thinning for many years to get it on a trajectory to attain old-growth characteristics. This aspect of restoration/management is something that will pay for itself through timber sales (please see the CCP Economic Analysis, Appendix R). While a boundary expansion may be authorized, it in no way guarantees that the Refuge will acquire any additional lands. However, for the duration of this plan (15 years), should funding be available and willing sellers exist, it makes sense to protect these properties even if at the time we cannot fully restore them due to a lack of financial resources.

***Comment:***

- "Divestment of property in the Cape Shoalwater and Wheaton Units would encourage more development in the area which is not needed. It would eliminate public access to coastal lands."

***Service Response:*** The Shoalwater Unit currently does not provide any public access as it is completely below mean high water and is submerged. It is unlikely that any disposition of these units to Washington State would have any effect on development potential of nearby uplands. The Wheaton Unit would be transferred with the wetland easements in place and therefore remain protected. We believe it would be more efficient for these properties to be owned and managed by one of the Washington State resource agencies.

## E.6.11 Goal 11: Comments and Responses

*Goal 11. Provide support for off-Refuge conservation efforts in southwest Washington in partnership with private landowners, agencies, and nongovernmental organizations.*

***Comments:***

- "A more effective approach for conserving and restoring Willapa's forest ecosystem is one in which conservation funding is used to catalyze change within the forest industry. I suggest that this can be done by helping to defray the costs of protecting specific forest functions that provide for public benefits, such as fish and wildlife habitat. The use of easements can be very effective for accomplishing this."

- "Finally, working cooperatively with large, private landowners on lands they manage to develop a model for conservation that is driven by economic incentives and disincentives, will greatly increase the overall impact of the public funds that are spent. If public dollars are matched by private ones in such cooperative approaches, conservation practices can be carried out at a far more meaningful scale."

***Service Response:*** The Refuge has a Partners for Fish and Wildlife Program, which focuses on partnerships with willing private landowners, nongovernmental organizations, and tribes to protect, restore, and enhance coastal habitats including forest ecosystems on a watershed/landscape scale. Through this program, the Refuge provides technical assistance to develop sound habitat restoration projects, provides and/or assists in locating fund sources to implement projects, and oftentimes assists in delivering all or a portion of a restoration project. Landowner agreements and conservation easements with willing landowners are used when appropriate. The Refuge acknowledges that successful restoration practices on the Refuge can be useful on private property under the right conditions and that numerous meaningful potential conservation opportunities outside the Refuge boundary exist.

## E.6.12 Comments not Related to a Specific Goal or Objective

**ELK**

***Comment Summary:***

- Many comments were received expressing concerns that tidal restoration and increased hunting opportunities would cause elk herds to move onto nearby cranberry bogs and cause economic damage. Concerns were also received regarding elevated goose use of private pastures, should tidal restoration occur (please see Canada Goose response section under Goal 2).

***Service Response:*** No numbers are available for the population of Roosevelt elk on the Long Beach Peninsula from the lead agency for elk management in the state (Washington Department of Fish and Wildlife). Refuge staff have documented a herd of approximately 70 animals at Leadbetter Point at the northern terminus of the Long Beach Peninsula. Approximately 25 elk have been seen occasionally at the pasture edge in the Riekkola Unit, and they move on and off the Refuge. In the case of Leadbetter, the general consensus is that the elk herd is expanding.

Not much is known about elk movements on the Long Beach Peninsula as no study has been done. Elk, however, are wide-ranging animals, and home ranges for Roosevelt elk are usually 1,500 to 4,000 acres. Harper (1971) stated that the average daily distance traveled by Roosevelt elk in Oregon is about 1,200 yards (October-June), 800 yards (July), and 500 yards (August-September).

Meandering by feeding, elk may cover a total of 1,200 yards, but the beginning and end points may only be 300 to 400 yards apart.

In the Riekkola Unit, Roosevelt elk forage in salt marsh and pasture as well as forested areas. Salt marsh use has been documented by Refuge staff and has been observed in other natural areas on the West Coast in the United States and Canada (site literature: Tahsish River Ecological Reserve and Salmon River Estuary, Vancouver Island). According to Kurt Jenkins (USGS-Forest and Rangeland Ecosystem Science Center, Olympic Field Station), elk have been seen in the tidelands around the Duckabush and Dosewallips on Hood Canal. Tideland as an elk feeding area has been mentioned in the literature (Schirato and Wiltse 1990).

