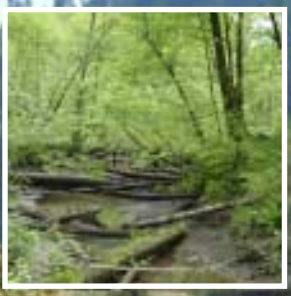
U.S. Fish & Wildlife Service

Nisqually National Wildlife Refuge

Final Comprehensive Conservation Plan



CCPs provide long-term guidance for management decisions and set forth goals, objectives, and strategies needed to accomplish refuge purposes and identify the Service's best estimate of future needs. These plans detail program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service 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.

Nisqually
National Wildlife Refuge

Comprehensive Conservation Plan

March 2005

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Nisqually National Wildlife Refuge
Comprehensive Conservation Plan
Approval Submission
U.S. Fish and Wildlife Service, Region 1

In accordance with the National Wildlife Refuge System Improvement Act of 1997, this Comprehensive Conservation Plan (CCP) has been prepared for Nisqually National Wildlife Refuge. The purpose of the CCP is to specify a management direction for the Refuge for the next 15 years. The CCP charts a vision of the Refuge's future desired conditions–the types of habitat that will be provided and public use and partnership opportunities–and the Refuge management actions needed to achieve that vision. This CCP is submitted for approval by the Regional Director.

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***Appendices in bold and designated with an asterisk (*) are included with this CCP. Unbolded appendices (without an asterisk) are included only with the Final CCP/EIS document, but are cross-referenced as appropriate throughout this CCP.**

[1]Information from this CCP/EIS appendix has been updated and is included as Chapter 5 of this CCP.

[2]Information from this CCP/EIS appendix has been updated and is included as Chapter 4 of this CCP.

[3]New appendix, exclusive to the CCP (not part of the CCP/EIS).

Chapter 1
Introduction & Background

CHAPTER 1: INTRODUCTION & BACKGROUND

1.1 INTRODUCTION

Nisqually National Wildlife Refuge (NWR or Refuge) is located at the southern end of Puget Sound, Washington in the Nisqually River delta (Figure 1.1-1). The 2,925-acre Refuge, located in Thurston and Pierce counties, is managed by the U.S. Fish and Wildlife Service (Service) and protects one of the few relatively undeveloped large estuaries remaining in Puget Sound. The Refuge has international significance as a staging area, sanctuary, and migration stopover for migratory birds of the Pacific Flyway. The Refuge also has regional importance as migration and rearing habitat for salmon, particularly the Federally listed fall chinook salmon. A more detailed description of the environment and resources on the Refuge is contained in Chapter 3.

The south Puget Sound region, with its rapidly growing urban development, is undergoing dramatic changes in population and landscape. Some areas within the study area that are currently proposed for development are ecologically inseparable from Refuge habitats. Eighty percent of estuarine habitat has been lost in Puget Sound in the last 150 years, contributing to the decline of many fish and wildlife that depend on estuaries, including several salmon species (Dean et al. 2000). The Refuge's diked freshwater wetlands were historically estuarine and habitat quality has declined.

Nisqually NWR has become an urban Refuge easily accessible to outdoor enthusiasts. Visitor use and interest in the Refuge have increased as residential developments expand in the nearby cities of Lacey, DuPont, Olympia, and the Seattle-Tacoma area. Thousands of students and teachers participate in the Refuge's environmental education program. The Refuge is an ideal setting to provide an improved and expanded education program to respond to this growing need. More than 100,000 visitors come to Nisqually NWR each year to participate in wildlife interpretation, wildlife observation, environmental education, photography, fishing, and shellfishing. As Refuge use has increased, so have conflicts among visitors and concerns over meeting the needs of fish and wildlife species. These planning issues, concerns, and opportunities are described further in Chapter 2.

The Comprehensive Conservation Plan (CCP) for Nisqually NWR describes a bold new vision for management of Nisqually NWR. The vision is detailed in Chapter 4, Management Direction, which contains new goals, objectives, and strategies. Most significant are its new objectives for habitat restoration including restoring 699 acres of diked freshwater marsh to estuarine habitat. Also, the CCP nearly doubles the size of the Refuge boundary and contains numerous other management strategies to increase the quality of Refuge public use activities or bring them into compatibility with Refuge purposes and policies and guidelines of the National Wildlife Refuge System (NWRS or System). The CCP will guide management of Refuge operations, habitat restoration, and visitor services for the next 15 years. The CCP replaces the 1978 Conceptual Plan (CH2M Hill et al. 1978) as the primary management guidance document for the Refuge.

The former approved Refuge boundary totaled 3,936 acres. Figure 1.1-2 identifies the CCP Study Area, which was used during the planning process to identify potential areas for Refuge expansion that could be incorporated into the various action alternatives in the Environmental Impact Statement (EIS) developed to analyze CCP implementation (USFWS 2004). The CCP Study Area totals 9,326 acres and includes the bluffs east of the Refuge and lands south of Interstate 5 (I-5) along approximately 6 miles of the Nisqually River corridor and 2.5 miles up McAllister Creek to its headwaters at McAllister Springs. The new approved Refuge boundary consists of 7,415 acres, and thus reflects a portion of the CCP Study Area. Any reference made to the study area in this document refers to the 9,326-acre CCP Study Area.

1.2 HISTORY OF REFUGE ESTABLISHMENT AND PURPOSE

The proximity of the Nisqually delta to two major urban centers, Tacoma and Olympia, has exposed it to numerous development threats over the years. In 1965, the Port of Tacoma proposed developing 1,100 acres of the Nisqually River Estuary as a deepwater port facility. Largely as a result of citizen efforts led by conservationist and teacher Margaret McKenny and the Nisqually Delta Association, the proposal was denied (Burg 1984). In 1967, the Port of Olympia proposed development of an aluminum mill on the delta (Stevenson 1998). In 1966 and 1967, to further stave off development, the Washington State Department of Game (now the Washington Department of Fish and Wildlife [WDFW]) purchased holdings of approximately 616 acres of delta tidelands and salt marshes (USFWS 1977; Guth 1998).

In 1970, the Nisqually River Task Force (see Section 5.4.2 in the CCP/EIS) was created to assist in preserving and protecting the river and delta. In 1971, in recognition of the significance of the area as a natural estuarine and aquatic ecosystem, the U.S. Department of the Interior designated the estuarine portion of the Nisqually River delta as a National Natural Landmark (see Figure 1.1-2). The Nisqually River Task Force recommended in 1972 that the delta be set aside as a National Wildlife Refuge.

In February 1974, in recognition of the area's unique fish and wildlife resources, the Brown Farm property and tidelands were acquired for inclusion in the NWRS as Nisqually NWR. In total, 1,285 acres of diked grasslands, freshwater marshes, and tidelands were initially purchased with funds approved by the Migratory Bird Conservation Commission under authority of the Migratory Bird Conservation Act and subsequently placed under the management of the Service (Hesselbart 1977a). Revenue from the sale of Duck Stamps is the primary source of funding for those lands purchased under the Migratory Bird Conservation Act. Three other funding sources include appropriations authorized by the Wetlands Loan Act, import duties collected on arms and ammunition, and receipts from the sale of Refuge admission permits. Nisqually NWR was established with the following purposes:

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

Figure 1.1-1
Regional Context

Legend
- National Wildlife Refuge
- Nisqually River Watershed
- North Pacific Coast Ecoregion

N

Source: USFWS, 2000; Ducks Unlimited, 1999; EDAW, 2003

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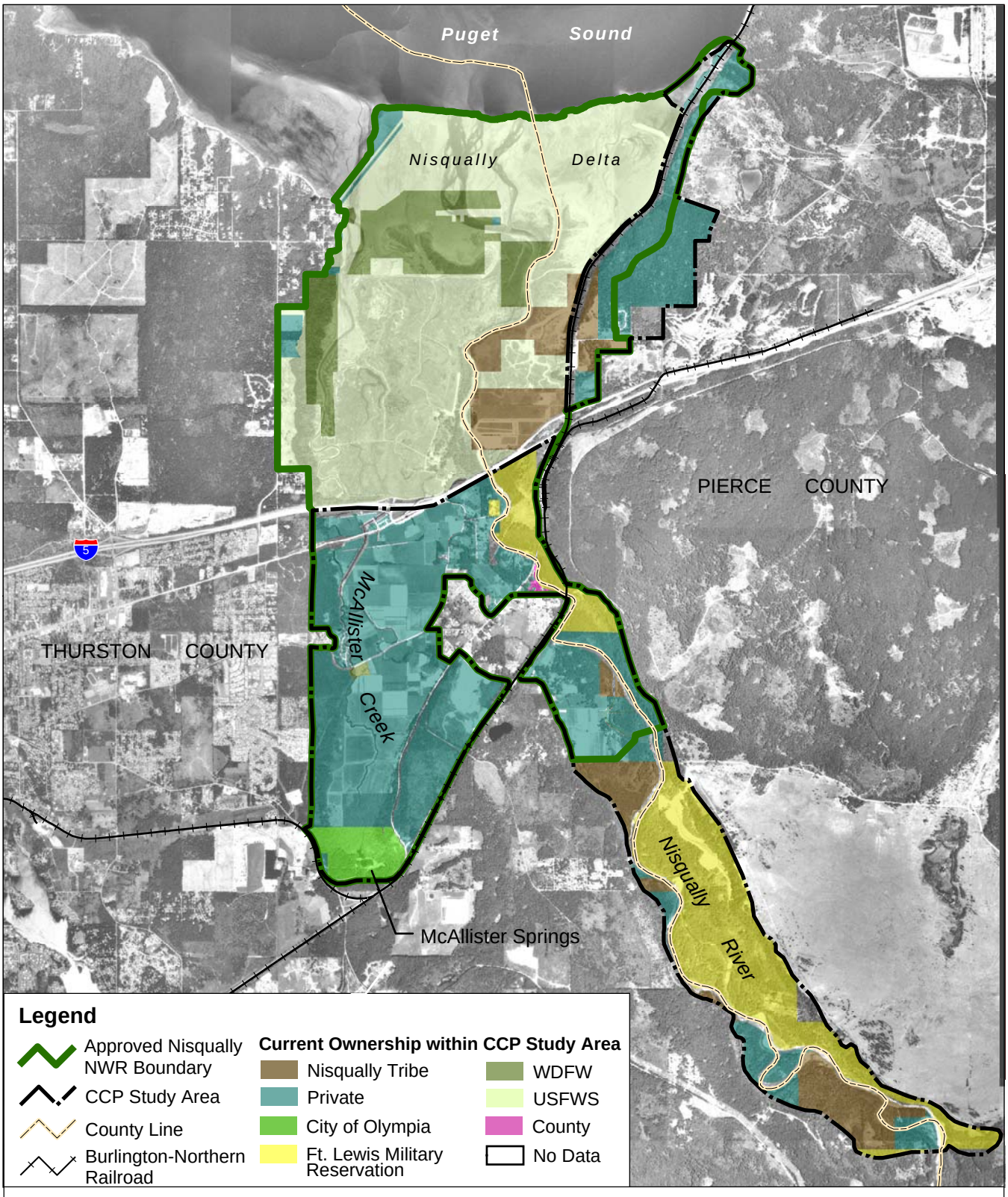

Figure 1.1-2
Current Ownership within CCP Study Area

Aerial Photo 1990

N

0 0.3 0.6 1.2 Miles

1:70,000

Source: USFWS, 2000; Ducks Unlimited, 1999; EDAW, 2003

P:\0e01401 Nisqually\GIS\mxd_CCP\Figure1_1_2.mxd

> *"... 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 1977, an Environmental Assessment (EA) was completed to expand the Refuge boundary and authorize the acquisition of approximately 3,780 acres of delta lands (USFWS 1977). One year later, a Conceptual Plan and associated EA were developed for the Refuge (CH2M Hill et al. 1978). These documents provided initial direction for managing wildlife, habitat, and public use. The Conceptual Plan designated a Research Natural Area (RNA) in the northeast corner and habitat management, surface water control, and haying within the diked interior to provide forage and cover for waterfowl.

In 1996, the Service acquired a 107-acre parcel on the top of the West Bluff. Funding for this parcel came from the Land and Water Conservation Fund, which is supported by proceeds from off-shore oil and gas development. A total of 516 acres of tidelands was also transferred from the Department of Army to the Refuge.

By 2000, the Service had acquired 76% (or 2,925 acres) within the approved Refuge boundary. These lands consist primarily of the Nisqually River, the delta estuary, McAllister Creek, diked freshwater wetlands and grasslands, and upland bluffs to the west. The diked area includes approximately 1,000 acres of Refuge lands between the Nisqually River and McAllister Creek. Refuge buildings, roads, parking lots, and an old orchard are located at the southeast corner of the Refuge.

In November 2000, Congress appropriated an additional $2 million of Land and Water Conservation Funds earmarked for a land purchase on the East Bluff of the delta. In December 2004, the Service purchased 20 acres of forested habitat from the Cascade Land Conservancy, who had purchased the land from Quadrant, a subsidiary of Weyerhauser on behalf of the Service.

1.3 PURPOSE AND NEED FOR THE COMPREHENSIVE CONSERVATION PLAN

The purpose of this Comprehensive Conservation Plan is to provide the Service, the NWRS, partners, and citizens with a management plan for improving fish and wildlife habitat conditions and Refuge infrastructure for wildlife and public use on Nisqually NWR over the next 15 years. The National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57) requires that all National Wildlife Refuges be managed in accordance with an approved CCP by 2012. Implementing the approved CCP will ensure that the Service manages Nisqually NWR to achieve the Refuge purposes, vision, and goals and to help fulfill the mission of the NWRS. Specifically, the CCP: (1) determined that the Refuge boundary should be expanded; (2) determined the extent of restoration of historic estuarine habitat; (3) addressed the compatibility and quality of wildlife-dependent recreation and environmental education; (4) addressed waterfowl hunting and related needs for sufficient wildlife sanctuary; and (5) provided a basis

for budget requests to support the Refuge's operational needs for staffing, operations, maintenance, and capital improvements.

1.4 LEGAL AND POLICY GUIDANCE

Nisqually NWR and its management and administrative activities are managed as part of the NWRS within a framework provided by legal and policy guidelines. The Refuge is guided by the mission and goals of the NWRS, the purpose of the Refuge as described in its acquisition authority, Service policy, Federal laws and executive orders, and international treaties. Below is a discussion of concepts and guidance for the System covered in the NWRS Administration Act of 1966, the Refuge Recreation Act of 1962, Title 50 of the Code of Federal Regulations (CFR), the Fish and Wildlife Service Manual (USFWS 1981), and, more recently, through the National Wildlife Refuge System Improvement Act of 1997. A list of other laws and Executive Orders that may affect the CCP for Nisqually NWR or the Service's implementation of the CCP is provided in Appendix D of the Final CCP/EIS.

1.4.1 The U.S. Fish and Wildlife Service

Nisqually NWR is managed by the U.S. Fish and Wildlife Service within the Department of the Interior. The Service is the primary Federal agency responsible for conserving and enhancing the nation's fish and wildlife populations and their habitats. Although the Service shares this responsibility with other Federal, State, tribal, local, and private entities, the Service has specific trust responsibilities for migratory birds, threatened and endangered species, and certain anadromous fish and marine mammals. The Service also has similar trust responsibilities for the lands and waters it administers to support the conservation and enhancement of fish and wildlife.

1.4.2 National Wildlife Refuge System

The mission of the National Wildlife Refuge System is:

> "*To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.*" (16 U.S.C. 668dd et seq.)

Starting with the first Refuge, Florida's Pelican Island NWR established in 1903 by President Theodore Roosevelt, the NWRS has grown to 100 million acres in size, including 542 National Wildlife Refuges. The NWRS is the largest collection of lands specifically managed for fish and wildlife conservation in the nation. The needs of wildlife and their habitats come first on Refuges, in contrast to other public lands which are managed for multiple uses.

The administration, management, and growth of the NWRS are guided by the following goals (Director's Order No. 132, as amended on March 31, 2003):

- Fulfill our statutory duty to achieve Refuge purpose(s) and further the System mission.
- Conserve, restore where appropriate, and enhance all species of fish, wildlife, and plants that are endangered or threatened with becoming endangered.

- Perpetuate migratory bird, interjurisdictional fish, and marine mammal populations.
- Conserve a diversity of fish, wildlife, and plants.
- Conserve and restore where appropriate representative ecosystems of the United States, including the ecological processes characteristic of those ecosystems.
- 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 public use. Such use includes hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

1.4.2.1 National Wildlife Refuge System Improvement Act

The National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) amends the Refuge System Administration Act of 1966 by defining a unifying mission for all Refuges, including a new process for determining compatible uses on Refuges, and requiring that each Refuge be managed under a CCP. The Act expressly states that wildlife conservation is the priority of NWRS lands and that the Secretary of the Interior shall ensure that the biological integrity, diversity, and environmental health of Refuge lands are maintained. Each Refuge must be managed to fulfill the NWRS mission and the specific purposes for which the Refuge was established. The first priority of each Refuge is to conserve, manage, and, if needed, restore fish and wildlife populations and habitats according to its purpose. The Service has statutory authority under the National Wildlife Refuge Administration Act and the Improvement Act to regulate activities that occur on water bodies "within" a Refuge. The Improvement Act requires that a CCP be completed for each Refuge by the year 2012 and that the public have an opportunity for active involvement in plan development and revision. It is Service policy that CCPs are developed in an open public process and that the agency is committed to securing public input throughout the process.

Compatibility Policy

Lands within the NWRS are different from other, multiple-use public lands in that they are closed to all public uses unless specifically and legally opened. No Refuge use may be allowed unless it is determined to be compatible. A compatible use is a use that, in the sound professional judgement of the Refuge Manager, will not materially interfere with or detract from the fulfillment of the mission of the NWRS or the purposes of the Refuge. The Improvement Act identifies six priority wildlife-dependent recreational uses: hunting, fishing, wildlife observation, photography, environmental education, and interpretation. As priority public uses of the NWRS, they receive priority consideration over other public uses in planning and management.

Biological Integrity, Diversity, and Environmental Health Policy

The Improvement Act directs the Service to "ensure that the biological integrity, diversity, and environmental health of the NWRS are maintained for the benefit of present and future generations of Americans..." The policy is an additional directive for Refuge managers to follow while achieving Refuge purpose(s) and System mission. It provides for the consideration and protection of the broad spectrum of fish, wildlife, and habitat resources found on Refuges and

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

1.4.2.2 Research Natural Area Policy

> Research Natural Areas (RNA) have special status on lands managed by the Service. Guidance for the operation of RNAs is provided in Section 8 RM 10 of the Service's Refuge Manual. The purposes of RNAs are:
>
> (1) "*...to preserve adequate examples of all major ecosystem types or other outstanding physical or biological phenomena;*"
>
> (2) *"To provide research and educational opportunities for scientists and others in the observation, study, and monitoring of the environment;*" and
>
> (3) "*...to preserve a full range of genetic and behavioral diversity for native plants and animals, including endangered or threatened species*."

According to the Manual:

> *"activities on RNAs are limited to research, study, observation, monitoring, and educational activities that are non-destructive, non-manipulative, and maintain unmodified conditions. Picnicking, camping, collecting plants, gathering nuts and herbs, picking berries, hunting, fishing, trapping, and other public uses which contribute to modification of a Research Natural Area should be discontinued or expressly prohibited if such uses threaten serious impairment of research and education values." (USFWS 1981)*

Chapter 2
Comprehensive Conservation Planning Process

CHAPTER 2: COMPREHENSIVE CONSERVATION PLANNING PROCESS

2.1 THE NISQUALLY NWR CCP PROCESS

The CCP process for Nisqually NWR met the dual requirements of compliance with the Improvement Act and the National Environmental Policy Act (NEPA), both of which require the Service to actively seek public involvement in the preparation of environmental documents. NEPA also requires the Service to seriously consider all reasonable alternatives to its Preferred Alternative including the "No Action" alternative, which represents continuation of current conditions and management practices. The Final CCP/EIS, dated August 2004, evaluated four alternatives for Refuge management. The Record of Decision (ROD), dated November 1, 2004, selected Alternative D as the Proposed Action.

Key steps in the CCP/EIS process include:

1. Form the Planning Team and conduct pre-planning
2. Initiate public involvement and scoping
3. Identify issues and develop vision and goal statements
4. Develop alternatives and assess their environmental effects
5. Identify the Preferred Alternative
6. Publish the Draft CCP and NEPA Document
7. Revise and Publish a Final Plan
8. Implement the CCP

During the summer of 1995, Nisqually NWR staff initiated preliminary habitat management planning. Interest was based on a desire to reevaluate how habitat was managed and to guide improvements for areas of deteriorating habitat quality. After the Refuge experienced severe flooding in 1996, comprehensive planning was initiated, and public scoping meetings were held during 1996 and 1997 to gather comments on issues to be addressed in the CCP. The CCP process is guided by the Refuge Planning Chapter of the Fish and Wildlife Service Manual (Part 602 FW2.1, Draft, November 1996 and Final, June 2000).

In 1997, a core team of Refuge and Regional Office staff was established to prepare the CCP. An internal Service technical work group was also formed to advise on the technical aspects and management strategies of the plan. This technical work group met five times during the planning process to review and comment on the progress of the plan. The list of preparers as well as other participants can be found in Chapter 6 and Appendix H of the Final CCP/EIS.

During 1997, the Refuge also established a cooperative management agreement with Ducks Unlimited (DU) to assist with the CCP and provide technical support on habitat management and restoration. In early 1998, the Service and DU hired ENSR, a Redmond, Washington-based consulting firm, to prepare a hydrodynamic and sediment transport model to assess restoration alternatives on the Nisqually River delta. The model and evaluation of restoration alternatives were presented in a technical report completed by ENSR in May 1999. A summary of this report can be found in Appendix J.

In this same month, an analysis in support of the CCP, titled "The Regional Context of Intertidal Habitat Restoration in the Nisqually River Delta" was produced by Curtis Tanner (1999). Also, a "Characterization of Fishes in the Nisqually River, Estuary, and Reach" was developed by Carrie Cook-Tabor (1999) in support of the planning process. In September 2000, the Service hired EDAW, Inc., an environmental consulting firm, to assist the agency in completing the CCP/EIS and assist with public involvement.

Like most Refuges, the CCP process was carried out at the same time that existing management programs continued. Habitat management and public use programs steadily increased in size and complexity during this time and the Refuge met all of its administrative demands. The 7- to 8-year timeframe to complete the CCP and its EIS was long, but one should consider the following factors. Flood damage to the Refuge and its facilities in 1996 resulted in a complete rebuilding of the Refuge headquarters including design and construction of a new visitor center, maintenance complex, parking lot and entrance road, and boardwalk trail (completed in 1999); planning guidance was lacking as the national planning and compatibility policies were being written during the early stages of the plan (policies were completed in 2000); many staffing changes occurred; the Refuge Complex was restructured, splitting it into two complexes in 1999; and the Refuge had to respond to damage caused by a 2001 earthquake measuring 6.8 magnitude with the epicenter located in the Nisqually River delta. Since its establishment in 1974, the 8 years, 1996 to 2004, will stand out in Nisqually's history. It seemed that several events converged and were in some way connected to the significant change in management direction proposed by the CCP.

2.2 CONSULTATION AND COORDINATION WITH OTHERS

This section describes consultation and coordination efforts with the public, interested groups, other agencies, and tribes. A Public Involvement Plan was completed February 4, 1998 that described goals and procedures that would be used to ensure full public involvement in developing the CCP.

2.2.1 Public Involvement

Public involvement is an important component of Federal planning and was given considerable attention in the Nisqually NWR CCP process. Public involvement began with a preliminary scoping meeting on July 25, 1996. Refuge staff gave more than 50 presentations to a variety of groups. Tools used to encourage public involvement included public meetings, Planning Update newsletters, workbooks, workshops, presentations, web pages, and Federal Register notices. The Final CCP/EIS was revised from the Draft CCP/EIS (released in December 2002) based on

extensive public comment received on the draft document. The full comment and response process of the Draft is described in detail in Appendix M of the Final CCP/EIS.

The following summarizes public outreach, including public meetings/open houses, workshops, Planning Update mailings, and Federal Register notices.

2.2.1.1 Public Meetings / Open Houses

Scoping Meeting: The first scoping meeting was held on July 25, 1996 in Lacey, Washington. Thirty participants came to discuss habitat management concerns within the diked area, provide input on key issues, and help to identify partners.

Open Houses: Two open houses were held on November 18 and 19, 1997 in Lacey and Tacoma, Washington. The purpose of these meetings was to encourage public input by providing an informal opportunity for the public to learn about and comment on the CCP process. The meetings were attended by 151 people who provided input on Refuge goals, Refuge expansion, eight draft habitat restoration alternatives, and a wide range of public use issues, including trail access and configuration, waterfowl hunting, fishing, environmental education, personal watercraft, boating, and wildlife disturbance issues.

Public Meetings: Two meetings were held on January 15 and 16, 2003, to provide the public opportunities to review, discuss, and provide comments on the Draft CCP/EIS. The meetings were held at Nisqually NWR and in Tacoma and were attended by 250 people. A wide range of subjects were discussed and are summarized in Appendix M of the Final CCP/EIS.

2.2.1.2 Workshops

Grassland Workshop: On May 13, 1998, a technical Grassland Workshop was conducted at Nisqually NWR. Eight technical experts reviewed historic and current grassland conditions and developed recommendations for improving grassland wildlife habitat on the Refuge.

Public Use Workshop: Sixty-five representatives of local groups or organizations with specific interests in public use and education participated in a Public Use Workshop on June 2, 1998 in Lacey, Washington. Workshop attendees were divided into six focus groups to provide input on these topics: (1) boating and kayaking; (2) hunting and fishing; (3) hiking, photography, and bird watching; (4) outdoor recreation providers and planners; (5) tourism; and (6) environmental education.

Estuarine and Freshwater Wetland Workshops: Two technical workshops were held on June 29-30, 1998 and June 3, 1999 to focus on estuarine and freshwater wetland management on the Refuge. Fifteen to 18 technical experts reviewed historic and current habitat conditions, conducted site visits, and provided recommendations for future restoration and management of Refuge wetlands. They provided input on estuarine restoration, wetland loss, invasive species, monitoring, and provided recommendations on specific habitat restoration alternatives.