Salt marsh plants utilized by elk include species of *Agrostis, Carex, Juncus, Scirpus, Plantago, Deschampsia,* and *Festuca* (Jenkins and Starkey 1991). No detailed elk food studies have been done locally but a study in western Oregon (Harper 1971 *in* North American Elk: Ecology and Management) found about 70 percent of elk diets in the spring and summer consisted of browse. This percentage declined to about 50 percent in the fall and winter. Forbs were important in fall and winter, when they made up approximately 30 percent of the diet. This dropped to about 15 percent in spring and summer. Consumption of grass species ranged from 12 percent to 15 percent, although grass consumption increased in winter to about 20 percent. Jenkins and Starkey (1991) found that Roosevelt elk consumed a large variety of plant species across their range, exhibiting generalist foraging strategies.

Pasture is an important elk habitat on the west side of the Cascades (personal communication WDFW). There are 2,544 acres of pastures within a 12-mile radius of the Tarlatt and Riekkola Units of the Refuge, which contain 275.5 acres of pasture. (This acreage represents only areas south of the Refuge up to the Columbia River and on the Long Beach Peninsula.) The Refuge currently contains approximately 11 percent of this pasture habitat. A reduction in pasture habitat is proposed in Alternative 2 due to estuarine restoration. Pasture at the Riekkola Unit will be reduced by approximately 120 acres. The short-grass and old field habitat that will remain at Riekkola is in a location that has consistently demonstrated the most use by elk.

On the Refuge, elk occasionally forage on smartweed in a freshwater impoundment that has been drawn down (the Lewis and Porter Point impoundments are drawn down on a rotational basis). This food resource is available for a limited period (approximately 2 months) due to the lag time necessary for the forage to mature enough to attract elk.

Disturbance is currently an issue with elk use of Riekkola pastures. In a communication with WDFW it was stated that the Refuge grazing program and goose hunt are disturbance factors for elk, and elk will avoid these areas during the period when these activities are taking place. February through mid April is the only prolonged period where elk are not disturbed by these activities, as this is the period after the hunt ends and before cattle are placed on the fields. Several studies have documented competitive displacement of elk in response to the presence of cattle (Coe et al. 2001, 2004; Stewart et al. 2002; Toweill and Thomas, eds. 2002; Wallace and Krausman 1987; Yeo et al. 1993). To alleviate competitive displacement of elk, the Refuge grazing program may be eliminated and if feasible, haying will be instituted as a management tool to maintain short grass habitat for elk and geese. In addition, old field habitat will also be available for elk and goose foraging habitat.

Forest restoration efforts on the Refuge should assist in creating additional elk habitat due to variable density thinning and thinning with skips and gaps, which set back plant succession to a degree, and

along with more natural processes such as windthrow and occasional fires, create openings in the forest and favorable foraging conditions for elk.

Proposed elk hunting in the South Bay area of the Refuge (Riekkola, Porter Point, and Lewis Units) and a proposed elk hunt on the Leadbetter Point Unit could help alleviate some of the elk damage that occurs on adjacent lands and help to address some concerns expressed by nearby cranberry bog owners about elk impacts on their properties. There are 94.6 acres of cranberry bogs within a half-mile radius of the Tarlatt and Riekkola Units of the Refuge and 768.5 acres within a 12-mile radius. (This acreage represents only areas south of the Refuge up to the Columbia River and on the Long Beach Peninsula.)

In regard to comments on potential increase in depredation that may or may not result from estuarine restoration, some National Wildlife Refuges were established for the express purpose of alleviating crop depredation on surrounding private cropland and are part of their establishing legislation. An example is the Merced NWR in the Central Valley of California, which was established under authority of the Lea Act " … for the management and control of migratory waterfowl and other wildlife …." There is no legal authority or purpose in either the establishment of Willapa NWR or in subsequent additions that give the Refuge the purpose of alleviating crop depredation pressures on private lands (see Section 1.6, Establishment and Refuge Purposes). Goose and elk use of area pastures and cranberry bogs already exist, and tidal restoration practices are not expected to significantly change elk and goose use of the Refuge over time (see Canada goose response under Goal 2). The Washington Department of Fish and Wildlife does have a compensation program in place for elk damage that occurs to private property. The number of complaints reported for elk damage to cranberry bogs in Pacific County between 2000 and 2010 has totaled two incidents, with a total payment of $4,759.37. There is no indication that this extremely low-level impact on local cranberry bogs would change significantly in the near future.