2.2.1.3 Planning Update Mailings

The Service published eight Planning Updates and one Issues Workbook as part of public outreach efforts. These were sent to everyone on the CCP mailing list. In addition, the Issues Workbook was handed out at the November 1997 public open houses. Planning Update #6 was also summarized in the April 2002 issue of the *McAllister Water News* published by the City of Olympia. The seventh Planning Update announced the release of the Final CCP/EIS and the last update announced release of the Record of Decision. Planning Updates were published in August 1996, November 1996, November 1997, April 1998, December 1998, June 2001, August 2004, and November 2004.

2.2.1.4 Federal Register Notices

A formal "Notice of Intent to Prepare a Comprehensive Management Plan and Associated Environmental Document" was published in the Federal Register on October 9, 1997. Later in the process, the Service decided to prepare an EIS for the CCP. For this, a second Notice of Intent was published in the Federal Register on February 9, 2000. A Notice of Availability was published in the Federal Register on December 20, 2002, which announced the availability of the Draft CCP/EIS for public review with comments due on February 21, 2003, and two public open house meetings to be held in January 2003. A Notice of Availability of the Final CCP/EIS was published in the Federal Register on August 31, 2004. A Notice of Decision and Availability of the Record of Decision was published in the Federal Register on December 9, 2004.

2.2.2 Interest Group and Other Agency Consultation/Coordination

Refuge staff gave more than 50 presentations to a variety of groups on- and off-Refuge, providing a summary and update on the CCP process, key issues, and soliciting public input. These groups included: local Audubon chapters, Evergreen College classes, Kiwanis Club of Olympia, Rotary Club in Tacoma, National Marine Fisheries Service technical group, U.S. Army Corps of Engineers wetland training classes, Pacific Coast Joint Venture, Sierra Club, Thurston County Leadership Council, Nisqually Summer Lecture Series, among others.

Service staff participated in panel discussions on estuarine wetland restoration at two Society of Wetland Scientists Northwest Chapter Meetings on May 6, 1996 in Olympia, Washington with approximately 45 attendees and on May 21, 1998 in Tacoma, Washington with about 200 participants. The panelists included university scientists, agency and tribal representatives, and other restoration professionals. Discussions centered around the issues and challenges of estuarine restoration in Puget Sound as related to Nisqually NWR.

The Refuge Manager met individually with the three Thurston County Commissioners on May 17 and June 4, 2001, summarizing the CCP key issues and focusing on Refuge expansion. A meeting was held with representatives of Congressman Adam Smith's and Congressman Brian Baird's local offices on May 23, 2001 to summarize CCP key issues, the schedule, and focus on Refuge expansion. Briefings were provided to Congressmen Adam Smith, Norm Dicks, and Brian Baird during the planning process, and to representatives from Senator Patty Murray's office.

Several meetings were held with major landowners within the expansion study area, including Fort Lewis, Weyerhaeuser, City of Olympia, and some of the farmers with the largest land holdings in the Nisqually Valley, to summarize the CCP process, key issues, and schedule, with a focus on Refuge expansion and solicit further comment. Coordination meetings were also held with the City of DuPont. Fort Lewis was given the opportunity to comment on the internal review draft of the CCP/EIS.

The Service gave five presentations to the Nisqually River Council during the planning process. The Council includes more than 20 key partners and citizen participants. Meeting dates included November 19, 1999; May 18, 2001; August 17, 2001; April 19, 2002; and January 17, 2003.

The Service met with the WDFW seven times during the planning process. WDFW was given the opportunity to comment on an internal review draft of the CCP/EIS. Meeting dates were on January 29, 1998; November 9, 2000; April 17, 2001; May 1, 2001; May 17, 2001; September 14, 2001; and October 5, 2001.

2.2.3 Tribal Consultation/Coordination

The Service met with the Nisqually Indian Tribe 14 times during the course of the planning process, and they were given the opportunity to comment on an internal review draft of the CCP/EIS. Meeting dates included:

June 23, 1999
July 20, 1999
January 25, 2000
February 29, 2000
April 24, 2000
June 9, 2000
August 10, 2000
January 31, 2001
August 27, 2001
October 1, 2001
October 15, 2001
February 14, 2002
March 19, 2002
April 18, 2002

2.3 COMMENT RESPONSE PROCESS ON THE DRAFT CCP/EIS

Public comments on the Draft CCP/EIS were accepted from December 20, 2002 to February 21, 2003; in addition, comments dated within one week after the official close of the comment period were accepted and analyzed. All comments were reviewed and analyzed; the information contained in those comments was used to help develop the Final CCP/EIS and the refined Preferred Alternative. A detailed summary of the comment process, all comments, and the Service's responses to those comments is included as Appendix M of the Final CCP/EIS.

2.4 PLANNING ISSUES, CONCERNS, AND OPPORTUNITIES

Issues, concerns, and opportunities were identified through discussions with key contacts, workshop participants, and through the public scoping process. The following section summarizes seven major issues that were identified and analyzed as part of the CCP/EIS process.

ISSUE 1: REFUGE BOUNDARY EXPANSION

Should the Service play a larger role in protecting the lower Nisqually watershed and expand its Refuge boundary and, if so, what areas should be included?

When the Refuge was originally established, protection was focused on the part of the delta that was imminently threatened with development. The CCP process provided an opportunity to consider whether the original boundary provided sufficient protection to the delta and lower Nisqually watershed, or whether additional lands beyond the approved Refuge boundary should be included within an expanded Refuge boundary. The CCP/EIS evaluated the potential for and environmental consequences of Refuge expansion onto lands along the East Bluff and on adjacent habitats of the Nisqually Valley on the south side of I-5 along the Nisqually River and McAllister Creek. Public comments indicated almost unanimous support for Refuge expansion. An additional 3,479 acres have been added to the approved Refuge boundary as a part of the CCP, for a total approved boundary of 7,415 acres.

ISSUE 2: HABITAT RESTORATION AND MANAGEMENT OF THE DIKED AREA

Should Nisqually NWR restore historical estuarine habitat and, if so, to what extent should this occur?

This issue focused primarily on the 1,000 acres of former estuarine habitat within the Brown Farm Dike. This area was historically a major part of the Nisqually River Estuary but was diked for farming in the late 1800s. This habitat is currently managed by the Service as a mosaic of freshwater wetlands and non-native grasslands to benefit a variety of migratory waterfowl and other migratory birds. However, the quality of this habitat has become degraded due to the spread of reed canary grass, limited water level management capabilities, plant succession to shrub habitats, and deterioration of the dike system, which has required costly repairs. The dikes were further damaged by flood conditions in 1996 and 1997, as well as the Nisqually Earthquake of 2001.

Estuarine habitat loss in Puget Sound and throughout the West Coast area has led to the decline of many estuarine-dependent fish and wildlife species. Estuarine restoration is considered the highest priority to recover the Nisqually Chinook salmon, a federally threatened species. Estuarine restoration would also benefit many key migratory birds and restore a critical part of the Nisqually Estuary.

Public input was wide ranging, but a majority who expressed preference for an alternative supported the Preferred Alternative. People who supported estuarine restoration did so for a variety of reasons, including restoring an historic habitat, improving protection of the Nisqually delta, restoring ecological function in the estuary, enhancing recovery of salmon, improving control of invasive plants, and reducing costs of maintaining the dike system. Those who opposed estuarine restoration or the amount of restoration selected did so for various reasons, but the majority focused on the effects on the trail system and the conversion of freshwater or non-native grassland habitats and the effects on associated migratory birds and mammals. The Preferred Alternative will restore 699 acres to estuarine habitat, leaving 263 acres of freshwater

wetlands to be managed more intensively than under current conditions. Freshwater wetland restoration was also identified as a high priority in expansion areas.

ISSUE 3: ENVIRONMENTAL EDUCATION

Should the Refuge expand its environmental education program and facilities to serve the growing urban community?

Environmental education is a priority use of the NWRS and a high priority use for urban refuges like Nisqually NWR. The Refuge is ideally located to reach a diverse group of students in the surrounding, growing urban community. Public scoping identified environmental education as a highly valued purpose and activity of Nisqually NWR. The current environmental education program and facilities are inadequate to meet both current and projected future demands for environmental education opportunities. The Service also sees an opportunity to develop and strengthen a partnership with the Nisqually Reach Nature Center to provide a coordinated environmental education program in the Nisqually delta area. Public input showed strong support for the environmental education program, and some commentors indicated a preference for a larger expansion of the program than described in the Preferred Alternative. The CCP includes a variety of program improvements and will triple the number of students served annually, from 5,000 to 15,000.

ISSUE 4: WILDLIFE OBSERVATION, HIKING, AND TRAIL CONFIGURATION

What areas of the Refuge will be accessed by trails and available to visitors if estuarine restoration occurs?

The Refuge supports 7 miles of trails, including the 5½-mile Brown Farm Dike Trail and the 1-mile Twin Barns Loop Trail. During the scoping process in public meetings, workshops, and Issues Workbooks, many commentors said that fish, wildlife, and habitat needs should take priority. Some expressed the desire to have access to all habitat types in whatever changes were selected. Changes to the Brown Farm Dike associated with habitat restoration activities will greatly reduce the length of the dike trail and change the configuration so it is no longer a loop. During the public comment period on the Draft CCP/EIS, of those who commented specifically on the trail, slightly more expressed a preference for maintaining the trail as is, than changing it. The effects of trail changes will be reduced in the Preferred Alternative through construction of new trails, including a 0.75-mile boardwalk trail that would extend into the estuary, a 2.5-mile loop trail on the east side of the Nisqually River, and a 0.5-mile primitive trail through surge-plain habitat. The 1-mile Twin Barns Loop Trail will remain intact.

ISSUE 5: WATERFOWL HUNTING ON NISQUALLY NWR

How can unauthorized hunting on the Refuge be resolved? Is sufficient wildlife sanctuary currently provided within the Refuge? Should waterfowl hunting occur on Nisqually NWR? Would consolidation of hunting on Refuge and State lands in the tideflats provide the best location for a hunting area? Should the Service in cooperation with the WDFW take a more direct role in managing the waterfowl hunting program?

The CCP process provided an opportunity to re-evaluate waterfowl hunting in the delta and consider implementation, consolidation, or enforcement of closure of a waterfowl hunting program on Refuge lands to resolve the current unauthorized hunting on a closed Refuge. Since its establishment, Nisqually NWR has never been formally opened to waterfowl hunting. However, waterfowl hunting is a popular State-managed activity that occurs in the delta, October through January each year. Waterfowl hunting is permitted on three parcels (inholdings within the Refuge boundary) owned by WDFW. These parcels have irregular boundaries and are not distinguished from Refuge lands by boundary markers, so hunters often hunt on Refuge lands. Except in limited areas where some posting has been done, the Service has not enforced the hunting closure. The most comments received on the CCP addressed this key issue, with the great majority opposed to opening Nisqually NWR to waterfowl hunting. Many comments specifically objected to the reduction in size of the Research Natural Area to accommodate hunting. A number of comments recommended additional restrictions to reduce wildlife disturbance or conflicts with other visitors. Some provided suggestions on other areas to be opened to hunting or walk-in or accessible hunting opportunities. The selected alternative will open 191 acres of Refuge lands to waterfowl hunting adjacent to State lands, but provides improved wildlife sanctuary in other portions of the Refuge. The RNA will be reduced by 73 acres to accommodate hunting, but 44 acres will be added to the south end.

ISSUE 6: FISHING AND SHELLFISHING

What opportunities should the Refuge provide for bank fishing, boat fishing, and shellfishing?

The Refuge offers fishing for salmon, steelhead, and cutthroat trout in McAllister Creek and the Nisqually River, and for shellfish and bottomfish in the tideflats. No fishing is allowed inside the dike. Some fishing and shellfishing occur within the RNA although this is not allowed by Service policy. Relatively few people commented on these issues on the Draft CCP/EIS. Public comments during the scoping process identified concerns over limited access and opportunities for bank fishing, increases in use and crowding, conflicts with other users, and the need for fishing facilities accessible to people with disabilities. The Preferred Alternative provides continued boat fishing opportunities but eliminates the McAllister bank fishing access due to dike removal for restoration. New opportunities for bank fishing access along the Nisqually River are included, as well as exploration of sites along McAllister Creek if suitable sites are acquired in Refuge expansion. The RNA closure to consumptive uses will be enforced to provide improved wildlife sanctuary.

ISSUE 7: BOATING

Is boating a compatible use and, if so, what restrictions are necessary?

Limited launch sites, shallow water conditions, and narrow boating corridors along the Nisqually River and McAllister Creek currently limit the amount of boat traffic in the Refuge. However, boat use, estimated at 6,700 visits per year for motorized and non-motorized use, is increasing. High speeds and erosion caused by boat wakes, pollution, and wildlife disturbance are the primary management concerns. Other management concerns include lack of access control, disturbance to Refuge wildlife, conflicts with other Refuge visitors, and the absence of educational materials at launch sites. Wildlife disturbance caused by boating could also

potentially increase in areas currently diked. Under Thurston County regulations, all watercraft are restricted to a speed of 5 mph within 200 feet of any shoreline; however, the speed limit is minimally enforced. Many people opposed allowing personal watercraft use on the Refuge. Some expressed a desire to eliminate all motorized boating in Refuge waters. The selected alternative continues to provide boating opportunities, but also reduces wildlife disturbance through a 5 mph boat speed limit in all Refuge waters, a seasonal closure in the RNA during winter months, and closure of all estuarine restoration sites.

Chapter 3
Refuge Environment

CHAPTER 3: REFUGE ENVIRONMENT

This chapter describes the environment that may be affected by land acquisition and management activities of Nisqually NWR. The Refuge environment includes important portions of the Nisqually delta and lower reaches of the Nisqually River watershed. For this document, the affected environment includes the CCP Study Area, which includes the lands within the former approved Refuge boundary (3,936 acres) and areas considered for Refuge expansion (5,390 acres), for a total study area of 9,326 acres. The new approved Refuge boundary includes 7,415 acres, and this reflects a portion of the CCP Study Area. The study area (Figure 1.1-2) includes four distinct areas: McAllister Springs and Creek area, Nisqually River corridor, Nisqually agricultural lands and floodplain, and East Bluff. The McAllister Springs and Creek area, Nisqually River corridor, and Nisqually agricultural lands and floodplain are located south of the current Refuge and are bordered on the north by I-5, on the east and west by bluffs, and on the south by a combination of railroad tracks, bluffs, and property boundaries of residential housing developments. The East Bluff area is east of the Refuge and is bordered on the north by Sequalitchew Creek, on the west by Puget Sound, on the south by I-5, and the eastern boundary follows property lines, including most of the forested habitat west of Fort Lewis.

3.1 PHYSICAL ENVIRONMENT

Elements of the physical environment considered include climate, hydrology, geology, soils, and contaminants.

3.1.1 Climate

Maritime air masses have a moderating effect in south Puget Sound year round, creating a modified Mediterranean climate. Air quality is generally high due to climate, location, and few industries that produce particulates. Average annual rainfall is 53 inches in nearby Olympia. During the fall and spring seasons, the climate of the Nisqually delta is relatively mild. Winters are usually wet and mild, with intermittent moderate to heavy rain rather than snow. Summers are generally cool and dry.

The Olympic coast and Cascade ranges protect south Puget Sound from strong south-southwest prevailing winds associated with winter storms. Average fall and winter daytime temperatures range from 40°F to the low 50s. Winds are northeasterly during the summer and fair-weather periods. July, August, and September temperatures average 60 to 70°F, exceeding 90°F on approximately six days each summer. The average growing season is 250 days, depending on elevation and distance from Puget Sound (D. Weaver, pers. comm.; USFWS 1978; Thurston County Advance Planning and Historical Preservation 1994).

3.1.2 Hydrology

3.1.2.1 Freshwater

Freshwater sources in the CCP Study Area include the Nisqually River, McAllister and Red Salmon creeks, Medicine Creek, McAllister Springs, and groundwater aquifers and artesian

wells. Surface drainage primarily enters the delta from the Nisqually River, McAllister Creek, and Red Salmon Creek (USFWS 1978). A subsurface aquifer is located 175 feet below the delta (USFWS 1977, 1978).

Originating on the south slope of Mount Rainier, the Nisqually River is 78 miles long and has a 712 square mile drainage basin. Flow volumes in the upper half of the Nisqually River result from runoff and snow melt into the tributaries (Canning 1986). Located at river mile 44.2 and 42.5 are Tacoma City Light's Alder and LaGrande hydroelectric dams, respectively. These dams and their reservoirs have altered the natural flow regime by regulating downstream discharge (Whiley and Walter 1998). From the town of Yelm to the delta, the floodplain width broadens to 1 mile, bordered by bluffs on both sides rising 200 feet. Peak flows on the Nisqually River occur during winter (December through February) and late spring (May and June). Low flow periods occur in August and September. Low flows of about 1,000 cubic feet per second (cfs) usually occur in June through October in the watershed; wet season flow values are typically around 2,000 cfs (ENSR 1999). Flood flows of about 13,000 cfs were recorded in December 1995. River discharges over 18,000 cfs can overflow onto the riverbanks (Consoer, Townsend, and Associates 1974; USFWS 1977).

McAllister Creek originates at McAllister Springs in the lower Nisqually River Valley at 6.7 feet above mean sea level. Numerous small springs and seeps also feed into the creek near its headwaters (Thurston County Department of Water and Waste Management 1993). McAllister Springs is the source for the municipal water supply for the City of Olympia (Consoer, Townsend, and Associates 1974). A wellhead protection plan was developed and implemented in 1995 to decrease the possibility of contamination of the drinking water supply and to provide reaction time for a town to find another water source or install a treatment system in the event of water contamination (City of Olympia 1995).

McAllister Creek flows north through the study area and Refuge for 6 miles to the Nisqually Reach in Puget Sound. A very low stream gradient allows the tide to influence the creek all the way to its source, and creek salinity varies with the tide. The streambed changes to sand, peat, and muck downstream toward the delta. Medicine Creek is the longest tributary to McAllister Creek, originating near the Nisqually River and flowing 3½ miles, joining McAllister Creek at river mile 4.1. Another tributary to McAllister Creek is Little McAllister Creek. In wetlands above McAllister bluff, Little McAllister Creek travels through a steep ravine into agricultural ditches that outfall into McAllister Creek (Thurston County Dept. of Water and Waste Management 1993).

Red Salmon Creek originates in the eastern uplands above the delta as a shallow gradient creek that courses through marshes to the east delta bluffs, where it enters the Nisqually River (USFWS 1978).

Groundwater aquifers and several artesian wells are located within the study area. Generally, groundwater flows toward Puget Sound and major drainages, but patterns can vary locally. Groundwater of the Nisqually River watershed occurs mostly in the glacially deposited unconsolidated sand and gravel aquifers. Infiltrated precipitation recharges the central and western portions of the watershed (Emmett 1995). A 500 square mile south-central Pierce County aquifer extends north and east to the Puyallup River and Ohop Creek, bordering the

Nisqually River and Puget Sound to the south and west. The U.S. Environmental Protection Agency (EPA) has designated this aquifer as a sole source aquifer and is a primary drinking source for Pierce County (Emmett 1995; Moulton 1994; White 1997).

Population growth in the watershed is increasing the demand for water. Currently, 225,000 people live in the watershed, with 169,000 using the Pierce County aquifer as their sole source for drinking water (which supplies on the average of 42 million gallons of drinking water per day) (Emmett 1995). The City of Olympia withdraws 7 to 15 million gallons of water per day from McAllister Springs to serve approximately 40,000 customers (V. Decillo, pers. comm.). Groundwater withdrawals within all the drainages have the potential to adversely affect critical flows (Emmett 1995).

3.1.2.2 Estuary

The Nisqually River provides the majority of the freshwater to the estuary. The tidally driven reach currents distribute the turbid plume of river waters and sediment into a crescent-shaped pattern across the delta front (Thom et al. 1985). McAllister Creek also opens into a broad, tidally influenced estuary with a silt and muck streambed, braided distributaries, and mudflats at Nisqually Reach (Thurston County Dept. of Water and Waste Management 1993).

The delta undergoes two daily high and low tides. The mean higher high water (MHHW) line in the Nisqually Reach is 13.5 feet, and the maximum yearly tide is 18.7 feet (J.G. Dunbar, pers. comm.). Tidal influence extends upstream of the Nisqually River to about river mile 3.3 (Canning 1986). Very low tidal cycles (below Mean Low Low Water [MLLW]) usually occur twice a month, and the lowest tides occur during the spring and summer (-3.5 feet MLLW) (Wisseman et al. 1978).

3.1.3 Geology

The Nisqually delta is one of several river-mouth estuaries within the greater fjord-type estuary of Puget Sound. The delta is located in the Puget Trough, a broad structural and topographic depression formed at the time of the final uplift of the Cascade and Coast Range mountains, 11 million years ago (Burg 1984). Areas of volcanic activity raised large volcanic cones such as Rainier and Baker. Sedimentation, glaciation, and pressure between plates all worked to form the Puget Sound lowlands (White 1997).

After erosion, deposition, and plate tectonics worked on the landscape in Puget Sound for approximately 60 million years, a series of glaciers advanced from what is now British Columbia into the lowlands between the Cascade and Olympic ranges (White 1997). After each advance, the glaciers receded to the north and up the valleys to higher elevations, where they persist today. Between 150,000 and 15,000 years ago, these glaciers formed a glacial drift plain of gravels, sand, silt, clays, and tills that comprise the gently undulating surface of the Puget Sound lowlands (White 1997). When the last glacier receded about 14,000 years ago, the valleys were flooded with sea water and became the major basins and numerous smaller inlets of Puget Sound (Burg 1984). In lowland areas around the sound, retreating glaciers left behind a thick mantle of lacustrine and outwash sediments over the bedrock as far south as Chehalis, Washington (Burg 1984). The Nisqually River carved a deep valley into its floodplain, building the present-day

delta when sea level reached its present condition 5,000 years ago. Sediments deposited at the mouth of the river built the delta northward a distance of at least 2.4 km until an equilibrium was reached between the river's deposition and tidal current erosion in the Nisqually Reach. The delta achieved its unique crescent shape during the final stages of development when more extensive outward growth occurred along the east and west margins where tidal currents were weaker (Burg 1984).

3.1.4 Soils

Refuge soils vary widely, from the hydric soils of tidal marshes to the sandy and gravelly soils of the adjacent uplands. The delta is composed of alluvial layers of sand, silt, and clay to a depth of 138 feet (CH2M Hill et al. 1978). Tidal soils are very deep, poorly drained soils on which salt-tolerant vegetation grows (Pringle 1982; Burg 1984). Surface sediments of the main river channel are composed of silt mixed with sand, clay, and organic matter (Caicco 1989b).

Soils of the high marsh and sloughs are generally organic with silt, sand, or clay (Caicco 1989b). Sediments of the delta marsh and mudflats have been largely derived from glacial material, which historically and currently have been carried by the Nisqually River from its glacial source on Mount Rainier. The construction of LaGrande Dam in 1910-1912 and completion of Alder Dam midway up the river in 1945 reduced the amount of sediment carried to the delta by the Nisqually River.

Pilchuck loamy sand underlies an area known as the surge plain (see Section 3.2, Vegetation and Habitat Resources) and is then covered by sandy alluvial deposits of the Nisqually River floodplain.

Soils within the diked interior are silt loams of the Pilchuck, Puget, Puyallup, Sultan, and Tacoma series. These soils are compressible, tend toward wetness, and have a high organic content, low strength, and slow permeability (CH2M Hill et al. 1978).

The West Bluff in the Refuge consists of well-drained very gravelly sandy soils on 60 to 90% slopes. The East Bluff is composed of similar soils, moderately to excessively well-drained on 45 to 70% slopes, and are formed in sandy and gravelly outwash (Pringle 1982). In the uplands above East Bluff, known as the Hoffman Hill area, the Kitsap formation is associated with a significant risk of slope failure. In areas of groundwater seepage, steep slopes tend to break off in large blocks (URS Company 1979).

The McAllister Springs basin soils are found in six or so layers of silt, sand, and gravel. Soils consist of glacial till, outwash, and drift, some with peat layers deposited before the Vashon glacier advanced. Soils south of I-5 in the agricultural area are primarily Puyallup silt loams, a dark brown loamy fine sand, and sandy loam. This moderately rapidly draining soil developed in the alluvium, forming floodplain soils. Large pockets of Puget silt loam, a deep, poorly drained soil, are found within depressions in the floodplain soils (Pringle 1982).

3.1.5 Environmental Contaminants

Between 1985 and 1988, the Service conducted four contaminant investigations on the Refuge. As a result of their findings, the Refuge was classified as Category C, which requires reconnaissance monitoring for metals. The justification for the classification was based on the Refuge's proximity to urban areas and a dead bald eagle containing extremely high levels of polychlorinated biphenyls (PCBs) found on the Refuge in 1982 (Momot 1993).

The diked interior along I-5, the orchard, Shannon Slough, and McAllister Creek on the Refuge were documented as areas of potential concern due to elevated levels of arsenic, lead, and mercury. Mice from the Twin Barns contained high levels of lead. Elevated levels of mercury were found at McAllister Creek at I-5, Shannon Slough, and the "red-tailed hawk" pump (Momot 1993). In 1997 and 1998, amphipod tissue studies conducted in the delta detected measurable quantities of heavy metals, especially copper, zinc, and butyltins, in the tissues of amphipods (Davis et al. 1997). However heavy metals detected were below what are considered levels of concern for these organisms. In 1999, the Washington State Department of Ecology tested soils collected from the old orchard area for the presence of arsenic, cadmium, and lead. Results detected no presence of cadmium and very low levels of arsenic and lead (J. Mercuri, pers. comm.).