## PLANNING PROCESS AND CCP SCOPE

***Comment:***

- "I would like this draft plan to be re-done with better and more options. Separate out some of the issues into more options:- the dike removal- the 4,000+ acres of timberland-the new headquarters. All these issues are major items of their own and when Alternatives are given with more options, it could get support for."

***Service Response:*** Please refer to Chapter 1, Section 1.9, Issues, Concerns, and Opportunities, and Section 1.8, The Planning Process. Although CCPs are comprehensive plans, no single plan can cover all issues or variations of issues. Individual issues influence and help to define the draft management plan. The CCP planning process is designed and developed to analyze major issues, and then develop a series of combined management alternatives that address these issues in one management plan. Alternatives 2 and 3 identified in the draft CCP have the major issues linked to each other in varying degrees. The alternatives presented also include the current management; Alternative 1, which is used as the baseline to compare the other alternatives. This alternative does not include any new issues. Major issues singled out individually would not represent the management plan and the impacts of that plan, which are required by law in this process.

***Comment:***

- "Alternative 1 is the best proposal at minimizing negative impacts to the surrounding community, but is not the best alternative for the reliant wildlife, public utilization, or surrounding community. PROBLEM: the best possible alternative is not yet presented in the draft CCP/EIS. Required drafts are presented not for automatic adoption or just to fulfill the 'PROCESS' requirements but correspondingly to expose and correct concerns, complications, and harms through further actions that offer more viable solutions, solutions often not yet on the table."

***Service Response:*** Please see Chapter 1, Section 1.3, Purpose and Need for the Comprehensive Conservation Plan, and Section 1.8, The Planning Process. The Service's CCP planning process and guidelines, in addition to satisfying service planning policy, are also designed to satisfy the requirements of the National Environmental Policy Act (NEPA) planning process, which requires in general: the identification of resource issues, the development of alternative management plans, the evaluation of effects of the alternative plans on the environment, and the solicitation of public comments on the alternative plans. During the analysis of letters received, the Service considers the alternative suggestions and ideas presented by the public. Viable solutions suggested, that fall within the scope of the plan, are considered thoroughly.

***Comment:***

- "USFWS acquired the Riekkola Property through a condemnation process that started July 24,1959 to include this property as a public goose field in the refuge."

***Service Response:*** The Service did acquire these lands through the condemnation process "eminent domain" as the records indicate. The method of acquisition does not change the purposes of the Refuge unit or the planning process for the unit. By law, National Wildlife Refuge lands are closed until opened for public use. It is true this unit has over time been opened for hunting. Through the CCP planning process, we examine the management activities on the refuge and determine the appropriate course of action for each of these activities based on the needs of wildlife and their habitat first. As a side note, the Service maintains a "willing seller" policy for the purchase of new Refuge lands.

***Comment:***

- "What will happen in 15 years?"

***Service Response:*** We will initiate a new planning process and revise the CCP as necessary to guide the Refuge for the next 15 years.

***Comment:***

- "At the very least I would recommend that you extend the public comment period for the Willapa National Wildlife Refuge (Refuge) Draft CCP/EIS in order to seek a better community consensus regarding the management of the Refuge."

***Service Response:*** The Service extended the public comment period from 45 days to 60 days to provide more opportunity for people to provide comment.

***Comment:***

- "This proposal has not had adequate public scrutiny nor has the public had adequate opportunity to express opinions. To my knowledge, only one meeting was held to which the public was invited. That meeting was in 2008 and I was there along with some forty or so other citizens; not one person outside of Refuge personnel supported breaching any dikes."

***Service Response:*** Please see the Public Scoping section at the beginning of this appendix, Summary of Public Involvement. We initiated public scoping on April 9, 2008 by publishing a Notice of Intent in the *Federal Register* (Volume 73, Number 69). We distributed our Planning Update 1 (newsletter) announcing our planning process and two public meetings to a mailing list of approximately 400 recipients. Our press release announcing the planning went to five regional television stations, one local radio station, and eight western Washington and Oregon newspapers. We issued three additional Planning Updates to our mailing list and posted the updates to the Refuge web site. Planning Update 2 was mailed in August 2008 describing the results of public scoping. Planning Update 3 was distributed in July 2009 and identified the preliminary management alternatives, and Planning Update 4 was sent out in January 2011 announcing the draft release's availability for public comment. A local public hearing was organized to discuss the draft management alternatives on March 13, 2011. The comment period was lengthened to 60 days to provide more opportunities for public comments. The public comment summaries are located in Appendix E and comments related specifically to breaching the dikes are located under *Tidal Marsh Restoration Comments Received*. Public involvement and public input has been a major influence on this planning effort and in reaching the final decisions.