On the Nisqually Reach, vanadium and aromatic hydrocarbons were found in clams and oysters, and low levels of PCBs were found in ghost shrimp. Elevated concentrations exceeding National Oceanic and Atmospheric Administration (NOAA) standards were also documented for zinc, copper, nickel, and manganese (Momot 1993). Heavy metals and chemicals were found in 1987 and 1992 in sediment chemistry of the Nisqually River delta and reach by the Puget Sound Water Quality Authority. They included aromatic hydrocarbons, PCBs, arsenic, copper, cadmium, mercury, lead, zinc, and total organic carbon (Evans-Hamilton and D.R. Systems 1987; Puget Sound Water Quality Authority 1992). A 1985 study in Puget Sound revealed high levels of contaminants in fish, marine mammals, and marine birds. Great blue heron eggshells from the heronry in the Nisqually River delta were found to be significantly thinner than a pre-1947 mean, likely due to contamination by Dichlorodiphenyltrichloroethane (DDT) or its derivative, DDE (Calambokidis et al. 1985). Aquatic plants, such as eelgrass, appear to concentrate metals without being affected, allowing metals to move through the food web (Phillips 1984).

Since the study area is located in the vicinity of I-5, industrial and commercial operations (such as the gravel mine and gas stations), and residential developments, non-point sources of environmental contaminants exist. In addition, hazardous materials may be transported on I-5, the railroad, or by ship in Puget Sound and have potential for accidental spills, which would affect Refuge lands and waters.

It is Service policy to minimize the potential liability of the Department of the Interior and the Service by acquiring real property that is not contaminated with hazardous waste unless directed by the Congress, court mandate, or as determined by the Secretary of the Interior. In compliance with Service policy, we have conducted an initial overview survey to identify actual or potential hazardous substances or other environmental problems located in areas identified for Refuge expansion. This is the first step in determining the potential for hazardous wastes prior to

acquisition or land transfer. Additional "Level 1" environmental site assessments are also required prior to the acquisition of any real property to determine the potential for, and extent of liability for hazardous substances or other environmental remediation or injury. This includes but is not limited to a determination of the absence or presence of hazardous substances or conditions that indicate an existing or past release, or a material threat of a release on the real property. The initial site assessment and records search revealed the following:

East Bluff: A portion of the former DuPont Works, an explosives manufacturing plant from 1906 until the mid-1970s, is within the Refuge expansion area. Contamination resulted from the manufacturing process, waste disposal, pesticide use, and decommissioning of the site buildings. In July 1991, Department of Ecology, Weyerhaeuser, and DuPont Companies signed a consent decree to conduct a remedial investigation/risk assessment/feasibility study (RI/RA/FS). The site was divided into two main areas: Parcel 1 (the former production area, about 636 acres) and Parcel 2 (about 205 acres). Parcel 2 (the black powder area or Area 40) was cleaned up to industrial standards and was removed from the 1991 consent decree in August 1997.

A final EIS was issued in July 2000 for a golf course/containment facility in Parcel 1 which would isolate and manage lead and arsenic-contaminated soil (WDOE 2003). The main contaminants of concern are lead and arsenic in soil. While lead was detected site-wide, arsenic contamination, generally from pesticide use, was restricted to more discrete areas. Other hazardous substances discovered are total petroleum hydrocarbons (TPH), mercury, di- and trinitrotoluenes (DNT/TNT), and benzo(a)pyrene. DNT is the only chemical of concern in groundwater and concentrations are generally low, at levels that meet drinking water standards.

The Department of Ecology, Weyerhaeuser, and DuPont Companies have agreed on a cleanup for the former explosives plant. The consent decree, including the cleanup action plan, requires Weyerhaeuser and DuPont Companies to take several actions, which include disposal of higher level-contaminated soils at a hazardous waste landfill, excavating and consolidating lower level-contaminated soil within approximately 90 acres of the planned golf course area, capping it with a 180-acre engineered golf course including 18 inches of clean gravel and soils, and monitoring groundwater. Deed restrictions would limit site use to primarily commercial purposes that will not disturb the cap/cover system and to control groundwater so it will not be used for drinking water (WDOE 2003). The cleanup regulation also requires the Department of Ecology to review site conditions every five years to make sure that human health and the environment are being protected. The Department of Ecology will oversee the project to ensure that all terms of the consent decree are satisfied.

Expansion Area South of I-5: The portion of the study area managed by the Fort Lewis Military Reservation includes areas used for light training and areas zoned as Research Natural Area (RNA). A Level 1 contaminants survey would be conducted prior to the land transfer process.

Other locations in the study area south of I-5 with potential for contaminants include farms, the Holroyd gravel mine, the Nisqually Exit 114 gas stations, and McAllister Creek State Fish Hatchery (now closed). All may have underground or above-ground fuel storage tanks that have potential for leaking or past spills. Other potential contamination may occur in equipment maintenance areas or from pesticide storage and use. Fish hatchery operations may also have other sources of contaminants that would be investigated in a Level 1 survey prior to acquisition.

Initial reconnaissance of the City of Olympia McAllister Springs site has indicated that there is a low probability of contaminants located at this site due to its history as a drinking water source for the City.

3.1.5.1 Water Quality

The Nisqually River, from its headwaters on Mount Rainier to Alder Dam (river mile 44), is listed by the Department of Ecology as Class AA, which means that its waters are expected to meet criteria characteristic of extraordinary quality water (Emmett 1995). From Alder Dam to the delta, the river is listed as Class A, with expected criteria characteristic of good and fair quality waters. Water analyses of monitoring stations indicate that significantly higher fecal coliform concentrations occur below river mile 34 (within the mainstem Nisqually River) in comparison to upriver locations, particularly during storm events (Whiley and Walter 1998). This increase is linked to both an increase in nonpoint source fecal coliform loading and to decreased dilution. While significant increases in fecal coliform concentrations were observed for the lower portion of the river, those increases were well within the Washington State Water Quality Standard. The trend in fecal coliform for the lower river indicates that concentrations have reduced over the past 19 years from a median level of 33 colony-forming units (cfu)/100 ml to a present median of 10 cfu/100 ml (Whiley and Walter 1998).

McAllister Creek provides the most continuous source of fecal coliform to the marine areas of the Nisqually Reach (Whiley and Walter 1998). A positive correlation was detected between fecal coliform concentrations within the creek during storm events to corresponding increases in bacterial levels found over shellfish growing areas. In 1992, the Washington State Department of Health reclassified 2,130 acres of commercial and recreational shellfish beds in the Nisqually Reach from “approved” to “conditionally open” after finding elevated levels of fecal coliform bacteria in the reach following storm events (Whiley and Walter 1996; Emmett 1995). Following further evaluation, the shellfish beds were closed to harvest in spring 2000 (W. Clifford, pers. comm.). Water testing is conducted regularly to monitor contaminant levels.

The Nisqually River regularly experiences high turbidity or cloudiness during the summer due to its glacial source. Summer fluvial flows in all rivers and creeks within the CCP Study Area are extremely low and are not supporting existing water rights or fish populations, nor are they reducing the effects of pollutants or providing for recreation. The sand and gravel outwash deposits throughout the aquifer are susceptible to contamination from surface sources, such as land application of wastes (Emmett 1995).

River temperatures on the Nisqually River vary seasonally, with maximums greater than 60.8°F observed in August or September (at the gaging station at river mile 3.4). Minimum temperatures at this station are observed in January or February with values below 42.8°F (ENSR 1999).

Salinity profiles were sampled in 1977 in the Nisqually Reach during low slack water and flood tide (ENSR 1999). Freshwater in this area flows over the marine water in a very thin layer, estimated at 3 to 5 cm. Salinity measurements varied from 0 to 30 parts per thousand (ppt), with the most stratified conditions occurring near the Nisqually mudflats. The Nisqually Reach water is replaced every 8 days and is considered well flushed (ENSR 1999). Saltwater and tidal

influence have been observed from the mouth of Nisqually River to the old US Hwy 99 bridge (river mile 0.0-3.3) (Canning 1986). Salinity ranged from 0 to 6.3 ppt at McAllister Creek from October 1984 to May 1985 (ENSR 1999).

3.1.5.2 Air Quality

The delta is susceptible to localized low level inversions, which can entrap both gaseous and particulate pollutants (Hesselbart 1977b). Stationary sources of air pollution in south Puget Sound include pulp mills, lumber mills, veneer dryers, and sand and gravel companies. North to Seattle and Snohomish County, stationary sources also include steel plants, flour mills, cement plants, aluminum smelters, sawmills, and grain elevators (WDOE 1991). Deteriorating air quality in the local area is necessitating burn bans of increasing duration and area.

3.2 VEGETATION AND HABITAT RESOURCES

The Nisqually NWR represents an important regional wildlife habitat resource. Information is presented below on important habitats and plant species (including exotic and invasive species) present on the Refuge and in the entire study area. Habitats in the study area include estuarine, freshwater wetland, riverine and riparian, and upland. Figure 3.2-1 is a graphic representation of the habitat types and wildlife typical of the Refuge. This section ends with a discussion of regional trends for important habitats.

3.2.1 Habitats and Vegetation Communities

A habitat type map covering the approved Refuge as well as the entire study area was created based on analysis of a 1997 Landsat Thematic Mapper (TM) image. The amounts of each habitat type present within the approved Refuge boundary, the study area outside the approved Refuge boundary, and within the total study area are shown in Figure 3.2-2 and listed in Table 3.2-1.

3.2.1.1 Estuarine Habitat

The Nisqually River Estuary, one of the most extensive and productive estuaries in Puget Sound, is one of the few remaining vegetated nearshore estuarine habitats in the sound (Copping 1990). Estuarine habitat includes open water, aquatic bed, unconsolidated shore, and vegetated intertidal areas (Figure 3.2-3). The estuary is a complex and highly integrated system that serves as important habitat for migrating waterbirds, waterfowl, shorebirds, raptors, and salmon populations (Thom et al. 1985; URS Company 1979). Estuarine habitats attract a diversity and abundance of wildlife species and provide nursery areas for juvenile salmon and other fish. Many species of plants and animals depend on the delta for one or more phases of their life cycles (Canning 1986).

Nisqually National Wildlife Refuge

Major Habitat Types and Wildlife Typical of the Refuge

Major Habitat Types

Estuarine

The estuary is a complex and highly integrated system that serves as critical habitat for migratory waterfowl, shorebirds, raptors, waterbirds, and salmon. Estuarine habitats include aquatic bed, unconsolidated shore, and vegetated intertidal areas. Eelgrass beds, found in aquatic beds, provide shelter for fish and invertebrates and food for waterfowl and shorebirds. Unconsolidated shore areas (mudflats and sandflats) provide habitat for shellfish, shorebirds, and marine mammals, as well as nursery areas for fish. Vegetated intertidal areas are better known as salt marshes and are used by many wildlife species.

Freshwater Wetland

Freshwater wetland habitats include permanent and seasonal ponds, wet meadows, and marshes. These wetlands are fed by artesian wells and rainfall that collect in low lying depressions, channels, and ditches. Wildlife species found in freshwater habitats include dabbling ducks, geese, herons and other waterbirds, amphibians and mammals (river otters and mink).

Riverine and Riparian

Riverine and riparian habitats are found within and along the Nisqually River, McAllister Creek, and Red Salmon River. Surge plain forests are a type of riparian habitat that is influenced by tides and freshwater storm events. Riverine areas are important for salmon and other fish species, and fish-eating birds such as osprey, bald eagles, mergansers, and kingfishers. Riparian areas are important for many species.

Upland

Upland habitats include upland forest and grassland. Upland forests can be found along the steep bluffs and dikes. They support a variety of nesting birds, including eagles, hawks, herons, woodpeckers and passerines, as well as mammals and amphibians. Grassland areas on the Refuge are former pasturelands, comprised of non-native grasses. These areas are important for migrating waterfowl, landbirds, and mammals.

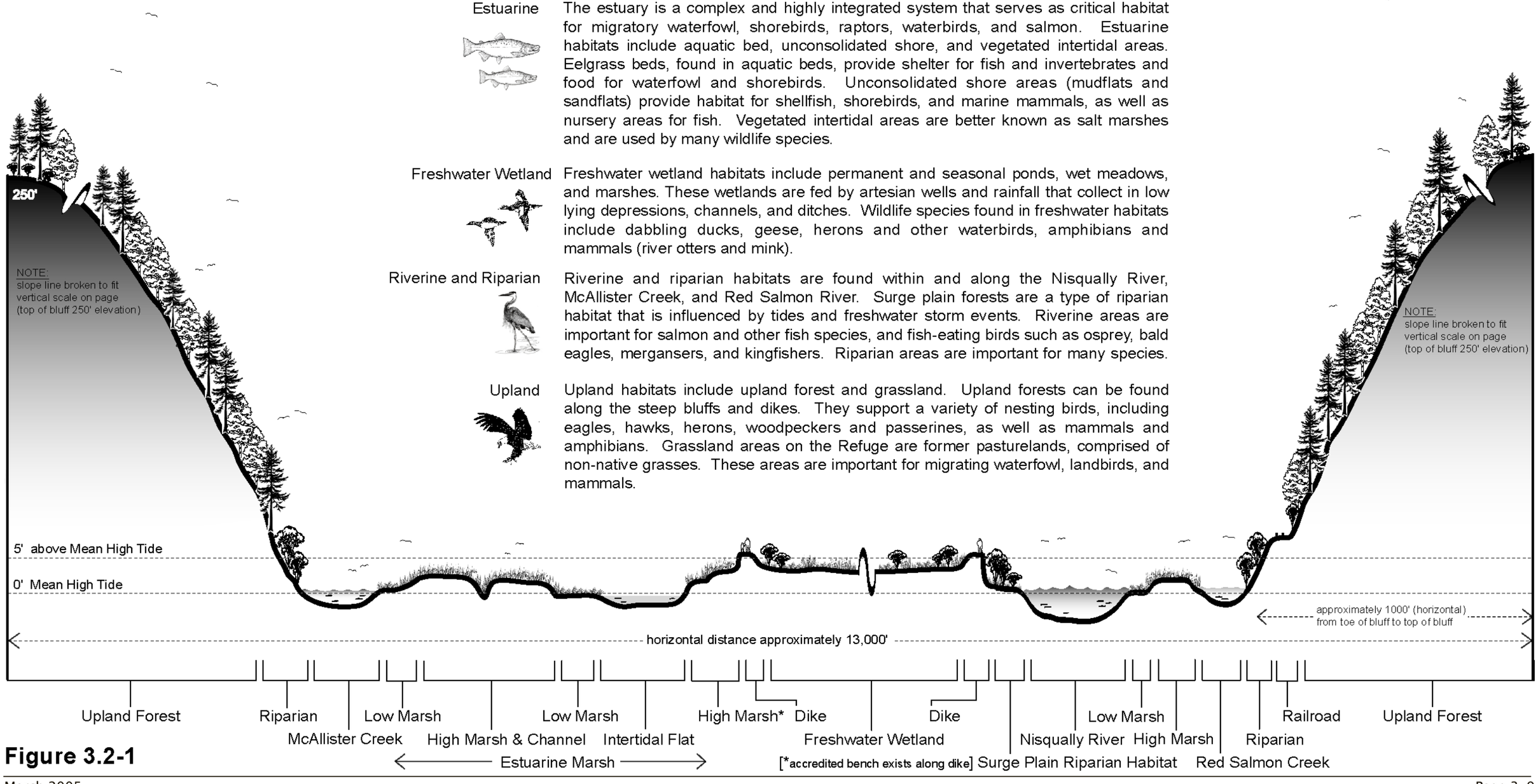

Figure 3.2-1

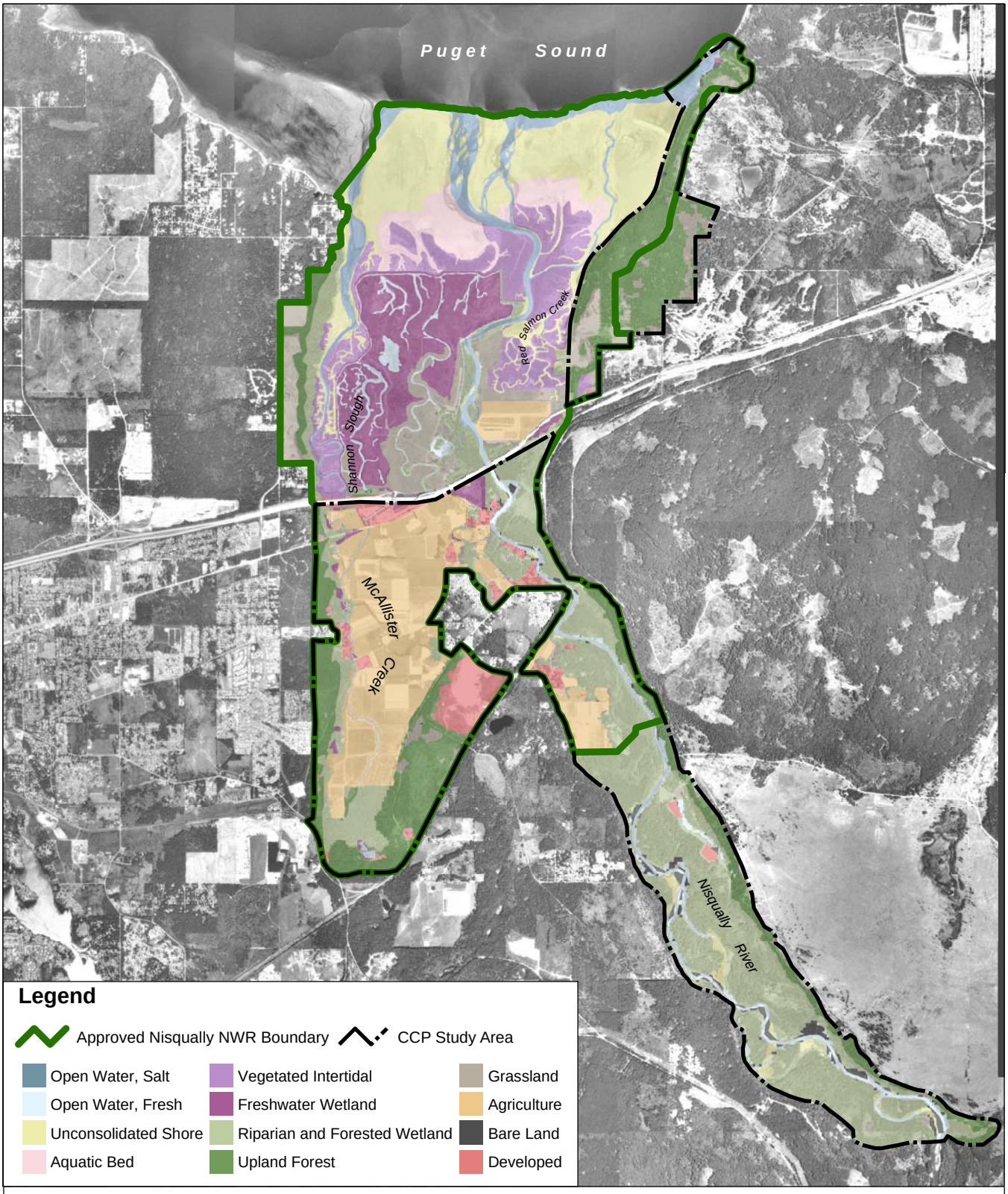

Figure 3.2-2
CCP Study Area Habitat Types

Source: 1997 Landsat TM Image; USFWS, 2000; Ducks Unlimited, 1999; EDAW, 2003

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Table 3.2-1. Summary of Habitat Types and Acres Within the CCP Study Area.

Habitat	Acres		
	Approved Refuge Boundary	Study Area Outside of Refuge Boundary	Total Study Area
Open Water, Salt	393	43	436
Open Water, Fresh	142	244	386
Unconsolidated Shore	1,115	64	1,179
Aquatic Bed	295	0	295
Vegetated Intertidal	623	10	633
Freshwater Wetland	623	48	671
Riparian and Forested Wetland	259	1,913	2,172
Upland Forest	71	1,262	1,333
Grassland	434	305	739
Agriculture	93	1,108	1,201
Bare Land	0	89	89
Developed	5	304	309
TOTAL ACRES	**4,053**	**5,390**	**9,443**

Source: Service data, Ducks Unlimited, and National Wetlands Inventories.

Includes State, Nisqually Indian Tribe, and Private lands. Acres presented in this table were calculated from Geographic Information System (GIS) database; variations in the GIS cover type data result in slight discrepancies in acreage totals presented elsewhere in this CCP.

Historically, the Nisqually delta supported 6,207 acres of intertidal estuarine habitat (Figure 3.2-4). Currently, 5,016 acres of this habitat remains, which represents a loss of 1,191 acres or 19%. Especially significant is the loss of vegetated intertidal habitat or salt marsh, which has decreased from 1,458 acres to 674 acres (a loss of 784 acres or 54%) because of diking, channel migration and straightening, and land filling around I-5 (Tanner 1999). The landward extent of the historical salt marsh, depicted on a 1878 topographic survey map (Bortleson et al. 1980; Figure 3.2-4), reached southwest to Martin Way, just south of I-5. Tidal channels crossed the forested lowland. Since 1878, the Nisqually River channel shifted laterally and straightened from the I-5 crossing to the river mouth (Burg 1984). At the turn of the century, the Brown Farm Dike was constructed and converted estuarine habitat to approximately 1,000 acres of freshwater wetlands and non-native grasslands in the current Refuge boundary (USFWS 1978). The construction of the dike also significantly reduced the amount of shoreline by cutting off the upper reaches of tidal channels and former river distributaries.

The dike is a barrier preventing nutrients, produced in the freshwater wetlands it encompasses, from being released into the estuary. Once an energy and nutrient source to the estuary, the

diked interior is now interrupting the physical, chemical, and biological processes of the estuarine system. The alteration of estuarine wetlands to freshwater wetlands by diking has removed habitat for waterfowl, salmon, and other estuarine-dependent species, resulting in detrimental effects (Burg 1984).

The construction of two dams on the Nisqually River reduced the amount of sediment carried to the delta, which may have altered the equilibrium between erosion and deposition toward erosion and recession. The river discharges about 105,000 tons of sediment annually, nearly all of which is currently deposited in Alder Lake (Nelson 1974). The dike may also have caused tidal velocities to increase, resulting in erosion of the mudflats (Consoer, Townsend, and Associates 1974; USFWS 1977; Burg 1984; Canning 1986).

Estuarine Vegetation Community Descriptions

Estuarine habitat surrounds the diked area in the delta. Below are described three general categories of estuarine habitat–aquatic bed, unconsolidated shore, and vegetated intertidal–and their distinct vegetation communities (Figure 3.2-2).

Aquatic Bed

Aquatic bed refers to wetlands and deepwater habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season (Cowardin et al. 1979). One of the most important vegetation communities of the aquatic bed in the Nisqually delta is eelgrass beds. Eelgrass provides shelter for fish and invertebrates and is an important source of food for shorebirds, waterfowl, benthic invertebrates, and a large number of other animals. Eelgrass is restricted to habitats where erosion and sedimentation are in equilibrium because its rhizomes tend to grow horizontally (Phillips 1984). The Nisqually River delta is the southern-most source of eelgrass in Puget Sound (T. Mumford, pers. comm.).

Eelgrass beds covering about 49 acres in 1978 were found to occur from the County line northeast to the sandspit on the eastern shore (Wisseman et al. 1978), and covered about 25% of the RNA in the Nisqually Reach (Caicco 1989a). The northeast eelgrass meadows are in the lower intertidal and shallow subtidal areas (Wisseman et al. 1978). The delta front, from the County line to McAllister Creek, is devoid of eelgrass, presumably due to strong tidal scouring action in the reach. High concentrations of eelgrass (22 acres) were found in the McAllister Creek channel in 1978, extending well into the creek mouth and reach (Wisseman et al. 1978). The eelgrass beds in this area are sparsely distributed and less dense than eelgrass beds in other parts of Puget Sound (A. Sewell, pers. comm.).