***Comment:***

- "Salmon money should not be a factor that steers the refuge. As far as I can tell your local organization have put the cart before the horse by getting the funds from the Willapa Bay Regional Fisheries Enhancement Group."

***Service Response:*** The source of funds does not direct management actions but is based on laws, proclamation, executive order, donation document, and administrative memorandum that pertain to the Refuge (please see CCP Chapter 1, Section 1.6, Refuge Establishment and Refuge Purposes). It is not unusual to seek funds through multiple grants and outside fund sources for a specific project. It does sometimes happen that there can be two or more successful grants for a single project or that funding that is obtained is unable to be applied because of a change in circumstances. While funds have been obtained for part of the proposed tidal restoration, they can be retained for a period of time and should the project be invalidated, returned to the Salmon Recovery Funding Board.

***Comment:***

- "The draft began with a desired outcome, and the *facts* and anecdotal examples were skewed to support that outcome."

***Service Response:*** We are required through the CCP process to develop a series of alternatives and to identify an agency-preferred alternative. The thoughts, rationale, and science behind the decision to select the Preferred Alternative are also required. The purpose of the comment period is to allow the public to review that information and to provide comments to our CCP proposed alternatives, including providing information that we overlooked or scientific reports and data that we were not

aware of that could influence the development of alternatives. Changes were made to the final CCP to reflect public input.

***Comment:***

- "I would like to see an environmental and economic impact study completed by an institution that does not have a stake in the outcome of the project. Maybe a non-profit organization or university from outside the state of Washington would be a sound option. It is my belief that the current information being used is sloped. I believe that it has been produced in cooperation with the agency that will benefit from the findings through government grants and funding."

***Service Response:*** We are mandated by the National Wildlife Refuge Improvement Act to develop a CCP and conduct any National Environmental Policy Act requirements (EA/EIS). By law, the Service is responsible for the content of the CCP, associated environmental compliance, and decisions based on the processes and analyses under relevant statues, regulations, and policies. However, for this process, we have contracted with Washington State University to conduct specific studies to confirm Refuge data sets, have had a team of resource professionals outside of the Refuge review and partake in the crafting of the CCP, and have used available reports and studies that pertained to our resource issues.

***Comment:***

- "I did not find anything in the EIS concerning the City of Long Beach biosolids application site just inside the dike on the west end. It seems it would cut down considerably on ability to leach into the ground before entering the bay."

***Service Response:*** This issue is considered to be beyond the scope of the plan as it is outside the current and proposed Refuge boundary.

***Comment:***

- "Expand the woodland east of Highway 101 not only as refuge, but also as mitigation for the Naselle Radar Ridge Wind Turbine Project - a blended community wide project with multiple benefits."

***Service Response:*** This issue is considered to be beyond the scope of the plan as it is outside the current and proposed Refuge boundary.

***Comment:***

- "I recommend that USFWS manage the Long Island Unit with long-term restoration goals that would make it more eligible for consideration as a Wilderness Area in fifteen years when the next CCP revision is made."

***Service Response:*** We are working toward restoring Long Island to a condition that resembles historical conditions. The work associated with forest restoration will take longer than 15 years, but if successful should at some future time allow for consideration and analysis of potential wilderness

designation discussion to be conducted. For more Wilderness information please refer to Appendix G.

**OTHER COMMENTS**

***Comment:***

- "Who will repay the cattle rancher for cattle susceptible to ecoli from the goose droppings?"

***Service Response:*** We are unaware of any evidence linking goose excrement with disease transmission to cattle. Converse et al. (1999) further support this by stating that "although some authors have attempted to link the occurrence of *Salmonella* spp. in wild birds (i.e., gulls) with the transmission of *Salmonella* spp. in domestic animals (Williams et al. 1977; Hatch 1996)," to their knowledge there is no conclusive evidence, including DNA studies that substantiate this contention. *Escherichia coli* is a member of the fecal coliform group and is considered a normal inhabitant of the intestinal track of all mammals and some other animals, including Canada geese (Hussong et al. 1979). Toxigenic *E. coli* was not found by Converse et al. (1999) in their study investigating pathogens in goose fecal matter. However, they conclude that further study is needed to completely rule out involvement of Canada geese in transmission of this pathogen.