Unconsolidated Shore (Saltwater)

Unconsolidated shore areas consist of mudflats, sandflats, and rocky shores characterized by a lack of vegetation, except for pioneering plants that become established during brief periods when growing conditions are favorable. Erosion and deposition by waves and currents produce these landforms (Cowardin et al. 1979). These areas attract many wildlife species including

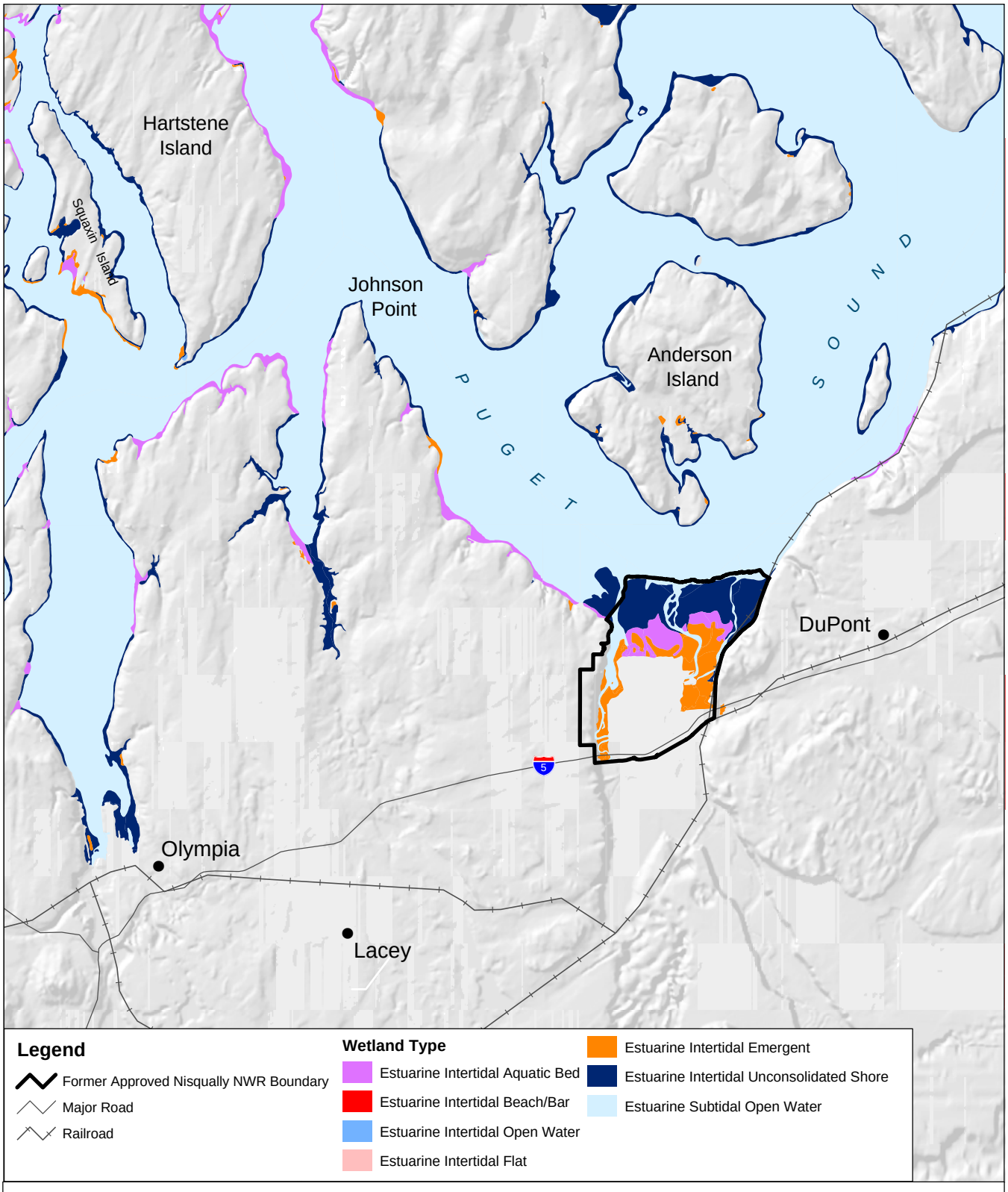

Figure 3.2-3
National Wetland Inventory of Regional Estuarine Wetlands

N

0 0.5 1 2 Miles

1:150,000

Source: USFWS, 2000; Ducks Unlimited, 1999; EDAW, 2002

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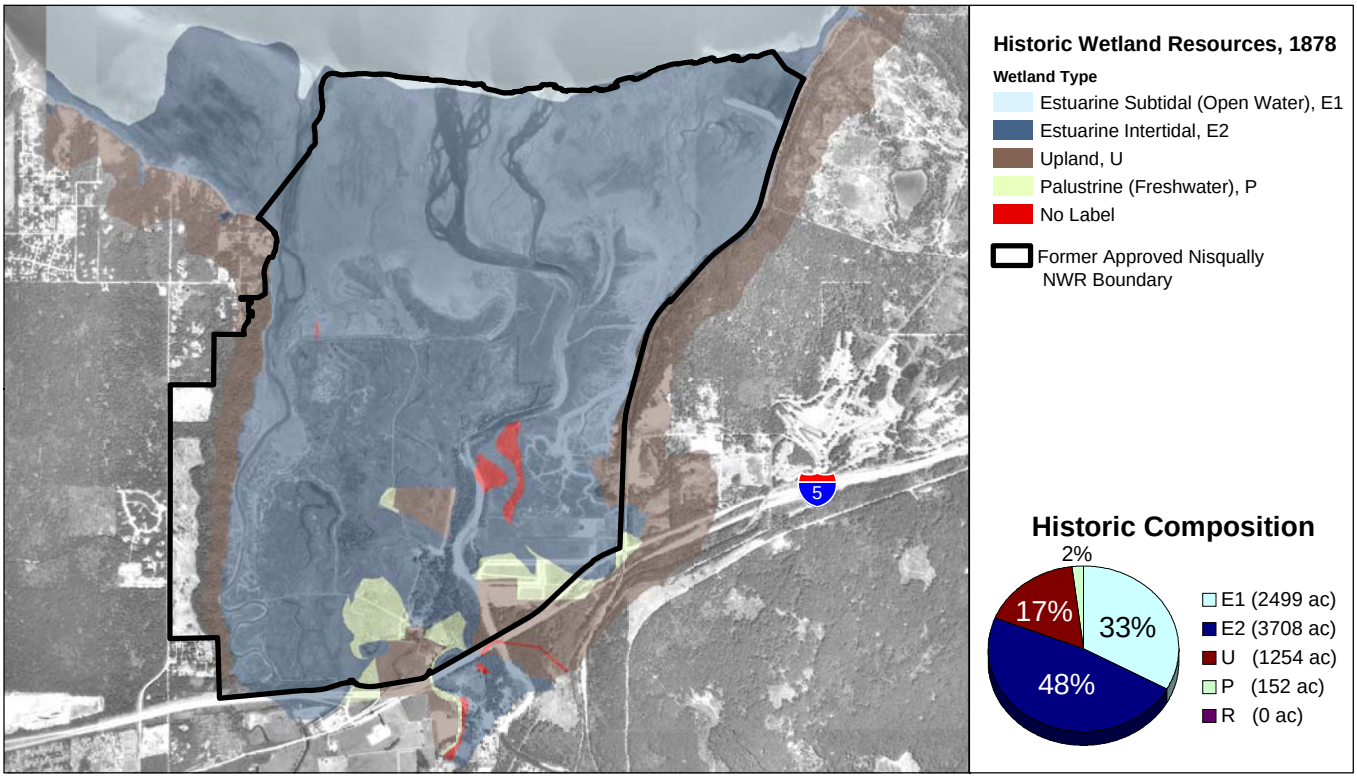

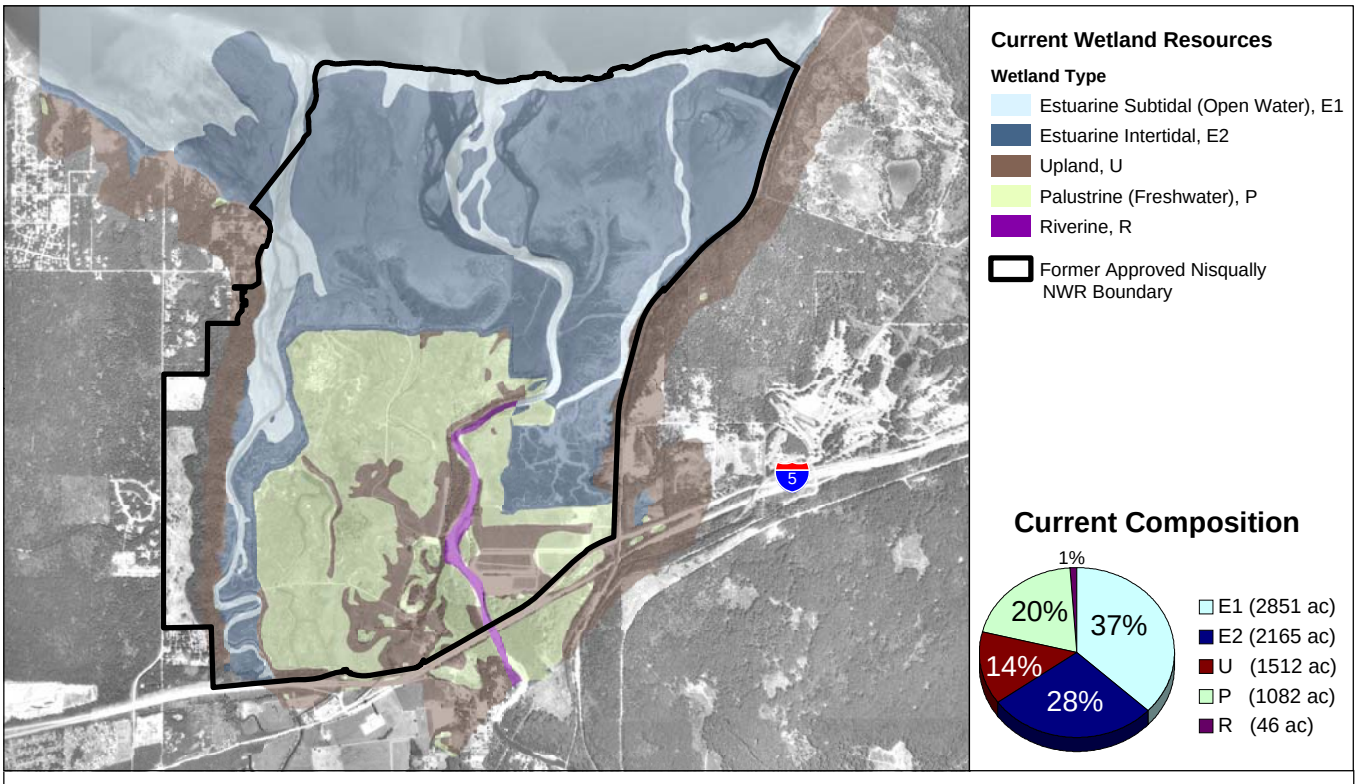

Figure 3.2-4
Historic (1878) and Current Wetlands in the Nisqually Delta

N

0 0.25 0.5 1 Miles

1:60,004

Source: USFWS, 2000; Ducks Unlimited, 1999; Tanner 1999; EDAW, 2002

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shellfish and other invertebrates, shorebirds, and mammals. The delta mudflats and unconsolidated substrate harbor microalgae and over 80 seaweed species. Microalgae, which attaches to sediment, is a possible source of carbon to the detritus-based food web, which plays a primary role in estuarine production (Thom et al. 1985). Sparse mudflat vegetation includes Lyngby's sedge, seashore saltgrass, seaside arrowgrass, fleshy jaumea, and pickleweed (Kunze 1984; Burg et al. 1980). The sparsely vegetated mudflats transition into the more abundant vegetation and dense drainage channels of the low salt marsh (see Vegetated Intertidal, below).

Vegetated Intertidal (Estuarine Emergent)

Vegetated intertidal or estuarine emergent areas are better known as salt marshes. These areas can be further subdivided into low, middle, and high salt marsh communities based on salinity patterns, elevation, and other factors such as substrate, wave energy, marsh age, sedimentation, and erosion. Low salt marsh generally occurs between the lowest margin of the marsh and mean high water (MHW). Middle salt marsh occurs between MHW and MHHW. High salt marsh occurs between MHHW and the highest margin of the marsh. High salt marsh vegetation typically mixes with upland plant species in the marsh/upland zone (Figure 3.2-1).

Low salt marshes are found on low terraces where the Nisqually River and McAllister Creek meet the reach and in sandy intertidal marsh areas along the outer fringe of the Brown Farm Dike. The topography is hummocky with a diffuse drainage pattern and attracts an abundance of migrating waterfowl species, rails, and bitterns. In the delta toward the reach, low salt marshes are of moderate salinity, with silty and sandy soils. Low to intermediate salt marsh plant communities are dominated by pickleweed, Lyngby's sedge, gumweed, tufted hairgrass, seaside arrowgrass, seashore saltgrass, fleshy jaumea, halberd-leaf saltbush, and scattered patches of Baltic rush (Burg 1984; Burg et al. 1980; Mason et al. 1974). In sandy, low intertidal marsh areas, plant communities include seashore saltgrass and pickleweed (Kunze 1984; WNHP 1998).

The broad, relatively level vegetated areas of the high salt marsh, separated by wide drainage channels up to 6 feet deep, were formed by distributaries of the Nisqually River prior to diking (Klotz et al. 1978; Burg 1984). Migrating waterfowl, particularly dabbling ducks, utilize the rich food sources available in these areas. The high salt marsh is composed of plant communities that tolerate low and moderate salinity. Along the river, communities include tufted hairgrass, Baltic rush, Pacific silverweed, Lyngby's sedge, and red fescue (Burg et al. 1980; Burg 1984). Quackgrass, redtop, velvetgrass, and orchardgrass are found high on the banks of McAllister Creek.

Salt marsh productivity is dependent upon the health of its vegetation (URS Company 1979). Nisqually salt marsh studies in 1980 showed a production weight recorded for Lyngby's sedge that is among the highest rates recorded for salt marshes in the Pacific Northwest (Thom et al. 1985). Lyngby's sedge, covering roughly 20 acres in the delta, was the most productive plant type at both high and low elevations (Burg et al. 1980).

3.2.1.2 Freshwater Wetland Habitat (Palustrine Emergent)

Freshwater wetlands in the CCP Study Area include permanent and seasonal ponds, marshes, wet meadows, and scrub-shrub habitats. These are also known as palustrine emergent wetlands.

Riverine and riparian wetlands are other types of freshwater wetlands, discussed separately below. Freshwater wetlands provide habitat for a variety of waterfowl (especially dabbling ducks), herons and other waterbirds, shorebirds, landbirds, mammals, amphibians, and invertebrate species.

Since the mid-1800s, a loss of wetlands in the Nisqually River delta and watershed has occurred, not only in estuarine but also in freshwater wetlands (Canning 1986). Freshwater wetland losses have been caused by draining, filling, and diking of lands. Losses are also due to competing activities and practices such as agriculture, grazing, forestry, and recreation (Canning 1986).

When the dike was built in the late 1800s, estuarine habitat was converted to freshwater habitat, increasing freshwater habitat in the delta by 610% (Tanner 1999). With the cessation of agricultural practices, the diked area became progressively wetter. Since Refuge establishment, the diked area has been managed as freshwater wetlands and non-native grasslands.

Freshwater wetlands within the current Refuge boundary are found primarily within the diked area and include permanent and seasonal wetlands, wet meadows, marshes, and scrub-shrub habitats. These wetlands are fed by several artesian wells and rainfall and are found around artesian wells, in low lying depressions, along historically tidal slough channels, and in borrow ditches. During high flood conditions, freshwater also flows into the diked area through two overflow channels from the Nisqually River. Normally, there is no direct flow from the Nisqually River or McAllister Creek into the diked area. Saltwater seepage through the dike occurs frequently, allowing both freshwater and brackish vegetation to grow in the borrow ditch and sloughs. Interspersed within the dike's emergent wetlands and seasonally flooded freshwater depressions are non-native grasslands (see Upland Habitat, below).

Vegetation dominating wet meadows commonly includes rushes, cattails, sedges, and grasses. Scrub-shrub vegetation scattered through the marsh areas includes mixed grasses and forbs and is dominated by native shrubs. Aquatic vegetation found in permanent ponds includes pondweeds, smartweeds, knotweeds, bulrushes, sedges, and grasses (Burg 1984).

During the past 20 years, the habitat quality of the diked interior freshwater wetlands at Nisqually NWR has declined. Reed canary grass, a highly invasive exotic plant, is rapidly spreading throughout much of the area and now occupies more than 30% of the total acreage. Water level management has become increasingly limited, and portions of the diked area are becoming too wet to easily manage. Plant succession has been allowed to occur in large sections of the diked area, allowing wetlands and grasslands to gradually convert to scrub-shrub habitats.

Approximately 48 acres of freshwater emergent wetlands occur in the study area outside of the currently approved Refuge boundary. All of these wetlands are found south of I-5. The majority of them occur in the McAllister Creek basin in potholes and upland depressions. Wetland vegetation ranges from sedge stands to cattails, bulrushes, willows, salmonberry, and skunk cabbage (Thurston County Dept. of Water and Waste Management 1993). Other freshwater wetland locations are also found along the Nisqually River and adjacent floodplains.

3.2.1.3 Riverine and Riparian Habitats

This group of habitats includes riverine, freshwater unconsolidated shore, riparian, and forested wetlands areas in the CCP Study Area. They are found within and alongside the Nisqually River, McAllister Creek, and Red Salmon Creek. Natural riverine and riparian corridors are diverse, dynamic, and complex habitats supporting a wide variety of fish and wildlife. Although riparian areas constitute a small portion of the surface landscape, they are very productive, and approximately 85% of Washington's wildlife species have been known to use riparian habitat associated with rivers and streams (Knutsen and Naef 1997). Habitat for many upland species is also directly enhanced by the presence of adjacent riparian and riverine habitat.

Most of the Nisqually River floodplain in the study area is comprised of riparian vegetation (Canning 1986). The original extent, and subsequent loss to conversions, of the riparian forests is unknown. Historically, losses occurred primarily due to timber harvest, livestock grazing, road construction, and reservoir impoundments (Canning 1986). On the Refuge, agricultural fields, roads, and building sites are located on historical riparian and bottomland habitat along the Nisqually River. These disturbed areas have been colonized mainly by non-native grasses and forbs (Klotz et al. 1978).

Riverine and Unconsolidated Shore

Riverine habitat is home to some aquatic plants but is dominated by open water. Unconsolidated shore includes sandflats containing pioneering plants that are periodically disturbed by floods and other erosive events. The Nisqually River provides good wintering habitat for bald eagles (URS Company 1979). A peak count of 200 eagles on the Nisqually River has been observed (Stalmaster 2001). Other species that use the riverine habitat in the study area include several anadromous (migratory) salmonids, such as chinook and chum salmon, and a variety of amphibians, reptiles, and mammals.

Riparian and Forested Wetland (Deciduous and Mixed)

Riparian forests in the study area are typically deciduous or mixed forests along the Nisqually River and McAllister Creek. Deciduous riparian forests are dominated by big-leaf maple, black cottonwood, and red alder. In areas where coniferous tree species are present (mixed forests), Douglas-fir or western red cedar are typical. Understory vegetation includes salmonberry, snowberry, Indian plum, and red-osier dogwood. Riparian vegetation along the upper McAllister Creek grows in a broad wetland with some saltwater intrusion. Vegetation consists of willows, red elderberry, ninebark, and Indian plum. From the middle reach of the creek to the estuary, agricultural dikes and lawns with scattered wetland plants occur, as well as riparian habitat limited to narrow bands along the streambanks (Thurston County Dept. of Water and Waste Management 1993). Riparian areas provide habitat for more bird species, including passerines, woodpeckers, waterfowl, and raptors, than all other habitat types combined (Knopf et al. 1988; Kirby et al. 1992).

Within the Refuge, a high quality example of a surge plain—a high energy, high nutrient, tidal freshwater forested wetland–can be found along the Nisqually River. The approximately 70-acre forested wetland community is regularly influenced by tidal waters. The surge plain is flooded

during high tides and freshwater storm events. Between inundating floods and high tides, the forested wetlands remain wet to saturated by slightly brackish water and freshwater, and the water table is near the surface (WNHP 1998; Caicco 1989a). The surge plain consists primarily of deciduous forests with small pockets of mixed canopy. The deciduous stands are dominated by black cottonwood, big-leaf maple, red alder, with a very dense shrub layer (Caicco 1989a). The shrub layer consists of two communities—one dominated by common snowberry and the other by salmonberry (Klotz et al. 1978; Caicco 1989a). Other plants found in the understory include various willow species, vine maple, red-osier dogwood, Oregon ash, and red elderberry (Caicco 1989a; URS Company 1979).

3.2.1.4 Upland Habitat

Upland habitat consists of lands not inundated by water except during catastrophic events. Upland habitat in the CCP Study Area includes upland forest, grassland, and agricultural land. Most of the upland areas within the approved Refuge boundary are in the southwestern portions of the diked area, on the western property above the bluffs, the eastern hillside near Mounts Road, and the area around the Refuge administrative buildings and parking lot. Upland areas within the study area outside the Refuge boundary include the bluffs along the Nisqually River, McAllister Creek and along the eastern boundary of the Refuge, and agricultural lands in the valley. Upland forest habitats support a variety of nesting birds, including the bald eagle, red-tailed hawk, great blue heron, woodpeckers, and passerines, as well as mammals and amphibians. Agricultural lands and grasslands, depending on specific management regime, can be good foraging areas for some landbirds, shorebirds, and waterfowl.

Within the Refuge, upland forests were formerly highly diverse and probably contained western hemlock, western red cedar, and Douglas-fir, which flourished in openings created by fire, wind, drought, insect damage, and disease (Thurston County Dept. of Water and Waste Management 1993). By the mid-1800s, the upland forests were cleared as settlers created fields for cultivation amidst transitional freshwater wetlands (Burg 1984). Forests throughout the Puget Sound lowlands, including the Nisqually River watershed, have been heavily affected by logging. Red alder, which was much less common before settlement and logging of the delta, is now more abundant (URS Company 1979). The overall reduction in structure and complexity of forests in the watershed compared to their historical counterparts may offer less stormwater protection and habitat diversity (Thurston County Dept. of Water and Waste Management 1993).

Soil map analysis of the study area suggests that prior to European settlement, forested uplands and riparian forested bottomlands grew adjacent to the estuarine wetlands of the delta. Native grasslands were, at that time, restricted to uplands and prairies south and east of the delta.

Upland Forest

The Refuge and study area lie entirely within the Puget Sound Douglas-fir ecoregion/vegetation zone, adjacent to the Woodland/Prairie Mosaic zone on Fort Lewis. Forests cover about 87 acres of the Nisqually delta and bluffs (Klotz et al. 1978). The delta bluffs are dominated by mixed coniferous-deciduous upland forests (USFWS 1977). Forests along the west delta bluffs are mixed deciduous-conifer species. Douglas-fir is predominant, mixed with big-leaf maple, western hemlock, and red alder at lower levels on the bluffs. The upland area adjacent to the

West Bluff between Meridian Road and the top of the bluff was historically a dense forest of Douglas-fir, western hemlock, and some western red cedar. Most of the trees were clearcut from the southern two-thirds of the property in the early 1990s, before the Service purchased the 110-acre tract. The parcel has since reverted to a field of Scot's broom with some occurrences of natural revegetation. The uplands were acquired by the Refuge as a wildlife corridor to the West Bluff and to stabilize the slope above the creek and protect the biological and aesthetic integrity of the Refuge. Reforestation efforts were initiated in the late 1990s.

Forests in the remainder of the study area are comprised of second-growth coniferous and mixed forests (Thurston County Dept. of Water and Waste Management 1993). The bluff along the eastern boundary of the Refuge and along McAllister Creek south of I-5 is dominated by coniferous trees, primarily Douglas-fir. Mixed deciduous forests are scattered along the Nisqually Valley lowlands.

Grassland

Approximately 230 acres of the diked interior are former pastures that were historically extensively cultivated and heavily grazed. Today, pasture grasses that dominate these areas and elevations of these former pasture lands fluctuate slightly with distinct vegetation changes, creating a mixture of non-native grasslands and wet meadows. In lower depressional areas of the diked interior, non-native grasses, such as creeping bentgrass and common velvetgrass, and occasional stands of rushes are found (Mason et al. 1974). Reed canary grass dominates the transition zone between former pasture land and wet meadows, comprising more than 30% of the diked interior.

Since 1974, between 75 and 450 acres have been mowed or hayed each year each to control reed canary grass and provide fall browse vegetation for waterfowl, particularly American wigeon. The area mowed or hayed varies from year to year, depending on rainfall. Currently, approximately 300 to 350 acres are mowed or hayed each year.

Agriculture

With over 1,100 acres in crops and pasture in the CCP Study Area outside of the Refuge boundary, agriculture is one of the predominant land uses south of I-5. The principal crops grown in this area include hay, corn, and Christmas tree farms. To maintain the existing rural environment of the Nisqually Valley, agricultural lands in this area became part of Thurston County's Purchase of Development Rights (PDR) program since 1994 (S. Morrison, pers. comm.; Thurston County Planning Department 1992). The PDR program permanently preserves farmland while supporting the farming community.

3.2.2 State and Regional Trends for Key Habitats Represented at Nisqually NWR

Historically, presettlement wetland acreage in Washington ranged from 1.17 to 1.53 million acres (Lane and Taylor 1996). Estimates of wetland loss in Washington range from 20 to as great as 50% decline during the past 200 years due to dredging, filling, diking, and industrial and residential development (Lane and Taylor 1996). The Puget Sound area has experienced even

greater losses of up to 70 to 100% of historic wetlands in some urbanized areas (White 1997; Lane and Taylor 1996). Freshwater wetlands throughout the state were subject to a high rate of loss until the 1940s. Since then, the trend of wetland loss has slowed considerably since fewer wetlands remain to be converted, particularly in urbanized areas (Boule et al. 1983; Lane and Taylor 1996). Of the estimated 900,000 acres of wetlands currently in Washington State, about 22% are estuarine and 78% are freshwater (also known as palustrine) (Boule et al. 1983; Lane and Taylor 1996).

Over 80% of estuarine wetlands in Puget Sound, and up to 33% of its eelgrass beds, have been lost (White 1997; Lane and Taylor 1996; Dean et al. 2000). In south Puget Sound, estuarine intertidal areas comprise only 6% of wetland areas and are dominated by vast expanses of shoreline (Tanner 1999). Figure 3.2-5 shows large overall losses in salt marsh acreage for 11 major river deltas in Puget Sound. Currently, salt marsh habitat is one of the smallest wetland components, comprising just 0.3% or approximately 1,529 acres of wetland and deepwater resources in the south Puget Sound region (Tanner 1999).

Roughly 500 to 1,000 acres of freshwater wetlands are filled each year in western Washington (White 1997). Current loss and degradation of freshwater wetlands in western Washington are due to urban expansion, forestry and agricultural practices, industrial development, and invasive or exotic plants and animals (Lane and Taylor 1996). Currently, freshwater wetlands comprise a significant component (18%) of wetlands in the south Puget Sound region (Tanner 1999). Freshwater wetlands in the region are dominated by vegetated wetland classes, with emergent wetlands comprising 35% of all freshwater wetlands found in this region (Tanner 1999).

3.2.3 Plants, Including Exotic and Invasive Species

A list of plant species found on the Refuge is located in Appendix E.1. There are no rare plants inhabiting the Refuge or study area. As many as 437 species of plants have been recorded on the Refuge (USFWS data). These include a variety of forbs, trees, shrubs, grasses, and sedges. The most abundant group of plants are forbs, with over 200 species. Shrubs are the next most abundant, with 60 species. The number of species of grasses and trees is similar, with about 35 species each. An inventory of plants within the study area has not been conducted. See Habitats and Vegetation Communities, above, for examples of plant species found in various habitat types.