***Comment:***

- "To increase habitat for Waterfowl, Big game all of the other wildlife species mowing of the Bear River Dike lowlands should be considered regardless of the alternatives."

***Service Response:*** The area east of Highway 101 that is impacted by limited tidal influence is approximately 180 acres. The intent is to restore full tidal action to this property and at this time we have not developed any management strategies for this area that would include mowing because mowing is not a management action that is known to improve habitat conditions in estuarine habitats.

***Comment:***

- "And we further demand that no more tax dollars be used to fund any and all dangerous chemicals being sprayed on public lands in Washington State."

***Service Response:*** Please refer to Appendix H of the CCP, which details the laws, regulations, and policies that guide Refuge herbicide/pesticide use.

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# Appendix F. Implementation Plan

## F.1 Overview

Full implementation of the CCP will require additional funding for specific actions, which will be sought from a variety of sources such as the existing budget, congressional allocations, Refuge Roads funding, partnerships, and grants. However, a significant portion of what is laid out in the Plan can and will be accomplished within existing annual budget allocations. There are no guarantees that additional federal funds will be made available to implement any of the projects. Other sources of funds will need to be obtained (both public and private). Activities and projects identified will be implemented as funds become available.

Operational management of Refuge lands is accomplished by permanent and temporary staffing, volunteers, and partnerships. Operational management includes managing public use, law enforcement, biology, fire, maintenance, administration, and habitat management programs on the Refuge.

The CCP presents several projects to be implemented over the next 15 years. All of these projects are included in either the Refuge Operational Needs System (RONS) or the Service Asset Management System (SAMMS). Both are used to request funding from the U.S. Congress. The RONS documents propose new projects to implement the CCP to meet Refuge goals and objectives, as well as legal mandates.

Annual revenue sharing payments to Pacific County, Washington, will continue. The total revenue sharing payment made in 2009 was $47,369 but will vary over time based on the value of Refuge property which is reassessed every five years. Revenue sharing payments will increase with any additional acreage acquired by the Refuge.

Monitoring activities will be conducted on a percentage of all new and existing projects and activities to document wildlife populations and changes across time, habitat conditions, and responses to management practices. Actual monitoring and evaluation procedures will be detailed in step-down management plans.

## F.2 Costs of Implementing CCP

The following sections compare both one-time and recurring costs for various projects. One-time costs reflect the initial costs associated with a project whether it is purchase of equipment, contracting services, or construction. Recurring costs reflect the future operational and maintenance costs associated with the project.

### F.2.1 One-time Costs

One-time costs are start-up project costs. These costs do not include permanent operational costs (staff salary and support). They can, however, include the cost of temporary or term salary associated with a short-term project. Salary for new positions and operational costs are reflected in operational or recurring costs. Funds for one-time costs will be sought through increases in Refuge base funding, special project funds, Refuge Roads funding, and through grant opportunities.

Projects listed in Tables F-1, F-2, and F-3 show relative one-time costs for specific actions under the management direction. One-time costs are typically those associated with building and facility needs such as offices, public use facilities, road improvements, habitat restoration projects, or baseline inventories. Tables F-1, F-2, and F-3 detail the one-time costs of the management direction for the Willapa NWR.

**Table F-1. One-time Costs (in Thousands) for Research, Monitoring, and Planning.**

| Project Research, Monitoring, and Planning | Unit | Unit Cost | Cost Estimate | Potential Fund Source |
|---|---|---|---|---|
| Survey and monitor for marbled murrelet presence/absence (Obj. 1.1F) | Project | $25 | $40 | 126X |
| Monitor water quality as warranted by conditions of restoration and/or maintenance activities (Obj. 2.1B, 2.2E) | Project | $2 | $7 | 126X |
| Compile watershed assessments (Obj. 3.2B) | Mainland and Long Island | $20 | $40 | 126X |
| Research actions for Western snowy plovers as needed (Obj. 6.1C) | Project | $10 | $10 | 126X |
| Inventory of Western snowy plover, streaked horned lark, pink sandverbena, mammal, fish and priority amphibian and invertebrate species on the Refuge (Obj. 7.1B) | Project | $30 | $40 | 126X |
| Management planning as needed for NEPA compliance | Project | $40 | $80 | 126X |
| **Cost for research, monitoring, and planning of projects Subtotal (thousands)** | | | **$217** | |

Projects will be funded as opportunities arise.