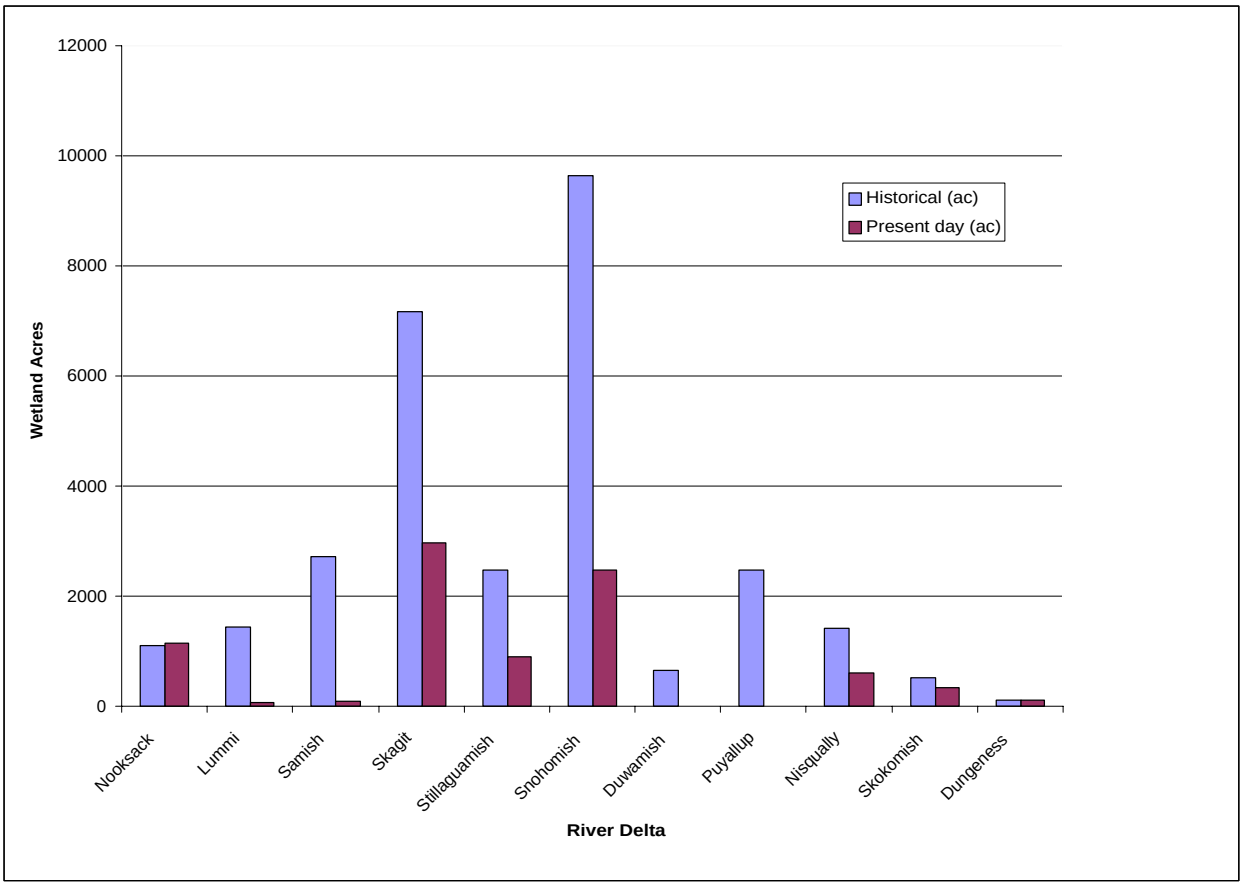

Figure 3.2-5. Overall losses in salt marsh acres for Puget Sound river deltas

Nisqually NWR has numerous invasive weed species that compete aggressively with native plant communities. One species in particular, reed canary grass, has invaded most non-forested freshwater wetlands. Figure 3.2-6 displays the best available data showing the distribution of reed canary grass on the Refuge.

Canary grass grows under a variety of moisture conditions; however, optimal growth occurs on moist or wet soils, particularly in wetlands. Canary grass infestations establish quickly and expand rapidly. Because canary grass is highly competitive, it poses a major threat to native wetland vegetation. Many wetlands throughout the Pacific Northwest have become infested with dense, monotypic stands of canary grass, decreasing the diversity of flora and fauna.

In 1997, reed canary grass dominated at least 30% of the diked interior and it continues to spread rapidly. Effective control is extremely difficult and costly, requiring an intensive combination of mowing, discing, prolonged and deep flooding, and herbicide application.

Other weed species are monitored and controlled annually to prevent them from taking over Refuge habitats. Scot's broom was introduced to the Pacific coast as a garden ornamental by early settlers. Scot's broom aggressively grows into dense, pure stands eliminating native forbs, grasses, or young trees. In Washington, this plant interferes with re-establishment of conifer

seedlings on harvested lands. Other pest species include common reed, poison hemlock, rush skeletonweed, gorse, Canada thistle, and tansy ragwort. The Refuge is surveyed throughout the year for the presence of these species, and plants are removed manually. The non-native Himalayan blackberry is an aggressive invader of pastures and seasonal freshwater wetlands, forming dense monotypic stands. Control requires aggressive measures including mowing, discing, scraping, hand removal, and herbicide application.

3.3 FISHERIES HABITATS AND RESOURCES

As many as 94 species of fishes from 30 different families have been observed in the Nisqually Basin, Estuary, and Reach (Cook-Tabor 1999). These species include salmonids, lamprey, herring, smelt, cods, sculpins, rockfish, surfperches, pricklebacks, gobies, sandlances, flounders, and flatfishes. There are few freshwater species residing in the Nisqually River, McAllister Creek, and associated tributaries that would be affected by this plan. The description presented in this CCP focuses on the selected species listed in Table 3.3-1 below (see Wildlife Species List, Appendix E.2). All of these species are considered indicators of estuarine environmental health and are meant to represent the broader set of fish species using estuarine habitats of the Refuge and study area (Emmett et al. 1991). The species listed in the following table are described below by species group.

3.3.1 Pacific Salmon

Salmonids are probably the most abundant fishes in the Nisqually River Basin, with ten species found in the Nisqually River and Estuary, McAllister Creek, and independent tributaries. Six of the salmonids observed in the Nisqually Basin are Pacific salmon. Pacific salmon are an integral component of the Pacific Northwest, supporting industry, recreation, and culture (Nehlsen et al. 1991). The Pacific salmon runs present in the Nisqually River include summer/fall chinook, winter chum, coho, and pink salmon, and cutthroat and winter steelhead. Chum salmon are the most abundant species, followed by coho salmon, pink salmon, steelhead, and chinook salmon. Due to high numbers of releases of hatchery fish in the Nisqually River Basin, the summer/fall chinook and coho salmon runs are considered to be of mixed hatchery/native origin. All other Pacific salmon runs are of native origin.

Extensive losses of salmonid populations throughout the Pacific have occurred over the last 150 years. Adverse effects of habitat alterations, dams, and hatchery operations are widely recognized as major contributors to the decline of salmon in the region. Nehlsen et al. (1991) associate these activities with over 90% of the documented stock extinctions or declines. The importance of habitat is underscored in coastal watersheds with declining salmon populations.

The generalized life history of Pacific salmon includes spawning in freshwater, migration through estuaries to the ocean, and subsequent maturation and migration back to freshwater for spawning. Juveniles migrate from the river to the estuary primarily during spring and early summer, and the occurrence of juvenile salmon within different estuarine habitats varies by time, species, and size, with species residing in estuaries from a few days to many months. Of the

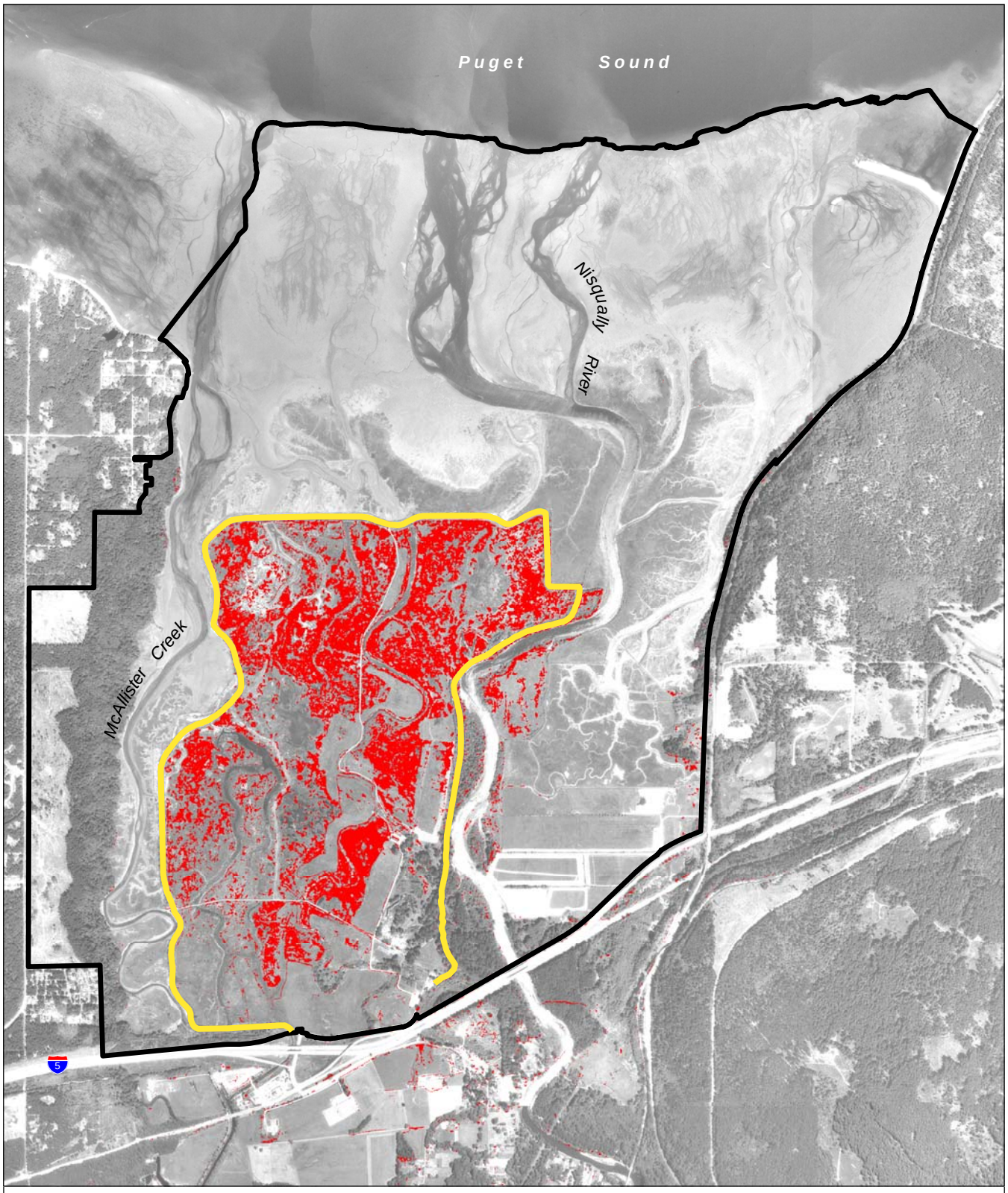

Figure 3.2-6
Distribution of Invasive Reed Canary Grass, 1997

Legend
- Former Approved Nisqually NWR Boundary
- Dike
- Seasonally Flooded Reed Canary Grass

N

0 0.125 0.25 0.5 Miles

1:30,007

Source: USFWS, 2000; Ducks Unlimited, 1999; EDAW, 2002

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Table 3.3-1. Representative Fish Species Inhabiting the Estuarine Habitats of the Refuge.

Species Group	Family
1. Pacific Salmon	
Chinook salmon *(Oncorhynchus tshawytscha)*	Salmonidae, trouts
Chum salmon *(O. keta)*	Salmonidae, trouts
Coho salmon *(O. kisutch)*	Salmonidae, trouts
2. Forage Fish	
Pacific herring *(Clupea harengus)*	Clupeidae, herrings
Surf smelt *(Hypomesus prettiosus)*	Osmeridae, smelts
Pacific sand lance *(Ammodytes hexapterus)*	Ammodytidae, sand lances
3. Other Fishes	
White sturgeon (*Acipenser transmontanus*)	Acipenseridae
Bull trout *(Salvelinus confluentus)*	Salmonidae, trouts
Pacific tomcod *(Microgadus proximus)*	Gadidae, cods
Pacific staghorn sculpin *(Leptocottus armatus)*	Cottidae, sculpins
Shiner perch *(Cymatogaster aggregata)*	Embiotocidae, surfperches
Arrow goby *(Clevelandia ios)*	Gobiidae, gobies
Starry flounder *(Platichthys stellatus)*	Pleuronectidae, righteye flounders
English sole *(P. vetulus)*	Pleuronectidae, righteye flounders

Pacific salmon found in the Nisqually River, chinook salmon are the most dependent on estuaries to complete their life cycle, followed by chum, pink, and coho salmon, and coastal cutthroat trout (Aitkin 1998).

Estuaries provide important habitat for foraging, predator avoidance, and for the physiological transition from fresh to saltwater (Healey 1982; Simenstad et al. 1982; Iwata and Komatsu 1984). Juvenile anadromous salmonids use intertidal and shallow subtidal sloughs and tidal channels during the critical transition from spawning habitats in freshwater to the marine feeding grounds of the north Pacific Ocean (Simenstad et al. 1992). Juvenile salmonids congregate in areas where estuary morphology favors detritus retention, such as weed beds and channels with braided and meandering morphology (Healey 1982).

Chinook salmon, also known as king salmon, are the largest of the Pacific salmon. Nisqually River chinook salmon are included, with 27 other distinct stocks, in the Puget Sound evolutionarily significant unit (ESU) determined by NMFS (Myers et al. 1998; Stout et al. 2001). Abundance of native chinook salmon in this ESU has declined substantially; NMFS has

determined this ESU to be at risk of becoming endangered within the foreseeable future and listed this ESU as threatened under the Endangered Species Act (ESA) in 1999 (63 FR 11482).

Chinook salmon have the most diverse life history strategies of the Pacific salmon (Myers et al. 1998) and remain at sea commonly from 2 to 4 years, with some proportion remaining as little as 2 or 3 months or as long as 6 years (Gilbert 1912; Mullen et al. 1992). The majority of juvenile chinook salmon out-migration to the estuary has been found to occur between mid-February and early June (Williams et al. 1975). The principal prey items eaten by juvenile chinook salmon in the estuary were insects (primarily dipteran flies) as well as spiders, decapod zoea, harpacticoid copepods, amphipods, and fish (Pearce et al. 1982). The highest growth rates for juvenile chinook salmon have been recorded in estuaries (Simenstad et al. 1982). Results of studies in the Sacramento River and Skagit River systems suggest that juvenile chinook salmon reared in estuaries grow faster than chinook salmon reared in upper river habitat, and this may increase their marine survival (Kjelson et al. 1982; Congleton et al. 1982). Tag recovery data from hatchery fish indicate that juvenile chinook salmon originating from other river systems in south Puget Sound utilize the Nisqually Estuary (Pearce et al. 1982).

Winter chum salmon in the Nisqually River are considered native in origin. The main prey of juvenile chum salmon in the Nisqually River Estuary was found to shift over the period of out-migration from bottom-dwelling prey, primarily harpacticoid copepods and gammarid amphipods, to prey found in shallow waters, such as calanoid copepods, crustacea larvae, and hyperiid amphipods (Fresh et al. 1979; Pearce et al. 1982).

Nisqually River coho salmon were included in the Puget Sound/Strait of Georgia ESU determined by NMFS in their status review of coho salmon stocks of Washington, Oregon, and California (Weitkamp et al. 1995). This ESU is under consideration for listing (candidate species) under the ESA due to the continuing loss of habitat, high artificial production rates, high harvest rates, and a severe decline in average size of spawners. Coho salmon juveniles remain in the system for more than 1 year, rearing in the accessible length and tributaries of the Nisqually River, the independent tributaries of the south shore of the Nisqually Reach, and McAllister Creek (Williams et al. 1975). The majority of out-migration to saltwater occurs between late February and early June. Juvenile coho salmon located in shallow sublittoral (water zone to about 600 feet) habitat in the Nisqually Reach feed primarily upon bottom-dwelling organisms, such as gammarid amphipods, harpacticoid copepods, cumaceans, isopods, and mysids, as well as sand lance and surface drift insects (Fresh et al. 1979; Pearce et al. 1982).

3.3.2 Forage Fish

Herring species observed in the Nisqually River, Estuary, and Reach include American shad, a non-native species, and Pacific herring (Fresh et al. 1979; Pearce et al. 1982). Pacific herring are a significant part of the prey base of finfish, marine mammals, and seabirds of Puget Sound (Lemberg et al. 1997; Stewart 1977; West 1997). The herring found utilizing the Nisqually Reach and Estuary is the Squaxin Pass stock, the southernmost stock in Puget Sound (Lemberg et al. 1997). A Biological Review Team (BRT) from NMFS reviewed the declining status of Pacific herring in Puget Sound and concluded that it is neither at risk of extinction, nor likely to become so. However, the report also found that there is evidence pointing to the potential for human-caused factors to be disrupting the Puget Sound ecosystem (Stout et al. 2001).

Prior to spawning, adult herring hold in the Nisqually Reach and, once ready, spawn in south Puget Sound from mid-January to mid-April (Lemberg et al. 1997). Herring usually deposit eggs on intertidal and shallow subtidal eelgrass and marine algae. Juveniles remain in nearshore shallow-water areas until fall, when most disperse to deeper off-shore waters. Alterations of water quality, prey species, spawning substrate, and habitat can also affect populations. Puget Sound herring reside in an increasingly urbanized and threatened environment and are particularly susceptible to influences of shoreline development (O'Tool et al. 2000). The maintenance of these stocks is dependent upon protection of their critical habitats—intertidal and shallow subtidal locations.

Surf smelt in all life stages are found in estuarine and marine waters (Emmett et al. 1991). They are a significant part of the total Puget Sound forage base (Lemberg et al. 1997). Surf smelt spawn in 2.5 to 5 cm of water in the upper intertidal zone, depositing eggs that stick to sand (Emmett et al. 1991). Surf smelt spawning habitat has been documented in the Nisqually Estuary (Lemberg et al. 1997). Due to its strict spawning habitat requirements, this species is considered an indicator of environmental health (Emmett et al. 1991).

Pacific sand lance have been observed in very large numbers in the Nisqually Reach and Estuary (Fresh et al. 1979; Pearce et al. 1982). Sand lance spawn within the upper intertidal zone (Emmett et al. 1991; Lemberg et al. 1997). Sand lance can be an important component of seabirds and salmon prey bases, with reports of 19 to 53% of the diet of coho, sockeye, and chinook salmon consisting of sand lance (Beacham 1986; Manzer 1969; Pearce et al. 1982). Due to their importance as prey for many species of marine vertebrates and sensitivity to oil-contaminated sediments, Pacific sand lance are considered an indicator species of environmental stress (Emmett et al. 1991).

3.3.3 Other Fishes

White sturgeon are anadromous, spawning in large rivers and residing in both marine and freshwater. This species tolerates a wide range of saltwater concentrations and is common in estuaries of large rivers of the Pacific coast. Larvae and very young juveniles are riverine, while older juveniles and adults are found in riverine, estuarine, and marine habitats. White sturgeon are not usually found in intertidal areas, although they may feed on intertidal flats at high tide. Juvenile and adult white sturgeon are primarily carnivorous benthic feeders. This species is considered an indicator of environmental stress because it is long-lived and may concentrate contaminants. White sturgeon are considered to be a priority species for conservation and management by WDFW.

Pacific tomcod spawn from late winter to spring in Washington in marine coastal waters (Emmett et al. 1991; Walters 1984). Larvae and small juveniles are pelagic (i.e., free swimming in open water) occurring in nearshore marine waters and estuaries, while adults and juveniles are demersal (i.e., near the bottom of the ocean) in salinities above 18 ppt. Pacific tomcod larvae are consumed by many fishes, while juveniles and adults are eaten by large fishes, harbor seals, and other marine mammals (Emmett et al. 1991).

Sculpin are small to moderate-sized bottom-dwelling fishes (Hart 1973). Twenty-two freshwater, marine, and estuarine species of sculpin have been observed in the Nisqually River,

Estuary, and Reach (Cook-Tabor 1999). Of these species, the Pacific staghorn sculpin is considered an indicator species of environmental health and is usually found in shallow water (<50 m) in the sand or mud (Emmett et al. 1991; Love 1991). Large numbers of Pacific staghorn sculpin have been found in the Nisqually Reach and Estuary (Fresh et al. 1979; Pearce et al. 1982). Pacific staghorn sculpin feed at high tide on mudflats (Love 1991) and are eaten by large fishes, birds, and mammals.

Most surfperches inhabit shallow intertidal locations along sandy or muddy shores (Lamb and Edgell 1986). Unlike most fish, they bear large and fully developed young. Shiner perch, striped seaperch, and pile perch have been found in the Nisqually Estuary and Reach with shiner perch in large numbers (Fresh et al. 1979; Perce et al. 1982). Shiner perch are considered an indicator species of environmental health. They are commonly associated with docks and pilings and aquatic vegetation (eelgrass) in nearshore intertidal and subtidal areas with depths of less than 50 feet (Emmett et al. 1991; Love 1991). Shiner perch move into shallow bays and estuaries in spring and summer, and offshore into deeper water in fall and winter (Emmett et al. 1991) and are eaten by large marine fishes, marine mammals, and fish-eating birds.

Most gobies live in shallow to moderately deep coastal waters and prefer sandy, silty bays and tideflats (Lamb and Edgell 1986). Gobies are active bottom-dwelling and small-sized fish. The arrow goby is considered to be an indicator of environmental stress because it depends on estuaries (Emmett et al. 1991). They spawn year round on intertidal mudflats or sand flats of estuaries. Arrow gobies are eaten by birds and other fish (Lamb and Edgell 1986).

Nine righteye flounder species occur in the Nisqually Estuary and Reach (Cook-Tabor 1999). Of those species, Dover sole, rock sole, butter sole, English sole, and sand sole are considered common or of economic importance by WDFW (Palsson et al. 1997). Very large numbers (~10,000) of starry flounders have been captured in the Nisqually Estuary and Reach (Fresh et al. 1979; Pearce et al. 1982). Puget Sound stocks spawn between February and April near river mouths and sloughs in shallow water (Emmett et al. 1991). Juveniles most commonly live in estuaries in shallow water and are also found in sandy, intertidal, and freshwater areas. Starry flounder are preyed upon by marine mammals and fish-eating birds (Emmett et al. 1991; Love 1991).

English sole in Puget Sound spawn from January to April over soft-bottom substrates at depths of 50 to 70 m (Emmett et al. 1991). Larvae are transported to nearshore nursery areas (primarily estuaries) by tidal currents, feed on plankton, and metamorphose into juveniles in spring and early summer. Due to its reliance on estuaries for rearing, alterations and pollution of estuarine habitats adversely affect English sole (Gunderson et al. 1990). English sole are eaten by larger fishes, marine mammals, and fish-eating birds.

3.3.4 Threatened and Endangered Fish

Threatened and endangered fish species present in the Nisqually Basin include chinook salmon, coho salmon (a Candidate species), as well as bull trout. Information regarding chinook and coho salmon is presented in Section 3.3.1.

Bull trout have historically occurred in the Nisqually River watershed. Bull trout are closely related to Dolly Varden. Bull trout populations are threatened by habitat degradation, dams and diversion, and predation by non-native fish. The anadromous form of bull trout is the least understood and documented of the four life history forms (resident, fluvial, adfluvial, and anadromous) (USFWS 1998). Adult fish have been occasionally seen in lower sections of Puget Sound rivers, Grays Harbor, and Skagit River estuaries and are presumed to be anadromous forms (Brix et al. 1974; Kraemer 1994; WDFW 1998).

Habitat is available in the Nisqually River for all life history forms: anadromous, fluvial, adfluvial, and resident. Not much is known about the native char in the Nisqually River system. Bull trout/Dolly Varden were described as entering the Nisqually River in "vast numbers" in historical accounts (Suckley and Cooper 1860), but little is known about the current status of the population (WDFW 1998). The anadromous form of bull trout, if present in the Nisqually River, is likely only in small numbers (J. Michaels, pers. comm.).

Bull trout within the Coastal/Puget Sound Distinct Population Segment (DPS) were listed as threatened under the Endangered Species Act on 1 November 1999 (64 FR 58909). Based on their geographic distribution, Nisqually River bull trout were classified by WDFW as “distinct” from other Puget Sound char stocks in their Salmonid Stock Inventory (WDFW 1998). Due to insufficient information, the stock status was classified as “unknown.”

Bull trout generally spawn from August through November in small tributaries and headwater streams. Because bull trout eggs incubate about 7 months in loose, clean gravel, they are especially vulnerable to fine sediments and water quality degradation (Fraley and Shepard 1989). Hatching occurs in late winter or early spring (Rieman and McIntyre 1993). Anadromous bull trout juveniles typically spend 2 to 3 years rearing in tributary streams before migrating to sea. Bull trout eat aquatic and terrestrial insects, macrozooplankton, mysids, and fish (Shepard et al. 1984). Large bull trout may feed almost exclusively on fish (Fraley and Shepard 1989; Shepard et al. 1984).

Bull trout distribution has been reduced by an estimated 40 to 60% since pre-settlement times, due primarily to local extirpations, habitat degradation, and isolating factors. In general, bull trout need habitat providing cold water, complex cover, stable substrate with a low percentage of fine sediments, high channel stability, and stream/population connectivity (Fraley and Shepard 1989; Rieman and McIntyre 1993; USFWS 1998). Bull trout also readily interbreed with non-native brook trout, causing genetic introgression. Brook trout may also exclude bull trout from native habitats (USFWS 1998). In addition, native char are easily caught and are highly susceptible to fishing pressure (Fraley and Shepard 1989).

3.4 WILDLIFE

The mosaic of saltwater estuary, freshwater wetlands, riparian, and open or forested upland habitats at Nisqually NWR results in a diversity of more than 300 species of birds, mammals, reptiles, and amphibians (see Wildlife Species List, Appendix E.2). The Nisqually delta is an important non-coastal resting and feeding area for migrating waterfowl and shorebirds between the Skagit Flats and the Columbia River within the Pacific Flyway. Eelgrass beds and tidal mudflats provide feeding and roosting areas for migrating waterfowl and shorebirds. Some birds

in the estuarine and freshwater ecosystem are year-round residents, or remain for the summer or winter season at the end of their migrations. The Nisqually Estuary is rich in microorganisms and invertebrates that support a variety of wildlife including waterfowl, shorebirds, waterbirds, marine mammals, and shellfish. Located in the lower Nisqually River watershed, the larger study area also provides freshwater, riparian, and upland habitats for a variety of wildlife.