**Table F-2. One-time Costs (in Thousands) for Facilities.**

| Project Facilities | Unit | Unit Cost | Cost Estimate | Fund Source |
|---|---|---|---|---|
| Construct a visitor contact and office facility that would include indoor/outdoor environ-mental education facilities (Obj. 8.6D and 8.8) | Tarlatt | $6,500 | $6,500 | Construction |
| Enhance 12 miles of trails with replacement signage and bridges (Obj. 8.2) | Refuge | $120 | $120 | 126X |
| Create a new trail based on the restoration along South Bay and new office/visitor center design (Obj. 8.2A and 8.1E) | Tarlatt | $320 | $320 | Construction/ Grant/ Donation |
| Create new wildlife observation site (Obj. 8.2A and 8.1F) | Tarlatt | $50 | $50 | Construction/ Grant/ Donation |
| Construct car-top canoe/boat put-in to access South Bay from Riekkola Unit (Obj. 8.1, 8.3F, and 8.5) | Riekkola | $18 | $18 | 126X |
| Prepare environmental/cultural education materials for interpretation displays/exhibits/ brochures regarding resources of the Refuge (Obj. 9.1) | Refuge | $10 | $ 0 | 126X |
| Install interpretive panel/map at new headquarter and along interpretive trail (Obj. 8.1F and 8.2A) | Tarlatt | $40 | $40 | 126X |
| Improve signage to better delineate Refuge and hunt boundaries (Obj. 8.3 and 8.4) | Refuge | $60 | $60 | 126X |

| Project Facilities | Unit | Unit Cost | Cost Estimate | Fund Source |
|---|---|---|---|---|
| Remove old buildings and restore habitat of the old building sites. | Refuge | $120 | $120 | Construction/ 126X |
| **Cost for all facilities Subtotal (thousands)** | | | **$7,228** | |

Projects will be funded as opportunities arise.

**Table F-3. One-time Costs (in Thousands) for Habitat Management.**

| Project Habitat | Unit | Unit Cost (in dollars) | Cost Estimate | Fund Source |
|---|---|---|---|---|
| **Objective 1.1 Protect and maintain late-successional Sitka spruce zone forest** | | | | |
| *Number of acres* | | | *557* | 126X |
| Total cost | acre | $50 | $28 | |
| **Objective 1.2 Restore late-successional Sitka spruce zone forest** | | | | |
| *Number of acres* | | | *1,2987* | 126X |
| Total cost | acre | $200 | $2,597 | |
| **Objectives 2.1 and 2.2 Restore and maintain open water** | | | | |
| *Number of acres* | | | *878.2* | 126X |
| Total cost | acre | $50 | $44 | |
| **Objectives 2.3 and 2.4 Restore and maintain intertidal flats** | | | | |
| *Number of acres* | | | *4,187* | 126X, Salmon Recovery Funding Board |
| Total cost | acre | $100 | $419 | |
| **Objectives 2.5 and 2.6 Restore and maintain salt marsh habitat** | | | | |
| *Number of acres* | | | *611* | 126X, Salmon Recovery Funding Board |
| Total cost | acre | $100 | $611 | |
| **Objectives 3.1 and 3.2 Protect, restore, and maintain riverine habitats** | | | | |
| *Number of acres* | | | *27* | 126X |
| Total cost | acre | $100 | $3 | |
| **Objective 3.3 Seasonal, managed freshwater wetlands** | | | | |
| *Number of acres* | | | *17* | 126X |
| Total cost | acre | $50 | $1 | |
| **Objective 3.4 Permanent/semi-permanent natural freshwater wetlands (includes beaver ponds and interdunal wetlands)** | | | | |
| *Number of acres* | | | *545* | 126X |
| Total cost | acre | $30 | $16 | |
| **Objectives 4.1 and 4.2 Protect, restore and maintain coastal dune ecosystem** | | | | |
| *Number of acres* | | | *1,801* | 126X |
| Total cost | acre | $75 | $135 | |
| **Objective 5.1 Maintain short-grass fields (improved pastures)** | | | | |
| *Number of acres* | | | *93* | 126X |
| Total cost | acre | $40 | $4 | |
| **Cost for habitat management (thousands)** | | | **$3,858** | |

Projects will be funded as opportunities arise.

## F.2.2. Operational and Maintenance (Recurring) Costs

Operational and maintenance costs reflect Refuge spending of base funds allocated each year. These are also known as recurring costs and are usually associated with day-to-day operations and projects that last longer than 3 years. Maintenance includes mowing of dikes, grading roads, and

maintenance actions such as painting of buildings. The costs presented here reflect the backlog and chart the increased maintenance need associated with new facilities and additional acquisitions.