3.4.1 Waterfowl

Waterfowl migrating in the Pacific Flyway begin arriving on the Nisqually delta in late September, with many remaining through the winter. While some birds may use the area only for short periods of time during migration, they are dependent upon the area and its rich food sources. Other birds remain for the winter on the delta, traveling between the estuary and flooded agricultural or grass fields and wetlands on or off the Refuge. Off-Refuge sites are primarily found south of I-5. Nisqually NWR staff have been conducting aerial surveys to monitor waterfowl population numbers on the Refuge since 1975. Since 1984, waterfowl data were collected in association with five distinct survey units (Figure 3.4-1): (1) McAllister Creek, (2) Nisqually tideflats, (3) diked area, (4) Nisqually River and east side estuarine habitats, and (5) northwest shoreline to Johnson Point.

Dabbling ducks comprise more than 90% of all Refuge waterfowl sightings. Peak population numbers were observed during October or November with an average of 5,125 birds observed annually (1984-2000). The highest annual average was 9,641 in 1994 and the lowest was 1,630 in 1997. The American wigeon was the most abundant (76% of all dabblers) waterfowl species observed on the Refuge. Numbers of wigeon observed peaked at 12,813 in November 1987 but have been declining in recent years. About 90% of wigeon are found in Units 1, 2, and 4, which are primarily estuarine. The remaining 10% of average wigeon numbers were found in diked habitats in Unit 3.

Other commonly observed dabblers include mallard, northern pintail, and green-winged teal. Dabblers consume vegetation mainly in shallow water, on mudflats, and in the salt marsh. Dabblers, as well as other waterfowl, feed on species such as eelgrass and wigeon grass present in the estuary (Klotz et al. 1978). In the fall and winter, during hunting season, a majority of the delta waterfowl rest far out on the reach. When not on the outer reach, they may rest and drink in freshwater wetlands during the day (i.e., in the Nisqually Valley and move out to the salt marsh to feed at the tide's edge throughout the night) (Berge et al. 1974; Shanewise 1996). Some animal foods, including crustaceans, insects, and mollusks, comprise a small component of their fall and winter diets. Most of the dabbling ducks feed primarily on seeds of aquatic plants, but the American wigeon prefers stems and leafy portions. Berge et al. (1974) stated that large

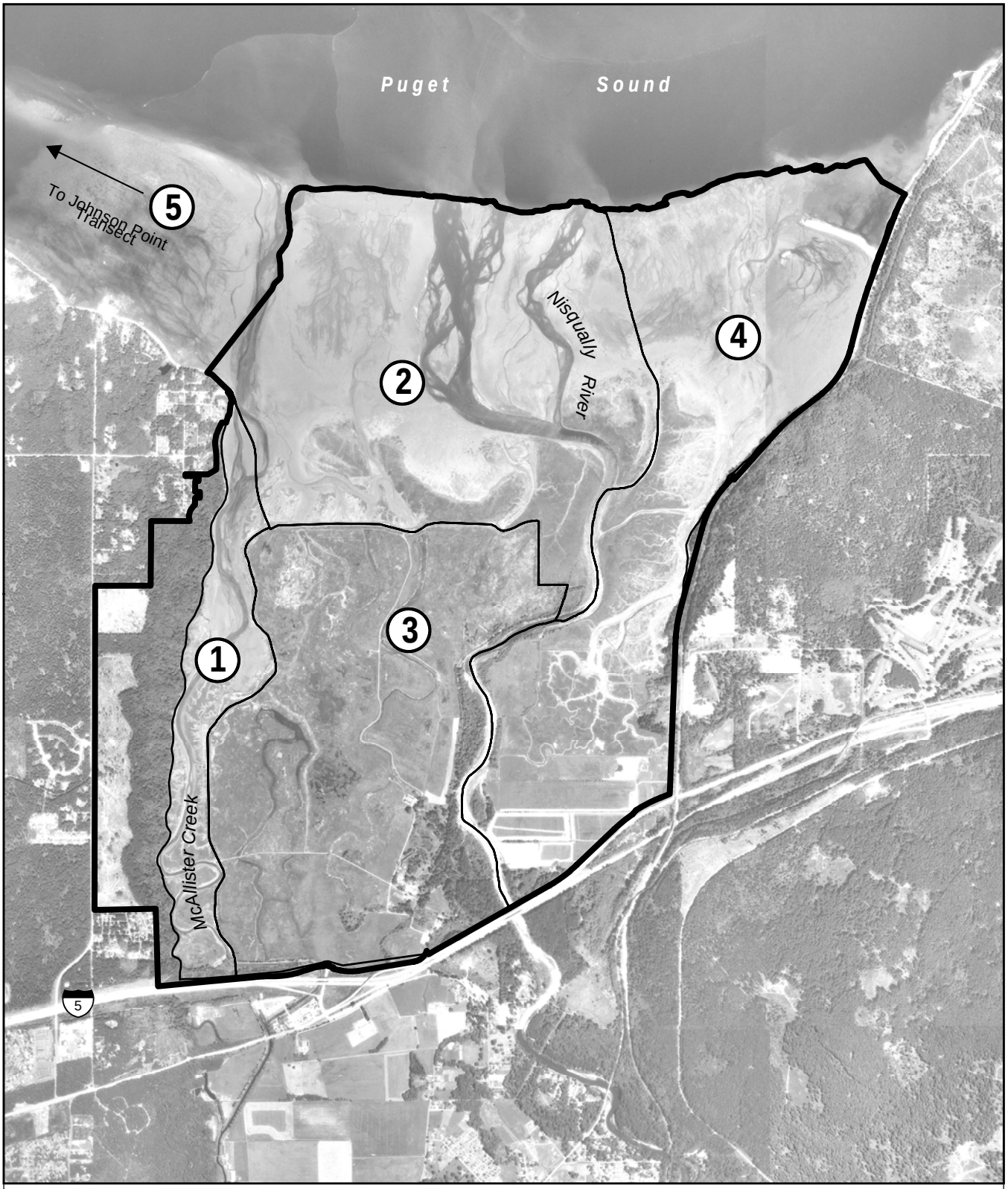

Figure 3.4-1
Waterfowl Survey Units

Legend

- Former Approved Nisqually NWR Boundary
- Survey Unit Boundary
- (2) Waterfowl Survey Unit

Aerial Photo 1990

N

0 0.125 0.25 0.5 Miles

1:35,005

Source: USFWS, 2000; Ducks Unlimited, 1999; EDAW, 2002

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numbers of waterfowl were seen on the reach in November, indicating that American wigeon, pintail, green-winged teal, and northern shoveler, among other waterfowl, opted for the estuarine areas over the diked interior. The inner diked areas of the Refuge are used by wigeon and other waterfowl in smaller numbers, especially during the period when seasonally flooded ponds are present. When the dike was breached in 1975 and the diked interior remained flooded in a brackish or altered estuarine state for a year and a half, it was heavily used by waterbirds (Klotz et al. 1978). Plants in the inner diked areas that are primary foods of waterfowl include pondweed, smartweed, bulrush, and grasses (Klotz et al. 1978).

Other waterfowl commonly observed on the Refuge include Canada geese, northern shoveler, bufflehead, and scoter. Both migratory and resident Canada geese subspecies are observed on the Refuge. Migratory Canada geese (primarily cackling subspecies) are present during fall and winter months, while resident (western subspecies) are present in much smaller numbers throughout the year. Observations of geese, primarily migrating subspecies, have increased since the early 1990s. The number of geese observed during winter waterfowl surveys peaked at 687 in 2000. Most Canada geese are observed in grassland areas of Unit 3. Northern shovelers are filter feeders in shallow water and consume a greater amount of small aquatic animals than other surface feeders (Klotz et al. 1978). Small numbers are commonly observed in ponds located in the inner diked area (Unit 3). Scoter are observed most often in Unit 2. Diets of scoter primarily consist of mollusks but can include decapods (crabs, shrimp), amphipods, barnacles, insects, fish, and plants (Klotz et al. 1978). Bufflehead feed on similar items, with insects making up a more important component of their diet. Bufflehead are observed most often in Units 4 and 2. Seaducks, including scoter and scaup, have declined in Puget Sound according to WDFW surveys (Nysewander and Evenson 1998).

Waterfowl are also found in the study area south of the Refuge, primarily in freshwater wetlands and seasonally flooded agricultural fields. Many waterfowl species travel between the delta estuary and freshwater habitats south of the Refuge.

3.4.2 Waterbirds and Seabirds

Waterbirds and seabirds commonly observed on the Refuge include great blue and green herons, American bitterns, American coot, Virginia rail, grebes, loons, cormorants, and gulls. Most birds within this group use the Refuge as feeding or resting grounds, with many departing the delta during the breeding season. Most of these birds also use the river, creeks, and sloughs within the study area south of the Refuge.

A few species, such as the great blue heron, feed and nest on the Refuge. The great blue heron hunts on the mudflats, salt marsh, and diked area, with principal foods consisting of fish, frogs, small mammals, insects, and crustaceans (Klotz et al. 1978). Great blue herons are found in all four units of the Refuge, but they are frequently seen feeding along McAllister Creek and the mudflats. The northwest bluffs of McAllister Creek provide habitat for a great blue heron colony (Thurston County Dept. of Water and Waste Management 1993). Herons were first observed nesting in this area in 1977 (1 nest). Nesting activity increased gradually to a high of 101 nests in 1994. Since then, nest counts have declined to 3 nests in 2001. This decline corresponds to the establishment of a nearby bald eagle nest. Predation by bald eagles appears to have influenced the movement of the nesting colony northward on the bluff, farther away from

the bald eagle nest. The colony has also been abandoned during the chick rearing stage in recent years resulting in nesting failure. It is unknown whether eagle predation, human disturbance, or changes in the heron food resource are causing the decline in nesting birds and nesting failure. The great blue heron is a monitored and priority species in the State of Washington because of the increasing loss of foraging and breeding habitats as well as increasing environmental pollutants associated with human expansion and development. Small numbers of American bitterns and Virginia rails are frequently observed on the Refuge in the spring and summer during nesting season (Ramsey 1997). Soras are less common but can be observed during spring and summer (Ramsey 1997). Sandhill cranes (3-4 at a time) have been observed infrequently in the inner diked area since 1983 (Ramsey 1997; USFWS data).

Western grebes are common migrants and winter residents. Pied-billed and horned grebes are common along McAllister Creek during winter and spring. Eared grebes can be observed occasionally on the Refuge. Fish are the primary food of western grebes. Other grebes feed on fish, crustaceans, insects, and mollusks.

Common and red-throated loons are commonly observed on the Refuge during the winter months. The common loon is considered a State candidate threatened species due to limited nesting locations and increasing human disturbances (Rodrick and Milner 1991). The yellow-billed loon, which is on the Birds of Conservation Concern (BCC) list (USFWS 2001), is an accidental vagrant to this area. Loons feed primarily on fish but do take other foods including crustaceans, mollusks, and insects.

Double-crested cormorants are commonly observed in McAllister Creek and the Nisqually River, or perched on driftwood or large snags in Unit 2. Gull species commonly observed on the Refuge include Bonaparte's gull, mew gull, ring-billed gull, California gull, and glaucous-winged gull. Gulls, primarily fish eaters and scavengers, forage on the exposed and flooded mudflats in Unit 2 and the reach. Large numbers of gulls are due in part to the proximity of the Hawks Prairie Landfill, where some gull species feed. Closure of the landfill in 2000 has likely changed gull abundance on the Refuge since numbers have declined slightly. Caspian tern sightings are becoming more common on the Refuge since the establishment of a colony in nearby Commencement Bay in Tacoma. Although this colony was displaced in 2001, Caspian tern sightings are still common in the spring and summer. Common murres and rhinoceros auklets are infrequently observed in tidal waters during the winter months.

3.4.3 Shorebirds

Shorebirds (42 species which occur in the Pacific region [Alaska, British Columbia, Washington, Oregon, and California]) migrate long distances from breeding grounds in Alaska and Canada to wintering grounds in Central and South America. Habitats used by these shorebirds include coastal wetlands, freshwater lakes, seasonally flooded wetlands and grasslands, and saline-alkaline lakes. Only 30% of the original coastal wetlands remain in the Pacific region (Helmers 1992). Numerous interior wetland and estuarine areas have been lost to agriculture or industry.

Large numbers of shorebirds, up to 22 species, feed on the Refuge mudflats and salt marsh as they pass through during spring and fall migrations. Western sandpipers and dunlin, the predominant species, can be observed feeding on the exposed mud at low tides, concentrated in

higher areas along the marsh, or in the inner diked area. Western sandpipers feed on annelid and nematode worms, arthropods, and other invertebrates, as well as salt marsh sandspurry seeds (Klotz et al. 1978). Greater yellowlegs, least sandpipers, killdeer, and common snipe are also commonly observed during the spring and summer. Other occasional sightings during this time of year include lesser yellowlegs, spotted sandpipers, semipalmated plovers, sanderlings, whimbrels, and dowitchers. A small number of common snipe and killdeer nest on the Refuge. A wintering population of dunlin has also been observed on the Refuge. An average of 480 birds (peak of 2,000 birds) have been observed during aerial winter waterfowl surveys; however, tidal conditions during surveys are often not conducive to high shorebird numbers. Black-bellied plovers are also occasionally seen on the tideflats in the winter months. On very rare occasions, marbled godwits and Wilson's phalaropes are seen.

3.4.4 Landbirds

Over 100 species of landbirds have been observed on the Refuge, including 22 species of raptors (owls, hawks, falcons, and eagles), 17 nonpasserines (e.g., woodpeckers, hummingbirds, kingfishers, doves, and pigeons), and 77 species of passerines (e.g., sparrows, finches, warblers, flycatchers, and swallows). Landbirds found on the Refuge and study area include both residents and migrants. Long-distance migrants travel between breeding grounds in temperate North America and wintering grounds in Mexico, the Caribbean, and Central and South America. Short-distance migrants travel between wintering grounds north of the Mexican border and breeding grounds to the north. Resident species both breed and winter in the local area. Landbirds can be found in all habitats of the Refuge including riparian woodlands, agricultural lands, and freshwater wetlands.

In the 1980s, scientists observed a decline in numbers of migratory landbirds across the nation, apparently due to habitat loss and degradation both on breeding and wintering grounds. Nationwide efforts are now underway to identify more clearly the causes of these population declines, monitor populations of the most affected species, and reverse the declines, e.g., where possible through large- and small-scale land management efforts. Several species (olive-sided flycatcher, white-crowned sparrow, and pine siskin) on Nisqually NWR have been identified as priority species in this effort, and the Service is actively monitoring these populations.

3.4.4.1 Raptors

Raptors are found throughout all habitats of the Refuge. Some of the 22 species found on the Refuge are considered neotropical migrants because they spend their winters in South America. Northern harriers are the most regularly observed raptor, hunting over the salt marsh and non-native grasslands throughout the year. Other frequently observed species on the Refuge include bald eagles, peregrine falcons, red-tailed hawks, great-horned owls, and American kestrels. Greater species diversity and larger numbers are observed in the fall and winter months. Northern harriers, red-tailed hawks, American kestrels, and great-horned owls are known to nest on the Refuge. Barn owls have also been observed to nest in either one of the Twin Barns. Ospreys and merlins are observed occasionally on the Refuge. Ospreys feed exclusively on fish and are a State-monitored species that breeds along coasts, rivers, and lakes of coastal North America in the summer. Limiting factors include availability of snags, suitable live trees, or

other suitable nest structures near large bodies of water that produce adequate fish supplies (Rodrick and Milner 1991). Northern goshawk, a BCC list species, is seen in the area on rare occasions.

Fall and spring migrating peregrine falcons are commonly observed hunting over the Refuge. They feed primarily on medium to small-sized birds such as pigeons, doves, shorebirds, waterfowl, and woodpeckers. Occasional sightings have been recorded from April through October. Peregrine falcons were recently taken off the Endangered Species List because their populations have rebounded. However, they are still listed as endangered by the State and are on the BCC list, and populations will be monitored for several years to ensure the population is stable or increasing. Falcons are observed most often hunting over the salt marsh and along the Nisqually River.

3.4.4.2 Nonpasserines

Common species in this group include rufous hummingbird, red-breasted sapsucker, downy woodpecker, belted kingfisher, and band-tailed pigeon. Hummingbirds arrive in late March and depart the Refuge by August. While downy woodpeckers are common, the Lewis's woodpecker is an uncommonly seen BBC list species. Belted kingfishers are commonly observed along McAllister Creek and the salt marsh areas, with nesting pairs observed along McAllister Creek. Band-tailed pigeons are commonly observed on the Refuge and the East Bluff throughout March and April early in the breeding season. Primary food sources include cascara, elderberry, wild cherry, huckleberry, dogwood, and madrone (Rodrick and Milner 1991), all of which are found on the Refuge and study area. Rufous hummingbird and band-tailed pigeon populations have been declining in this region (Sauer et al. 2000).

3.4.4.3 Passerines

Most of the 81 species of passerines found on the Refuge are observed during the spring and summer months. Fifty passerine species are known to nest on the Refuge, including the American robin, cedar waxwing, common yellowthroat, song sparrow, red-winged blackbird, and four species of swallows. American goldfinches and savannah sparrows nest in open grassland areas. Many species migrate south after breeding (e.g., common yellowthroats and the swallows), but some remain on the Refuge throughout the year (e.g., black-capped chickadee, Bewick's wren, and American robin). Western meadowlarks winter on the Refuge and can be observed from September through December in areas adjacent to mowed fields. A few species on the BCC list include olive-sided flycatchers, white-crowned sparrows, and pine siskins that probably breed in the area; horned larks and golden-crowned kinglets that are seen during migration; and vesper and sage sparrows that are accidental visitors.

The salt marsh, freshwater, and brackish marsh habitats provide a year-round home for the marsh wren. Other passerines that feed on the salt marsh, often in large flocks, include the European starling, blackbirds, and finches. Crows commonly forage on the mudflats. Barn, cliff, violet-green, and tree swallows are commonly observed feeding on insects over estuarine habitats during spring and summer (Ulmschneider 1976).

The riparian woodlands along the Nisqually River on the Refuge and in the study area are a critical habitat for several breeding species with significantly declining region- or nation-wide population trends. These include the yellow warbler, willow flycatcher, downy woodpecker, and Swainson's thrush (Sauer et al. 2000).

3.4.5 Marine Mammals

Puget Sound has a rich diversity of marine mammals that either feed or breed in these waters. Some, such as the harbor seal, are year-round residents. Other species, such as the gray whale, may move into Puget Sound during their migration between wintering and breeding grounds. The harbor seal is the most abundant marine mammal observed in the Nisqually delta. Seals haul out on logs in the Nisqually River mouth or on flooded mudflats in the northeast area of the delta. They are also often observed swimming in the Nisqually River or McAllister Creek. In the 1940s, the delta was described as an important breeding ground for the harbor seal. Currently, no seals are known to breed on the delta, most likely because of human disturbance and harassment by boaters and other users of the delta (Klotz et al. 1978). Gray whales, minke whales, false killer whales, and orcas are occasionally sighted during the winter months in the Nisqually Reach. Sea otters are occasionally sighted in the Nisqually delta reach. California sea lion observations have increased in recent years, with a few sightings of the Federally threatened Steller sea lion.

3.4.6 Land Mammals

Forty-eight species of land mammals have been observed on the Refuge. Common large land mammals observed on the Refuge include Columbian black-tailed deer, coyote, river otter, long-tailed weasel, mink, eastern gray squirrel, raccoon, skunk, opossum, eastern cottontail, and beaver. All of these species probably occur in the study area as well. The eastern gray squirrel is an introduced species from the eastern United States that now commonly occurs in urban areas of the west. Observations of this species have been increasing on the Refuge in recent years. Native western gray squirrels have been observed in the study area near McAllister Creek and east of the Nisqually River (Thurston County Dept. of Water and Waste Management 1993; WDFW 2001). Western gray squirrels prefer oak woodland habitats, and it is unlikely that a population historically or currently occurs on the Refuge. Small mammal trapping conducted in 1977 and 1978 resulted in the identification of vagrant shrews, shrews, shrew moles, deer mice, Oregon voles, Townsend voles, and Pacific jumping mice on the Refuge (Klotz et al. 1978). Townsend's vole, deer mice, and vagrant and masked shrews were also found in grassland habitats, with Townsend's voles at the highest density (120.7/ha) (Bowman and Dobos 1976). Deer mice, on the other hand, are abundant in forested areas. Townsend voles and deer mice can also be found in salt marsh areas (Bowman and Dobos 1976). In addition, various species of bats have been observed on the Refuge, but there are little data on abundance and distribution.

3.4.7 Reptiles and Amphibians

Sixty-two species of amphibians and reptiles occur in the Pacific Northwest (Nussbaum et al. 1983), 13 of which have been observed on the Refuge. Red-legged frogs, Pacific tree frogs, and garter snakes inhabit open grassland and riparian areas of the Refuge (Klotz et al. 1978) and most likely occur in similar habitats in the study area. Long-toed salamanders, rough-skinned

newts, and the introduced bullfrog are also found in emergent wetland, ponds, and woodland areas (Klotz et al. 1978). In recent years, northwestern and western red-backed salamanders have been observed on the Refuge.

The western pond turtle is listed by Washington State as an endangered species due to limited distribution, low numbers, and isolated populations. Historically, the Puget Sound lowlands were considered the northernmost limit of their range, but they were considered extirpated from this area and many other parts of Washington State by the 1980s (Hays et al. 1999). Western pond turtles spend much of their life in streams, ponds, lakes, and wetlands, but they also require terrestrial habitat for nesting, dispersal, dormancy during parts of the warmest months, and overwintering (Hays et al. 1999). The Refuge has suitable habitat for western pond turtles; however, none have been seen in recent years. In 1991, a western pond turtle was found near McAllister Creek under highway I-5 (Thurston County Dept. of Water and Waste Management 1993). The turtle was released within the Refuge, but after two weeks it was not seen again. No western pond turtles were found during extensive surveys in the Fort Lewis area (Cassidy et al. 1997).

The Oregon spotted frog, recently differentiated from the closely related Columbia spotted frog, is listed in Washington State as an endangered species and is also a candidate species under the Federal Endangered Species Act. The frog's limited number of existing populations and lack of protection for these populations warrants State and Federal protection (McAllister and Leonard 1997). While Oregon spotted frogs have a wide variety of predators, they are particularly vulnerable to introduced species including bullfrogs and numerous warmwater fishes. Oregon spotted frogs require freshwater emergent wetlands, which were historically found in the floodplains of many larger bodies of water. Much of this habitat has been drained, filled, diked, or degraded due to exotic plants like reed canary grass (McAllister and Leonard 1997). The Nisqually NWR has appropriate Oregon spotted frog habitat, but there are no known populations occurring on the Refuge or in the area.

3.4.8 Invertebrates

Many of the organisms found within estuaries depend on small marine invertebrates as a food resource. The marine invertebrate community in the Nisqually delta has been minimally studied in the past. A survey conducted in 1978 (Wisseman et al. 1978) found an abundance of ghost shrimp, bivalves, polychaetes, spionids, and nematodes in mudflats in the RNA portion of the Refuge. Polychaete assemblages found in cobble and mixed sediment areas contrasted sharply with those found in muddy areas. Small crustacea (tanaid and cumacean) and numerous amphipod species were found in sediment surfaces in high numbers. Bivalves were the most abundant species found in the mudflats between the Nisqually River and McAllister Creek. This area also contained gastropods and opisthobranchs at lower tide levels as well as amphipods, which were abundant in the sandy flats. Geoducks were found occasionally, low in the intertidal along the delta front (Wisseman et al. 1978).

Terrestrial invertebrates are also very important to the wildlife community. No complete inventory has been conducted on the Refuge or study area. In 1992, a specimen collection was prepared for educational purposes. It included 82 specimens from nine families, ranging from

damselflies and grasshoppers to wasps and bees (USFWS data). During the summer of 1994, a butterfly study detected 47 different species of butterflies on the Refuge (USFWS data).

3.4.9 Invasive and Exotic Wildlife Species

European starlings are abundant on the Refuge during the nesting season and winter months. Their early nesting behavior has eliminated many cavities for wood ducks, American kestrels, and swallows. Non-native bullfrogs are a threat to native amphibians because they prey on juveniles and adults. Competition between larval bullfrogs and larvae of native amphibians may also be a factor in the decline of native species. Mitten crabs and green crabs are aquatic nuisance species that are rapidly spreading in coastal Washington, but they have not yet been found on the Refuge or elsewhere in south Puget Sound (K. Aitkin, pers. comm.). Monitoring programs are being designed to ensure early detection of these invasive species.

3.4.10 Federally Endangered and Threatened Species

The Federally threatened bald eagle, marbled murrelet, and Steller sea lion, and endangered brown pelican occur on Nisqually NWR. Of these species, the bald eagle is most commonly observed. Wintering bald eagles are observed feeding and resting on the Refuge from October through March. A peak count of over 90 individuals has been observed feeding on the Refuge tideflats, whereas as many as 200 have been observed on the Nisqually River (Stalmaster 2001). Bald eagles are scavengers but also hunt for fish and birds. Nesting activity occurs from February through mid-July. A pair of eagles has used the same nest site along the western bluff of McAllister Creek every year since 1992. This breeding pair has fledged two healthy chicks every year, with the exception of 1997. Three other breeding pairs have been identified within the vicinity of the Refuge, including one in the study area on the eastern bank of the Nisqually River south of I-5. These birds most likely use the Refuge as feeding grounds. Eagles depend on dead or weakened prey such as fish, waterfowl, seabirds, and small mammals (Rodrick and Milner 1991).

Brown pelicans have been observed occasionally in the Nisqually Reach. Marbled murrelets have been observed in or heard flying over the Nisqually Reach. The Nisqually Reach probably serves as important feeding grounds for much of the south Puget Sound population (B. Ritchie, pers. comm.). Murrelets probably travel from the reach through the study area, using the Nisqually River corridor, to unidentified nesting locations in forested upland areas. The WDFW considers all of Thurston County potential marbled murrelet habitat (Thurston County Dept. of Water and Waste Management 1993).

The Steller sea lion is observed occasionally in the Nisqually Reach.

The National Oceanic and Atmospheric Administration (NOAA) Fisheries is the Federal agency responsible for Federally listing most marine life as threatened or endangered, including fish. Federally listed fish species are discussed in Sections 3.3.1 (Pacific Salmon) and 3.3.4 (Threatened and Endangered Fish).

3.4.11 State-Listed Species

There are several Washington State-listed species that are discussed in previous sections. These include the endangered western pond turtle, Oregon spotted frog, brown pelican, and sandhill crane. Washington State threatened species include the Steller sea lion, bald eagle, and marbled murrelet. Among the Washington State candidates for listing or species of concern, 11 species are either known to occur or potentially occur on the Refuge. These are Townsend's big-eared bat, common loon, western grebe, Brandt's cormorant, northern goshawk, merlin, common murre, pileated woodpecker, Lewis' woodpecker, willow flycatcher, and purple martin.

3.5 SPECIAL USES

3.5.1 Haying

Since 1974, permittee(s) have hayed the non-native grasslands on the Refuge in late summer to provide fall browse for migrating waterfowl, primarily American wigeon. The total acreage hayed varies from year to year with each permittee and depending on rainfall. Acreage cut has ranged from 100 to 312 acres. Currently, approximately 250 acres of non-native grassland are cut once from July 1 through September 30. Haying is delayed until July to maximize survival of any ground-nesting birds. The permittee pays a percentage per ton of hay cut.

3.5.2 Scientific Research

It is Service policy to encourage and support research and management studies to provide scientific data upon which decisions regarding management of units of the Refuge System may be based. Priority is granted to studies that contribute to the enhancement, protection, use, preservation, and management of native wildlife populations and their habitats in their natural diversity. All special use permits issued for research specify that they be conducted in a manner to cause minimal effects on wildlife and habitat. The Refuge is occasionally used for various research projects addressing vegetation, habitat, bird, small mammal, and other resources.

3.5.3 Tribal Fishing

Tribal fishing by members of the Nisqually Indian Tribe occurs in McAllister Creek and the Nisqually River. The fishing is provided for in the Treaty of Medicine Creek of 1854 (10 Stat. 1132). The Nisqually Indian Tribe fishes in McAllister Creek, the Nisqually River, and adjacent marine waters, using set nets or other traditional methods, or with modern, improved fishing techniques without curtailment of the right of access to these fishing areas. Tribal fishing is conducted by power boat in both the creek and the river with set nets. The commercial tribal fishery occasionally causes unintentional take of non-target species such as harbor seals or diving birds.

3.6 PUBLIC ACCESS, EDUCATION, AND RECREATIONAL OPPORTUNITIES

This section describes the public access, education, and recreation opportunities at the Nisqually NWR. Recreation features and access points on the Refuge are shown in Figure 3.6-1.

3.6.1 Public Access

The Refuge is open daily during daylight hours. The main access point is by road at Exit 114 off I-5. In addition, visitors access the Refuge by boat. Most boaters launch from the State-owned Luhr Beach boat ramp at the northwest corner of the Refuge. The Refuge has a daily entrance fee of $3.00 per family. The Golden Eagle, Golden Age, Golden Access Passports; Refuge Annual Pass; and Federal Duck Stamp also admit one family. Children under 16 are free. The entrance fee is waived for educational groups studying nature as part of a course of curriculum. Visitors pay the entrance fee at a fee station at the entrance to the Visitor Center.

The Visitor Center and its parking area is the primary destination for Refuge visitors. A paved ½- mile access road located within the Refuge boundary brings visitors to the Refuge Visitor Center, trailheads, and its 100-car parking lot. The entrance road provides access for cars and school buses with occasional bicycle use. Bicycle racks are provided at the Visitor Center. A city bus does not serve the Refuge at this time although the Refuge supports this possibility. Recent upgrading and improvements to the entrance and parking lot are adequate for the life of this plan other than expected routine maintenance.

Refuge lands east of the Nisqually River are currently closed but can potentially be accessed via Mounts Road, Exit No. 116. No public parking currently exists on the east side. A narrow road/underpass under the main line of the Burlington Northern Santa Fe Railway (BNSF) provides road access but is narrow and may present vehicle size limitations and safety concerns.

The only public access points within the study area are outside of the Refuge boundary located on WDFW and Fort Lewis lands for bank fishing access on the Nisqually River. Existing parking capacity at the State-owned Luhr Beach is approximately 30 vehicles. Visitors park loosely in an area that is a combination of gravel and hard surface. South of I-5 in the study area, vehicles associated with fishing park unofficially within the Trotters Woods unit of the Fort Lewis Military Reservation. No estimate of capacity is given for this area because of the highly dispersed parking and disturbed nature of this site.

Other potential public access points within the study area include a WDFW bank fishing site with some parking capacity on the west bank of the Nisqually River. Also, potential access and parking in the study area include the closed State fish hatchery site and the City of Olympia McAllister Springs site.

3.6.2 Recreation

3.6.2.1 Wildlife-Dependent Recreation

More than 100,000 people per year visit the Refuge to participate in a variety of wildlife-dependent recreational and educational activities. These include wildlife observation and photography, interpretation, environmental education, and fishing. A 7-mile trail system, Visitor Center, Environmental Education Center, designated bank fishing access, and photoblinds support these activities.

Wildlife Observation and Photography

Although wildlife observation and photography are good year round at the Refuge, the best times for wildlife viewing are fall, winter, and spring. The Refuge's location, with its wildlife diversity and mosaic of habitats and trail access to those habitats, makes it a popular place for birdwatchers; Nisqually NWR is considered by many to be one of the best birding areas in Puget Sound.

The Refuge's 7 miles of trails include a 5½-mile loop trail and a 1-mile loop trail for walking only. Bikes, jogging, and pets are not allowed on the Refuge. Wildlife observation is also conducted by Refuge visitors entering the Refuge by canoe or kayak.

The Brown Farm Dike Trail is a 5½-mile loop in which all major habitats on the Refuge can be viewed. The trail is on the dike and is flat, wide, and easy to walk. Along the trail are benches, an observation tower, two photoblinds, and two short spurs, a ½-mile Ring Dike Trail and the McAllister Creek bank fishing area. The Brown Farm Dike Trail is a popular trail for hikers and birdwatchers; because of its length, ease of walking, and access to many habitats, it is unique in the area. Visitors spend anywhere from 2-6 hours on this trail. On any given day, birdwatchers can tally upwards of 60 different bird species seen along this trail.

From early October to mid-January, 3 miles of the Brown Farm Dike Trail (between the Ring Dike and McAllister Creek) are closed during the waterfowl hunting season; specific dates vary from year to year. The trail is closed because waterfowl hunting is allowed on WDFW inholdings that are adjacent to large portions of the trail. The trail closure provides a dual purpose: to ensure safety for trail users and provide wildlife sanctuary. Waterfowl benefit by being able to move into the closed diked interior undisturbed by trail users when the trail is closed. This annual trail closure negatively affects large numbers of Refuge visitors unable to access certain areas of the Refuge during fall and winter. It is the single largest conflict among visitors within the Refuge boundary. Although the trail is closed with a gate and signs explain the closure, trespassing regularly occurs.

The Twin Barns Loop Trail is a 1-mile long boardwalk trail, which is fully accessible to people with disabilities. Along the trail, visitors pass through riparian habitat, freshwater wetlands, and grasslands. Habitat restoration along the 1-mile boardwalk trail has improved wildlife

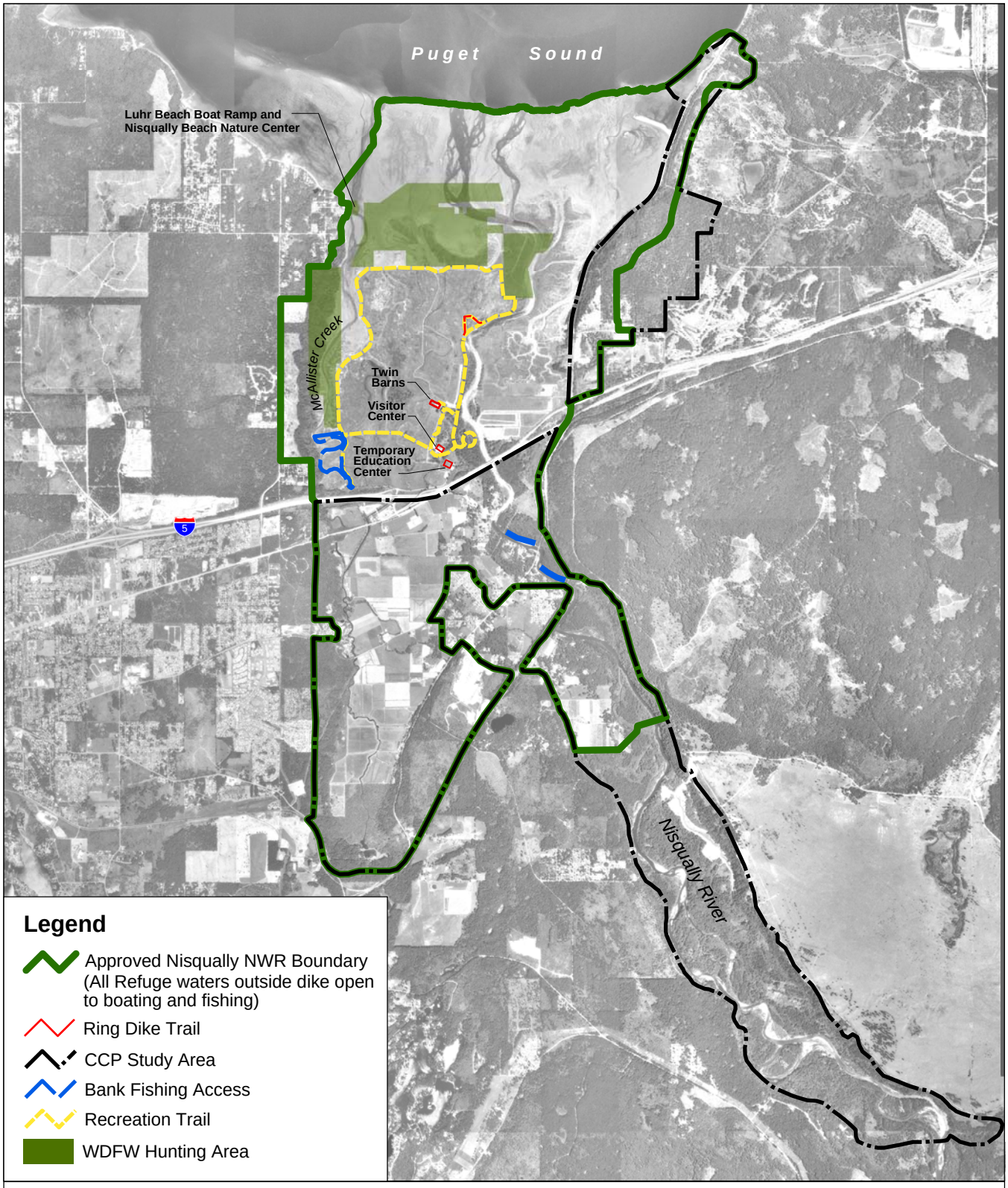

Figure 3.6-1
Current Authorized Public Recreation within the Study Area

Aerial Photo 1990

N

0 0.25 0.5 1 Miles

1:70,000

Source: USFWS, 2000; Ducks Unlimited, 1999; EDAW, 2002

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observation opportunities. At various locations along the trail, there are benches, viewing decks, scopes, and interpretive panels. SaniCans and trash receptacles are located at the northern end of the trail. Here, the trail also extends to include an elevated viewing platform with four different levels, scopes, and benches. Two short spur trails offer views of the Nisqually River and surge plain habitat. This trail is used by education groups and visitors who have less time to spend at the Refuge or want a shorter walk.

Interpretation

A new 4,800-square foot Visitor Center was opened to the public in fall of 1999. The Visitor Center has an interpretive exhibit room with displays that focus on the Nisqually River watershed, the Pacific Flyway and migratory birds, and the Nisqually River Estuary and delta. A 100-person auditorium, with full audiovisual capacity, is used for special events, lectures, and training sessions. The auditorium also has a rotating wildlife art exhibit.

The Visitor Center is open Wednesday through Sunday, 9:00 a.m. to 4:00 p.m. Trained Refuge volunteers staff the information desk, answering questions, handing out brochures, and selling entrance passes and items from the cooperating association sales outlet. The Friends of Nisqually National Wildlife Refuge operates the sales outlet and help support Refuge programs. Refuge staff are on-site at all times.

Refuge staff and volunteers conduct special events throughout the year to help people learn more about Nisqually's fish and wildlife resources. These events include International Migratory Bird Day, a Summer Lecture Series, National Wildlife Refuge Week, and the Nisqually Watershed Festival. The Twin Barns Loop Trail has interpretive panels at a number of locations that focus on the habitats and wildlife along the trail.

A private non-profit organization operates the Nisqually Reach Nature Center at Luhr Beach on WDFW land. The center is open to the public two days a week and has a variety of interpretive displays on the various fish and wildlife dependent on the marine waters of the Nisqually delta.

Fishing

The Refuge offers fishing opportunities for salmon, steelhead, and trout in McAllister Creek and the Nisqually River, and for shellfish and bottomfish in the tideflats. All State fishing regulations are in effect. No fishing is allowed inside the dike. The Refuge estimates that 3,800 visitors fish at the Refuge each year, but the number is difficult to verify as no counting system is in place. Some fishing occurs within the RNA in the northeast part of the Refuge. This is considered an administratively uncontrollable area as the RNA is not signed.

Most anglers access the Refuge by boat from Luhr Beach. Bank fishing is permitted only in the designated McAllister Creek bank fishing area, located on the east side of the creek and accessible from the Brown Farm Dike Trail. Anglers must walk 3/4 of a mile to access the bank fishing area. Persistent and numerous illegal entries occur from anglers entering this area at the southern boundary of the Refuge near the I-5 ramp. However, WDFW recently closed the McAllister Creek Hatchery so fishing opportunity in McAllister Creek will decline dramatically.

In 1996, due to loss of trails, river bank, and bank instability, the bank fishing area along the Nisqually River was closed. Currently, there is no Refuge bank fishing access along the Nisqually River although anglers use several points of illegal entry. Two bank fishing sites on the Nisqually River that are open to the public are located south of I-5 and within the study area. This includes a State-managed site on the west bank of the river and a site on Fort Lewis property on the east bank. The State site is owned and managed by WDFW and provides parking, bathrooms, and accessible bank fishing. However, changes in the river have made this site less usable for anglers with disabilities. The Fort Lewis site is open to the public with minimum management. The public is allowed to drive through riparian habitat down to the riverbank. A variety of dirt roads have been created from this off-road driving activity. There are no restroom facilities on-site.

In 1992, the Washington State Department of Health reclassified 2,130 acres of commercial and recreational shellfish beds in Nisqually Reach from "approved" to "conditionally open" after finding elevated levels of fecal coliform bacteria in the reach following storm events (Whiley and Walter 1996; Emmett 1995). Following further evaluation, the shellfish beds in the vicinity of Luhr Beach were closed to harvest in spring 2000 (W. Clifford, pers. comm.). Prior to these closures, recreational shellfishers accessed the tideflats by foot from Luhr Beach during spring and summer low tides to collect shellfish including littleneck, butter, and horse clams; crab; and geoduck. Dungeness crab is also harvested with pots in deeper water. Dungeness crab harvest is not affected by the Luhr Beach closure. Signs notifying the public of the shellfishing closure and health hazards are posted at Luhr Beach, and compliance is entirely voluntary. No enforcement is conducted and violations do occur. Shellfishing activity at Luhr Beach creates trespass problems on the Refuge tideflats and shoreline by attracting other visitors onto the tideflats. Dog and beach walkers enter the area illegally during low tides.

Hunting

Currently, the only authorized public waterfowl hunting that occurs within the delta is on State WDFW tidelands. Refuge lands are not open to hunting. The Nisqually NWR Conceptual Plan (CH2M Hill et al. 1978) proposed a quality waterfowl hunting program in the Nisqually tideflats area and on land east of the Nisqually River. This program was not implemented because the Service was not able to come to an agreement with the State on the hunting program design. In addition, the Refuge had been unsuccessful in acquiring the inholdings east of the Nisqually River. Because the Refuge and WDFW lands are not adequately posted, waterfowl hunting does occur on some Refuge tidelands (up to 1,189 acres) that are administratively uncontrollable.

Refuge staff and volunteers have been monitoring waterfowl harvest activities associated with State lands in the Nisqually delta almost annually since 1981. Prior to 1998, monitoring efforts consisted of sporadic hunter bag checks, conducted at the Luhr Beach boat ramp, varying in effort from year to year. Analysis of the 1990-1997 data set showed that the annual number of ducks harvested per hunter visit ranged from 1.5 to 1.9 ducks/hunter visit. The number of geese harvested ranged from 0.0 to 0.2 geese/hunter visit. Between 1991 and 1997, annual hunter visits ranged from 11 visits/day in 1997 to 31 visits/day in 1991 and 1994. The vast majority of ducks harvested were dabblers, primarily American wigeon, mallards, and green-winged teal. American wigeon comprised 51% of the total duck harvest over all years. Fifty-five percent of

hunter visits occurred in the area known as Survey Unit 2, the Nisqually tideflats area (Figure 3.4-1) (Seto 1998).

In October 1998, an intensive hunter bag check project was initiated to better document and understand hunting activity on the delta. All hunting activities occurring on weekend days, holidays, and 41% of weekdays were monitored throughout the waterfowl hunting season. The results of this monitoring effort showed similar results in terms of species harvested with wigeon, teal, and mallard comprising over 80% of the harvest. Hunter success averaged 1.5 birds/hunter visit over the season. There were an estimated 1,000 to 1,200 hunter visits during the entire season. Hunter visits were four times higher on weekends, averaging 20.5 hunters visiting each weekend day, and only 5.2 hunters per weekday. The level of hunting activity was relatively stable throughout the season, with only a slight decrease in activity after mid-November. No information was collected to map the distribution of hunters throughout the area (Seto 1999).

Some private hunting (Medicine Creek Hunt Club) occurs on property south of I-5 in the study area, although use levels are believed to be low. Waterfowl hunting also occurs in the Trotter's Woods area by approximately 3-4 hunters.

3.6.2.2 Non-Wildlife Dependent Recreation Activities

Non-wildlife dependent recreational activities that occur on the Refuge include boating, personal watercraft (PWC) use, and fruit and berry picking.

Boating

Both motorized and non-motorized recreational boating occur in all waters of the Refuge outside the Brown Farm Dike. Some of these activities are wildlife-dependent and are addressed above. The majority of boaters access the area from Luhr Beach. Commercial rafting, canoe, and kayak tours use the waters of the Refuge on a year-round basis. No boating is allowed inside the Brown Farm Dike. Boating occurs within the RNA in the northeast portion of the Refuge.

It is estimated that 6,700 boaters access the Refuge annually, although this number is difficult to verify as no counting system is in place. Recreational boating has increased dramatically and is expected to continue to increase in concert with residential development underway on adjacent lands. Luhr Beach is one of the few launch sites in the area with access to Puget Sound.

Prior to implementation of this CCP, there was no boat speed limit for motorized craft in open waters, except for Thurston County's Shoreline Protection regulation that limits speeds of motorized watercraft to 5 mph within 200 feet of the shoreline (Thurston County Regulations, Title 16, Waterways and Vessels [16.04.110]). A compatibility determination completed in 1994 stipulated several restrictions that have not been put in place, including: a posted no-wake zone, area and seasonal closures on the tideflats, regulations information in brochures and at Luhr Beach, and closure of most of the water of McAllister Creek year round.

PWC Use

PWC use occurs on the Refuge, mostly along McAllister Creek and in the reach, with users typically launching from Luhr Beach. There are no good estimates as to the amount of PWC use that occurs. Several complaints have been received from trail users about the disturbance caused by PWC activity related to noise and wildlife disturbance.

Fruit and Berry Picking

During the historical farming period, an apple and pear orchard was planted in what has now become the maintenance compound and adjacent areas. The Service does not routinely maintain the orchard trees, and the trees produce a large crop of fruit each year. Visitors are allowed to pick up windfall fruit or pick fruit off the trees that they can reach from the ground. No climbing of the trees or knocking down of fruit is allowed.

Visitors are also allowed to pick small amounts of blackberries that grow profusely in thickets along the Refuge trails and parking lot. The harvest of both fruit and berries is for personal use only; no picking for commercial use is allowed. Blackberry picking occurs during August and September, while the harvest of orchard fruit occurs from September through November.

Most picking of fruit and berries is done along the trails by small groups of visitors that are at the Refuge to walk and observe wildlife. However, off-trail berry picking and picking of large quantities of fruit and berries do occur, creating a trespassing problem and oversight problem for Refuge staff.

3.6.3 Environmental Education

Since the establishment of the Refuge, educators and youth professionals have been using Nisqually NWR as an outdoor classroom to enhance course curricula. The Refuge's environmental education program serves educators and youth professionals who work with pre-school through college-age youth. Educators include teachers, professors, and outdoor education leaders. Youth professionals include leaders for Scouts, 4H, and Campfire.

Each year, approximately 5,000 students and teachers from King, Pierce, Thurston, and Mason counties participate in the Refuge's environmental education program. Although educational groups use the Refuge throughout the year, the highest use period is from early April through mid-June. Summer use has increased dramatically in the past several years.

Environmental education field trips at Nisqually NWR are teacher-led. Due to limited Refuge staff availability, teachers and group leaders are expected to plan and lead their own field trip activities with minimal assistance from Refuge staff. It is recommended that teachers visit the Refuge prior to their field trip, walk the trail, and prepare clearly defined field trip goals and objectives. The Refuge offers lesson-planning assistance to teachers and orientation talks to school groups while at the Refuge. Approximately eight volunteers work with 90% of the school groups visiting the Refuge. Volunteers provide an orientation talk and may walk with groups along the trails. They also talk with the teachers prior to their trip about their goals and activities. Since November 2000, an Environmental Education Intern has been hired through the

Washington Conservation Corps AmeriCorps program. This full-time position helps improve and facilitate the education program. Plans are to recruit and fill this position each year as AmeriCorps positions are available and funding allows. Starting in 2004, the Friends of Nisqually NWR has begun funding this important work, by hiring a half-time education coordinator.

Prior to visiting, educational groups are required to make a reservation indicating pre-trip activities, goals, field trip activities, locations and times, and what assistance they would like from the Refuge. If the educational group is coming as part of a course of curriculum to study nature, the entrance fee is waived. Education groups visiting the Refuge are limited to 100 students per day. Groups are only allowed on the trails, the Environmental Education Center, Visitor Center, and currently in three designated environmental education (EE) study sites. They may not collect samples or go off trail unless allowed through a special use permit.

The Twin Barns Education Center was severely damaged and closed following the 2001 Nisqually Earthquake. The Environmental Education Center has been temporarily moved to a trailer near the maintenance compound. A replacement facility is required to upgrade facilities and ensure a safe, quality experience for school children participating in the program.

The only other education center within the Refuge or study area is located at Luhr Beach. The private, non-profit Nisqually Reach Nature Center doubles as a wildlife interpretation center and an educational center for school children ranging from 3rd to 12th grades. The educational focus at the Nature Center is on the marine environment. They have supported up to 2,000 students per year. In 2000, the Refuge provided half the cost to fund an AmeriCorps intern to enhance the program as part of a growing partnership with the Nature Center.

3.7 CULTURAL RESOURCES

3.7.1 Native American Cultural History and Landscape

From 13,500 to 8,000 years ago, aboriginal peoples may have used the delta estuary as a travel corridor between the sound, upland prairies (which were more prevalent at that time), and the glacial Lake Nisqually drainage channels (Forsman et al. 1998).

Aboriginal people were known to have a village at the mouth of the Nisqually River about 5,000 years ago (Stevenson 1998). During and since 3,000 years ago, winter and seasonal camps for foraging were maintained on the Nisqually River. Winter villages and camps have also been recorded at several locations along the lower reach of the Nisqually River.

The Nisqually Indians lived along the Nisqually River and its tributaries in numerous small villages. Permanent villages were noted for their cedar planked houses, while seasonal camps on the delta were characterized by temporary shelters. The variety of ecozones–prairies, woods, and the delta estuary–provided rich resources for fishing, hunting, and gathering activities. Coho, king, sockeye, chum, and pink salmon constituted a major part of their diet. Shellfish (clams, oysters, geoducks, mussels, and barnacles) were gathered along the shores of the river. Small and large game (deer, bear, and beaver) and waterfowl were also hunted. The delta and river basin supplied abundant plant resources for food, medicine, basketry, and other

technological needs. The open prairies were used for social gatherings and ceremonies (Forsman et al. 1998).

The Refuge is the site of the signing of the first Indian treaty in Washington Territory. In December 1854, at a grove of trees along the east bank of McAllister Creek now known as the Treaty Trees, representatives of southern Puget Sound tribes met with Territorial Governor Isaac Stevens to negotiate and sign the Medicine Creek Treaty. Through the treaty, Indian tribes relinquished rights to the land and agreed to relocate to certain reservations. The Nisqually Indians received a reservation along the Nisqually River 5 miles upstream from the delta. In 1918, the 3,300-acre holding in Pierce County was condemned to establish Fort Lewis. The Nisqually Tribal reservation currently includes 1,400 acres in Thurston County (Thurston Regional Planning Council 1997). The treaty reserved certain fishing, hunting, and gathering rights for the tribes. Members of the Nisqually Indian Tribe still exercise these treaty rights, fishing for salmon in Refuge waters (G. Walter, pers. comm.).

3.7.1.1 Archaeological Resources

Twelve recorded archaeological sites are located within the existing boundary of the Refuge. Prehistoric sites occur primarily along the west bank of McAllister (previously known as She-Nah-Num or Medicine) Creek and in various locations along the adjacent bluffs. Historical sites are found predominantly in the south-central portion of the Refuge. Of the 12 sites, six fall within the boundaries of the waterways managed by WDFW.