Tables F-4 and F-5 display the operating, maintenance, and personnel costs. These cost estimates reflect increased funding needs for proposed increases in public uses and facilities, increased habitat restoration and conservation activities, and new monitoring needs. These tables include such things as salary, operational expenditures such as travel, training, supplies, utilities, and annual maintenance costs.

**Table F-4. Operational (Recurring) Costs (in Thousands).**

| Project | Action | Cost Estimate | Fund Source |
|---|---|---|---|
| **Survey and Censuses** | All methods of enumerating fish and wildlife populations, vegetative habitats, analysis, interpretation, and reporting | $20 | 126X |
| **Studies and Investigations** | Research projects for managing fish and wildlife populations and habitats | $10 | 126X, cooperators |
| **Wetland Restoration** | The conversion of altered or degraded on-Refuge wetland habitats, including riparian zones back to their original conditions | $0 | 126X, special project funds |
| **Upland Management** | The conversion of altered or degraded on-Refuge upland habitats back to their original condition by such actions as road decommissioning, tree stand thinning, and replanting of native species | $30 | 126X, special project funds |
| **Wetland Management** | The manipulation of water bodies to affect vegetation and/or create desired wildlife conditions | $0 | 126X |
| **Riparian Habitat Management** | Planting of native trees and brush to mimic historical conditions | $50 | 126X |
| **Graze/Mow/Hay/ Crop Management** | The management of grasslands and other habitats for the benefit of wildlife by overseeing cropland, grazing, mowing, or haying | $0 | 126X, cooperators |
| **Fire Management** | Prescribed burning and wildfire preparedness activities. Follow-up monitoring and reporting | $5 | 926X |
| **Native Pest Plant Control** | Integrated pest management activities | $10 | 126X |
| **Invasive Plant Management** | The eradication, reduction, or control of invasive or exotic plants. Includes monitoring | $25 | 126X, special project funds |
| **Bird Banding** | Marking and banding of birds | $2 | 126X, volunteers |
| **Interagency Coordination** | Interactions with other federal, state, and local governments to share information, resolve problems, develop cooperative efforts, and manage species and habitats | $10 | 126X |
| **Tribal Coordination** | Activities associated with the development of cooperative agreements, MOUs, annual funding agreements, and similar cooperation/coordination/communications efforts with tribes | $10 | 126X |
| **Private Lands Management** | Efforts to assist private landowners with habitat improvement and wildlife issues (initiate stewardship management) | $10 | 126X, special project funds |

| Project | Action | Cost Estimate | Fund Source |
|---|---|---|---|
| **Wildlife Population Management** | Endangered species management as well as managing big game populations | $50 | 126X, special project funds |
| **Law Enforcement** | Public Safety, Resource Protection, Hunt Program | $100 | 126X |
| **Water Rights Management** | Activities associated with compliance with state and federal laws to protect and achieve adequate supplies of water. Reading, maintaining, and installing measurement devices and gaging stations, preparing water management plans, and also monitoring off-Refuge water uses | $5 | 126X |
| **Cultural Resource Management** | Supporting the study and protection of significant prehistoric and historic sites. Evaluation of cultural resources and management of museum property | $5 | 126X |
| **Land Acquisition Support** | Staff participation in land acquisition activities, including development of acquisition proposals and appraisals, meetings, inventories, and surveys | $5 | 126X |
| **Visitor Services** | Providing access, facilities, and programs for Refuge visitors. Planning, construction, operation, and maintenance of visitor facilities such as roads, trails, and signs. Managing interpretation, environmental education, hunting, and other recreational opportunities. | $60 | 126X, volunteers |
| **Outreach** | Off-site education of public about Service activities through presentations, exhibits, news releases, and radio/TV spots | $5 | 126X, volunteers |
| **Planning** | | $5 | 126X |
| **Totals** | **Subtotal annual operational costs** | **$ 417** | |
| | **Operational costs over 15 years** | **$6,255** | |

## F.2.3 Staffing

Table F-5 includes costs for permanent and seasonal staff needed each year. It does not include staff costs associated with special projects; these are summarized in Table F-6.

**Table F-5. Annual Costs of Salaries and Benefits Associated with Current Staff.**

| Staff—Refuge Operations | Status | Staff Positions |
|---|---|---|
| Project Leader | PFT | GS-0485-13 |
| Deputy Project Leader | PFT | GS-0485-12 |
| Refuge Manager | PFT | GS-0485-11 |
| Refuge Manager (planner for entire complex) | PFT | GS-0485-12 |
| Supervisory Wildlife Biologist | PFT | GS-0486-11 |
| Wildlife Biologist | CS | GS-0486-09 |
| Private Lands Biologist (for entire complex) | PFT | GS-0401-11 |
| Visitor Services Manager | PFT | GS-0023-11 |
| Park Ranger | PFT | GS-0023-07 |
| Law Enforcement Officer (for entire complex) | PFT | GS-0025-09 |
| Administrative Officer | PFT | GS-0341-09 |
| Purchasing Agent | PFT | GS-1105-05 |
| Engineering Equipment Operator | PFT | WG-5716-10 |

| Staff—Refuge Operations | Status | Staff Positions |
|---|---|---|
| Engineering Equipment Operator | PFT | WG-5716-10 |
| Engineering Equipment Operator | CS | WG-5716-08 |
| Maintenance Worker | PFT | WG-4749-08 |
| **Total Positions** | **16** | **$1,385,445** |

PFT: Permanent Full Time
CS: Permanent Career Seasonal
GS: General Schedule Federal Employee
WG: Wage Grade Scale

### Table F-6. Annual Costs of Salaries and Benefits Associated with Temporary (Summer Seasonal) Staff.

| Staff—Refuge Operations | Status | Staff Positions |
|---|---|---|
| Small Craft Operator (Leader) | Temp | WL-5786-05 |
| Small Craft Operator (Leader) | Temp | WL-5786-05 |
| Small Craft Operator | Temp | WG-5786-05 |
| Small Craft Operator | Temp | WL-5786-05 |
| Small Craft Operator | Temp | WL-5786-05 |
| Small Craft Operator | Temp | WL-5786-05 |
| Small Craft Operator | Temp | WL-5786-05 |
| Small Craft Operator | Temp | WL-5786-05 |
| Small Craft Operator | Temp | WL-5786-05 |
| Small Craft Operator | Temp | WL-5786-05 |
| Youth Conservation Corps Leader | Temp | GS-0186-05 |
| Youth Conservation Corps | Temp | Minimum wage |
| Youth Conservation Corps | Temp | Minimum wage |
| Youth Conservation Corps | Temp | Minimum wage |
| Youth Conservation Corps | Temp | Minimum wage |
| Youth Conservation Corps | Temp | Minimum wage |
| Wildlife Biologist | Temp | Minimum wage |
| **Total Positions** | 17 | $215,363 |

Temp: Temporary Position
WL: Wage Leader Scale
WG: Wage Grade Scale
GS: General Schedule Scale

### Table F-7. Annual Costs of Salaries and Benefits Associated with Fully Staffed Station for All Alternatives.

| Staff—Refuge Operations | Status | Staff Positions |
|---|---|---|
| GIS Specialist (for entire complex) | PFT | GS-2210-09 |
| Refuge Manager (SCEP) | PFT | GS-0485-09 |
| Heavy Mobile Equipment Mechanic | PFT | WG-5803-10 |
| Forester | PFT | GS-0460-11 |
| Contract Specialist (for entire complex) | PFT | GS-1102-09 |
| Database Manager (for entire complex) | PFT | GS-0343-09 |
| Environmental Ed Specialist | PFT | GS-2210-09 |
| Office Assistant | PFT | GS-0326-04 |
| | | |
| **Total Positions** | 8 | $502,304 |

GS: General Schedule Scale
WG: Wage Grade Scale

### F.2.4 Budget Summary

Table F-8 summarizes the data from the above tables and displays the overall *annual* funding need, by alternative, for the Refuge by alternative based on current staffing levels.

**Table F-8. Summary of Refuge Annual Funding Need**

| | Cost Estimate |
|---|---|
| **All projects—one-time expenditures (total costs over 15 years), in thousands** | |
| Research and monitoring | $217 |
| Facilities | **$**7,228 |
| Habitat management | **$**3,858 |
| **A. Subtotal one-time expenditures—all projects** | **$11,303** |
| **Recurring costs—all (total costs over 15 years), in thousands** | |
| **B. Recurring costs—all projects, salaries, and maintenance** | **$ 30,267** |
| **Total annual need—all projects (in thousands) (A+B)/15** | |
| | **$ 2,771** |

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**National Wildlife Refuge System Information**
**1 800/344 WILD**

**September 2011**

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