One prehistoric site, known ethnographically as She-Nah-Num and archaeologically as the Medicine Creek Site, was determined eligible to the National Register of Historic Places (NRHP) in 1977. A nomination was prepared but never submitted, however, so its status remains "eligible." It is one of the six sites outside Service jurisdiction. The site contains both prehistoric (shell, fire-cracked rock, bone, and lithics) and historical (bricks and bottles) elements. A shell midden site located on the McAllister Rod and Gun Club, which also contains an historical component, was determined ineligible to the NRHP. The remaining six prehistoric sites are all characterized as shell concentrations suffering from various degrees of tidal erosion.

Eighteen additional recorded cultural resources are located within the boundaries of the study area. Among the most significant of these resources is a shell midden with both prehistoric and historical components, which is identified as the probable home site of Sinnaywak, a noted Nisqually leader and shaman who lived from 1814-1904. Radiocarbon dating on another prehistoric midden deposit in the study area has returned occupation dates between 5,000 and 1,300 years ago, making it one of the oldest shell midden sites known in the southern Puget Sound area. A third shell midden site occurs in the study area but has received no in-depth archaeological research.

3.7.2 Euro-American Cultural History

In 1833, the Hudson's Bay Company established a trading post and farm in the Nisqually River delta. Soon after, Euro-Americans began to settle in the area, attracted by the proximity to water and the large, unforested tracts of land. By 1839, the character of the Nisqually Valley began to change as a major part of the economy shifted from fur trading to raising sheep and agricultural

pursuits. In 1845, the McAllister family settled on Medicine Creek, now McAllister Creek. By 1852, James McAllister had dammed McAllister Creek and built a sawmill which produced some of the first lumber to be exported from Puget Sound to San Francisco (Stevenson 1998; Guth 1998). Other early settlers included the Shazer family, William Packwood, and Joel Myers. Land survey maps of 1853 described the area around McAllister Creek as "rolling hills and burnt timber" (United States Surveyor General 1853).

North of present-day I-5 on the southeast corner of current Refuge lands, low-lying upland areas along the Nisqually River were cultivated by homesteaders such as the Shazers and Myers. During the late 1800s, many estuarine habitats were lost, including parts of the Nisqually River Estuary, as pioneers throughout the Puget Sound diked and drained deltas for agriculture. George Shannon acquired the Shazer property, located north of I-5 on the Refuge, in 1872. He began to dike the property to grow grain and hay, raise cattle and horses, and develop private hunting and fishing areas. Delta lands east of the river were purchased and diked in the late 1890s by Ollie Braget (Stevenson 1998). Ditches, dikes, and fence remnants on the tidelands seaward of the main dike found today indicate past use of some marsh areas. Old pilings and cable in the surge plain forest suggest past logging activities (Kunze 1984).

In 1904, Alson L. Brown and his wife purchased about 2,350 acres of the Nisqually River Estuary west of the mouth of the Nisqually River and along the McAllister Creek hillside. Brown constructed the original 4-mile dike which is now a prominent feature of the Refuge. The dike, which altered the hydrologic regime of the delta, was built using a horse-drawn scoop and a crew of 30 men. In 1910, the dike was reinforced by a dredge that filled in the remaining sloughs. The fertile river delta soils were converted to crop production. The farm also maintained chickens, hogs, a dairy operation, shipping operations, and a general store. The foundations of various buildings, most probably associated with the A.L. Brown Farm, are scattered around the delta. In addition, the apple orchard adjacent to the Refuge headquarters is also a remnant of the farm's early years. Structural and landscape elements associated with the Brown Farm are eligible to the NRHP. Although Brown went bankrupt after WWI, the farm continued to operate under the subsequent owners who rebuilt the dike, higher than the first, and built the Twin Barns in 1932. These barns were determined to be ineligible to the NRHP in the 1970s.

Historical sites within the study area, but outside of the former approved Refuge boundary, include examples of residential complexes, civil infrastructure, and structures associated with various organizations. Seven homestead locations were recorded, with settlement dates ranging from the 1870s to the 1940s. In some instances, a collapsed building or foundation marked the site of a structure at the time of recording, but in most cases the presence of fruit trees, clearings, and other landscape features was the only evidence remaining. Since these sites were first recorded in the late 1970s and 80s, it is likely that further deterioration or complete obliteration has occurred. At least two of the homestead sites occur on land originally allotted to Nisqually Indian Tribal members. While most of the sites have not been evaluated, two of the homesteads have been determined ineligible to the NRHP.

Other historical structures recorded within the study area include: the Indian Agency Headquarters dating to 1859, an old Boy Scout Camp structure, a gas station, and a structure of

unknown function which may have been constructed and utilized by the U.S. Army. Of the four, both the Boy Scout Camp structure and gas station have been determined ineligible, and the others have not been evaluated. Foundations of four historic bridges and/or trestles, two of which date from the 1930s, have also been recorded. At least two of the bridges have been completely destroyed.

3.8 SOCIOECONOMICS

This section provides an overview of the local demographic, land use, and economic setting in the vicinity of the Nisqually River delta and watershed, with emphasis on issues specific to inform comprehensive conservation planning efforts. The study area includes the lower Nisqually River Valley, including the delta. Socioeconomic data for both Pierce and Thurston counties are cited in this section.

3.8.1 Socioeconomic Setting

Nisqually NWR is located in south Puget Sound, straddling the Pierce and Thurston County border and within easy driving distance of approximately 4 million residents. The Seattle metropolitan area is the largest population concentration nearby, located roughly 50 miles to the northeast. Other large populations reside in the vicinity of Tacoma, 20 miles to the northeast, and Olympia, 10 miles to the west. All of these urban areas are provided an easy access to the Refuge via I-5.

Government provides the greatest share of employment in the vicinity of the Refuge. Olympia, the State Capitol, is the nearest major employment center to the Refuge. Fort Lewis, a major Army installation, is located adjacent to and northeast of the Refuge. The major private sector employers in Thurston County include St. Peter Hospital, Capital Medical Center, Group Health, Crown Cork & Seal, Miller Brewing Company, and CNC Corporation (Thurston County Economic Development Council 2001). The nearest major Pierce County employers are Intel and State Farm Insurance, both located in the nearby City of DuPont.

3.8.1.1 Population and Demographics

The population of Washington State has grown by 1.3 million since 1985, from 4.7 million to 6 million residents in 1999. Forecasters expect this figure to rise to approximately 6.5 million by the year 2005 (Office of Financial Management [OFM] 2001). The Puget Sound region, consisting of Pierce, Kitsap, King, and Snohomish counties, contains the largest population concentration in the state, with an estimated 1999 population of 3,125,200. This figure has increased by 441,130 new residents since 1990, an annual average increase of 1.8% (Thurston Regional Planning Council 2000; Puget Sound Regional Council [PSRC] 2000). Consistent with regional trends, urban growth and resulting population pressures in the area surrounding the Refuge have expanded dramatically over the last 50 years.

The population of the Puget Sound region is expected to grow by 30% in the next 15 years (White 1997). Table 3.8-1 shows the 1999 estimated population and growth projections for the areas surrounding Nisqually NWR, including both Thurston and Pierce counties and the nearest local communities of Lacey (including Hawks Prairie) to the west and DuPont to the east.

Table 3.8-1. Local Population Trends.

Locality	Estimated Population 1999	Anticipated Population, 2020	Percent Growth
Thurston County	**202,700*** **	**29,6734**	**46**
Olympia	40,210**	54,020	34
Lacey	29,020**	45,760	57
Hawks Prairie	3,000	12,250	398
Pierce County	**700,000****	84,8610	23
Lakewood	63,790*	81,290****	27
Tacoma	187,200*	249,000*****	33
City of DuPont	1,755***	No Estimate	Unknown
Fort Lewis Military Reservation and McChord AFB	46,438	No Estimate	Unknown

Sources: *PSRC (2000)
**Thurston County (2001)
***OFM (2000)
****City of Lakewood 2000 (Note: projection for 2017 not 2020)
*****City of Tacoma 2001; City of Tacoma (Note: projection for 2017 not 2020)

Thurston County

Thurston County has consistently exceeded the State's overall rate of growth since the 1960s and remains one of the fastest-growing counties in the state. Thurston County's 2000 population was estimated to be 204,300, having increased on average by 2.4% per year since 1990 (Thurston Regional Planning Council 2000), representing a 27% growth between 1990 and 1999 (DoA 2002). Thurston County's population is split between incorporated jurisdictions and unincorporated areas of the county. The county's seven incorporated cities have a combined population of 88,950, while the remaining (unincorporated) parts of the county have 115,350 residents. Lacey, the second largest city in the county with an estimated 2000 population of 29,240, lies to the west of Nisqually NWR. Since 1990, Lacey has averaged the fastest population growth rate of any large community in the county at 4.3% (Thurston Regional Planning Council 2000).

The community of Hawks Prairie, a portion of the City of Lacey located largely within the McAllister Creek basin to the west of Nisqually NWR, had a 1999 estimated population of 3,000. The population within Hawks Prairie is estimated to climb significantly to 12,250 by the year 2020 (V. Tabbutt, pers. comm.).

In 1997, Caucasians made up about 90% of the county's population, with 5.5% of the population comprised of Asians and Pacific Islanders. The African American population constitutes 2.5% of Thurston County, and the Indian/Eskimo/Aleut population is less than 2% of the Thurston County population (Thurston Regional Planning Council 1998).

Pierce County

Pierce County is the second-most populated county in Washington State (Thurston Regional Planning Council 2000). In 1990, 57% of the county's population lived in unincorporated areas (Pierce County Public Works and Utilities 1997). Pierce County's 1999 population was estimated at approximately 700,000 residents. This number is forecasted to grow by 21% over the next two decades to reach approximately 848,610 by 2020 (National Association of Counties 2000).

The cities of Tacoma and Lakewood contain the largest concentrations of Pierce County's current population. Pierce County is also home to two sizable military installations, the Army's Fort Lewis Military Reservation and McChord Air Force Base (AFB).

Fort Lewis supports 16,870 troops plus nearly an equal number of military dependants. Of these, 9,308 military personnel plus 9,192 dependants live on post, with the remainder residing in adjacent communities. In addition, 4,920 local civilians are employed by Fort Lewis. The Army expects to add 1,500 additional troops by the year 2003, many of whom will be accompanied by dependants (CH2M Hill 2001).

The population of McChord AFB includes 3,631 active duty personnel and 2,514 reserves. Of these, 1,441 live on base along with 1,669 out of a total of 4,547 dependants. In addition, 2,310 civilians are employed at McChord AFB (S. Eggman, pers. comm.).

No population growth estimates were available for Fort Lewis Military Reservation or McChord Air Force Base (AFB).

The City of DuPont lies in Pierce County to the east of the Nisqually delta. In 1992, the City of DuPont had a population of 600 people. This figure increased to an estimated 1,755 residents by 1999. By 2025, DuPont is expected to reach a population level of 10,994 people (OFM 2000). A significant component of DuPont's population and employment growth is located within a planned unit development currently under construction by the Weyerhaeuser Real Estate Company called Northwest Landing. Northwest Landing is particularly relevant to the Nisqually NWR because portions of the Northwest Landing abut the Nisqually NWR and are visible from many places on the delta. Completed portions of the 3,000-acre project currently accommodate approximately 2,000 residents. At full build-out in 2010, the project may grow to 11,000 residents and 20,000 jobs (Martinson, pers. comm.).

In 1998, almost 80% of Pierce County's population was Caucasian. African Americans comprised the largest minority population, making up approximately 7% of the population; Asians and Pacific Islanders comprised 6% of the population, with a variety of minorities comprising the remainder (National Association of Counties 2000).

3.8.1.2 Employment and Income

Thurston County

The Thurston County economy is primarily supported by employment by the State government, headquartered in Olympia. In addition to providing the largest share of the county's jobs, the government sector also provides the highest average wage.

The real (adjusted to account for inflation in 1998 dollars) per-capita income was $28,443 in 1998 (Thurston Regional Planning Council 2000). In 1998, 48.1% of wages and 39.3% of employees were based in the government sector. Also in 1998, the service industry was responsible for roughly 23% of employees and 20% of wages. Retail trade was responsible for just under 20% of employees and about 10% of wages. Manufacturing, construction, agriculture, forestry, fishing, transportation, and wholesale covered about 17% of employment and wages. In total, 4.6% of the county's labor force (4,600 workers) were unemployed in 1999, slightly lower than the statewide average of 4.7% (Thurston Regional Planning Council 2000).

Pierce County

The Pierce County economy is primarily supported by employment in the Fort Lewis-McChord AFB military complex, the City of Tacoma, local manufacturing in Tacoma, and aerospace-related industries. The largest employment sectors include services, government, and retail trade. The three largest individual private employers are all hospitals (Tacoma-Pierce County 2001).

The closest major employers to Nisqually NWR are Intel and State Farm Insurance, which both maintain large campuses in DuPont's Northwest Landing with a combined total of approximately 2,750 employees (Northwest Landing 2001). Employment within the Nisqually River Valley itself primarily includes education, retail trade, government, tourist services, agriculture, and forest production and harvesting (Pacific Coast Joint Venture 1996; Consoer, Townsend, and Associates 1974).

In 1998, real Pierce County per capita income was estimated to be $27,493 (Tacoma-Pierce County 2001). The largest employers were in the services sector (27%); Federal, State, and local government (21%); and retail trade (20%). Manufacturing, construction, real estate, agriculture, forestry, and other services in the industrial sector comprised approximately 25%, with the remaining 7% employed in other sectors. In 1999, Pierce County had a resident civilian unemployment rate of 4% (Tacoma-Pierce County 2001).

3.8.1.3 Transportation Patterns

The major transportation corridor providing access to Nisqually NWR is I-5, a major interstate highway linking many cities and major destinations in western Washington. I-5 provides convenient, direct access to Refuge lands at the Nisqually Interchange, Exit 114. In 2000, the Washington Department of Transportation (WSDOT) estimated traffic flow past Exit 114 at approximately 72,400 trips west of Exit 114 per day and 79,700 vehicles per day east of the Nisqually exit. In 1999, average daily flow of traffic was more than twice what it was in 1976.

Peak traffic can reach as high as 132,000 vehicles per day (R. Decker, pers. comm.). Ramp counts of vehicles using Exit 114 were 1,550 westbound vehicles entering the freeway per day. Daily counts of vehicles exiting the freeway and Exit 114 averaged 1,450 and 5,100 westbound and eastbound, respectively. Three-fourths of the residents of Pierce County who commuted to Olympia or elsewhere in Thurston County passed the Refuge to and from work (PSRC 1993).

The CCP Study Area contains a network of arterial roads that bisect the area. I-5 is the predominant transportation corridor with great impacts on the Refuge including traffic noise and an ecological barrier for many terrestrial wildlife species. In addition to I-5, there are several arterials including Old Pacific Highway, Reservation Road, Martin Way, Meridian Road, Nisqually Cut Off, Steilacoom Road, and Meridian Road in Thurston County. Many of these roads in the Nisqually Valley south of I-5 are "rural" in character with few shoulders and designed for low traffic volumes. Thurston County's Transportation Goal for the Nisqually Valley Sub-Area states: Develop a transportation system which addresses regional needs while still retaining the rural character of the Nisqually Planning Area and primarily the agricultural lands along the valley floor (Thurston County Planning Department 1992).

The Thurston County transportation planning that occurred in the early 1990s has been effective in directing new roads and commuter traffic away from the valley and preserving its rural character. In addition, County plans contain strategies to add a non-motorized path and trail system in the valley, preserve historic resources such as barns and the old Nisqually School, and add a system of interpretive signs. The proposed trail would connect to Nisqually NWR and connect key view points.

In Pierce County are Mounts Road as well as a network of new roads associated with the Northwest Landing development. The City of DuPont has proposed a road parallel to the east bluff of the Refuge. The exact location of this road is somewhat flexible.

The BNSF Railway line extends from Tacoma through and along the east side of the Refuge to Vancouver, Washington. This line is used by WSDOT as part of the Federally designated Pacific Northwest High Speed Rail Corridor. Over the next 20 years, there are plans to increase the number of mainline tracks from two to three south of I-5 and to reconstruct and reroute the Pt. Defiance Bypass and branch line connecting Lakewood and Tacoma. The Service will work with the WSDOT rail office in Olympia to coordinate rail line improvements with Refuge expansion.

3.8.2 Environmental Justice

In February 1994, President Clinton issued Executive Order 12898, requiring that all Federal agencies seek to achieve environmental justice by "identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations" (Executive Order 12898). Environmental justice is defined as the "fair treatment for people of all races, cultures, and incomes, regarding the development of environmental laws, regulations, and policies."

The U.S. Department of Housing and Urban Development (HUD) defines low income as 80% of the median family income for the area, subject to adjustment for areas with unusually high or

low incomes or housing costs. The 1999 estimated median family income was $43,475 in Thurston County and $43,624 in Pierce County, respectively. This compares with an estimated state-wide median income of $48,289 (OFM 2001). Since median family incomes for both counties were approximately 90% of the state median family income, neither county would be classified as low income. Caucasians made up about 90% of Thurston County's population and 80% of Pierce County's population in 1997 and 1998, respectively. Significant minority populations included Asians and Pacific Islanders and African Americans (National Association of Counties 2000).

The 400-member Nisqually Indian Tribe's reservation is located within the Nisqually River Valley, making the tribe the minority group most affected by the CCP. In addition to the tribe's reservation, there are numerous parcels of Nisqually Trust land in the valley, as well as the newly acquired 325-acre Braget parcel which is located within the Refuge.

3.8.3 Land Use

This section presents an overview of land uses within the study area. Because the Refuge straddles the boundaries of both Pierce and Thurston counties, the land use practices and regulations of both counties are presented. This section also emphasizes the lands comprising the Nisqually delta, especially special status lands within the study area such as the site's National Natural Landmark designation, RNA, Nisqually Public Use Natural Area, Shoreline of Statewide Significance, and National Recreation Trail.

3.8.3.1 General Land Use and Management

Historically, the Nisqually delta supported a variety of land uses, including subsistence hunting and gathering, logging, commercial shipping, recreational and commercial fish and shellfish harvesting, and agriculture (Burg 1984). Today, low density residential and agriculture constitute the prevailing land uses surrounding the Refuge (Thurston County Dept. of Water and Waste Management 1993). The Refuge itself provides open space and quality wildlife habitat and wildlife-dependent recreation and education to an expanding regional population (Pacific Coast Joint Venture 1986).

Growing demand for residential, commercial, and industrial land poses continuing threats to natural resource areas, including estuaries, freshwater wetlands, and agriculture (Klein and Reganold 1997). In 1990, Thurston County adopted an ordinance that allows development on rural lands to a density of 1 dwelling unit per 5 acres. In 1992, the Thurston County Planning Department created the Nisqually Planning Area south of I-5 to protect the Refuge from adjacent developments. The boundaries of this area, shown on Thurston County planning maps as the "Heart of the Valley," fall within the CCP Study Area south of I-5 (OFM 2000). To maintain the existing rural environment of the Nisqually River Valley, agricultural lands in this area became part of Thurston County's Purchase of Development Rights (PDR) program since 1994 (Thurston County Planning Department 1992). The PDR program permanently preserves farmland while supporting the farming community. The PDR program is administered by Thurston County using perpetual conservation easements attached to each deed. Within the 840 acres of PDR properties, agricultural uses would continue. These can include growing, raising, and producing horticultural and agricultural crops, as well as the processing and marketing of

these products. Other uses include raising, processing, and marketing of animals and the lying fallow or disuse of the land. Structures allowed can include residences, barns, machine sheds, permanent greenhouses and associated structures, retail and processing facilities, surfaced parking areas, surfaced driveways, surfaced roadways, and surfaced pads. Non-tillable surfaces can include asphalt, concrete, gravel, and any other material not normally associated with soil cultivation. Structure placement and non-tillable surfaces could occur on up to 5% of any parcel or lot and result in approximately 44 acres being removed as potential wildlife habitat.

Pierce County has a similar PDR program called "Conservation Futures," administered by the Pierce County Parks program. Conservation Futures is a land preservation program for the protection of threatened areas of open space, timber lands, wetlands, habitat areas, and agricultural lands within the boundaries of Pierce County. Conservation Futures funds are used to acquire the land or the rights to future development of the land (Pierce County 2001).

Consistent with State Growth Management Act (GMA) and County planning requirements, population growth in Washington is directed within incorporated cities and designated urban growth areas. The City of Lacey's urban growth area (UGA) is just west of the Nisqually Valley. Since 1995, a number of new homes have been constructed along the eastern edge of the UGA, close to the edge of the plateau which overlooks the Nisqually Valley (Thurston Regional Planning Council 2000). New single-family home construction activity is also occurring within the Nisqually Valley south of the Refuge both on and in the vicinity of the Nisqually Indian Reservation.

Under Thurston County's Nisqually Sub-Area Plan (Thurston County Planning Department 1992), much of the land in the Nisqually Valley is zoned Rural Residential in recognition of the limited water supply, and agricultural and delta resources of the valley. The Refuge itself is designated Public Reserve in the Sub-Area Plan. In general, land zoned Rural Residential may be developed for single-family housing with development densities of up to 1 dwelling unit per 5 acres.

The portion of the Nisqually River Valley referred to above as "the Heart of the Valley" is protected with a special zoning designation of Nisqually Agriculture (NA). Agricultural activities, including logging and other forestry practices, are the primary uses within this zone. Housing and other development are permitted, but only ancillary to agriculture. The development standards mandated by this zone are unique to the Nisqually Planning Area, and this zone is applied to those lands within the Nisqually Planning Area that: (1) contain large farms on primary agricultural soil, (2) have been farmed for several generations, or (3) are enrolled in or eligible for enrollment in the Agricultural Open Space Tax Program (Thurston County 2001).

Some local jurisdictions are actively preserving their natural heritage. The City of DuPont, for example, has identified 22% of the land area as open space to protect wetlands, steep slopes, buffers, and other areas, including oak savannah habitat (P. Clarke, pers. comm.).

Major land uses on Fort Lewis properties include cantonment (temporary living quarters for troops), range, and training areas. Effect areas such as artillery ranges are surrounded by buffer areas to prevent noise and safety effects to surrounding areas. Fort Lewis lands between the

bluff and the Nisqually River buffer the range, located on the prairie above the bluff. At this time, the range is expected to remain operational for the foreseeable future; the Army expects to continue to rely on its holdings between the range and the river as an unpopulated buffer area (W. Vanhoesen, pers. comm.).

3.8.3.2 Special Status Lands

The Service manages several areas on the Refuge that fall under special designations. These are shown in Figure 3.8-1 and described below.

National Natural Landmark Designation

The Nisqually delta was added to the National Park Service's Registry of Natural Landmarks in March 1971 (Boyer 1993). The designation was based on its significance as one of the best examples of a nationally representative river delta and estuarine ecosystem (Washington State Game Department 1971; USFWS 1978). The delta supports one of the five highest quality known examples of Washington and Oregon salt marshes (Friedman 1987).

The designated 2,765-acre landmark includes public and private ownerships of land, including lands of the National Audubon Society and WDFW. The 1,000 acres of diked Refuge lands are not included in the designation. The landmark status holds no legal obligations; however, the Service has a resource management responsibility for high quality habitat types, as recognized in the Landmarks Program (USFWS 1978).

Research Natural Area

Located at the mouth of the Nisqually River, the 793-acre Nisqually delta RNA was established by the Service in 1989 (Caicco 1989b). RNA objectives are limited to: (1) preserving and protecting the delta as a significant natural ecosystem; (2) serving as a gene pool for the preservation of native and endangered species; and (3) providing educational and research areas for the study of scientific aspects, including successional trends. Management activities that modify or alter natural ecological processes, including consumptive uses, are not allowed in RNAs (CH2M Hill et al. 1978; USFWS 1981). The Nisqually RNA boundaries are as follows: the east boundary of the RNA runs along the border of the East Bluff; the north boundary runs along the Nisqually Reach; and the west boundary runs along the Thurston-Pierce County line. The southern boundary generally runs east-west from the top (northernmost section) of the Brown Farm Dike across to the East Bluff.

A candidate RNA on Fort Lewis property is located in the Nisqually floodplain, along the eastern bank of the river, partially within the CCP Study Area. The boundaries of this Nisqually Floodplain Candidate RNA include the Nisqually River to the west, the top of the Seventh Infantry Bluff to the east, I-5 to the north, and the confluence of Muck Creek and the Nisqually River to the south. This area is representative of a low elevation stream and riparian system in the Puget Trough. Nearly all of the original low elevation riparian systems in the Puget Trough have been converted to agriculture or have been altered for development. The Nisqually Floodplain Candidate RNA is the largest remaining example of such a system in this physiographic province. This riparian system has statewide significance. Contained within the

upland bluffs rising from the river valley, old river channels, oxbows, and other hydrogeomorphic features illustrate the dynamic processes of a low elevation riparian floodplain system. The mosaic of vegetation communities found within the floodplain supports rich and varied wildlife use.

Nisqually Public Use Natural Area

Forty acres of the Nisqually River surge plain in the Refuge were designated as a Public Use Natural Area (PUNA) in 1990 (Caicco 1989a). PUNAs are designated by the Service to ensure the preservation of significant Refuge natural areas through restricted public access (USFWS 1981). Permitted public use activities are hiking, birdwatching, and fishing. The high quality freshwater surge plain includes a forested riparian area with a dense shrub layer along the west bank of the Nisqually River. The river is influenced by tidal waters from Puget Sound (Kunze 1984; Caicco 1989a). During high tides and floods, overflow in tidal channels carries fresh and slightly brackish water into and over the wetland area (Caicco 1989a).

Shoreline of Statewide Significance

In 1976, the Thurston County Shoreline Master Program designated the Nisqually Reach and River, from Alder Lake to Puget Sound, as shorelines of statewide significance (Giebelhaus 1998). The program segments the shoreline into different designations to regulate development (Thurston County Planning Department 1992; see F,S,L Policies, Plans and Zoning section).

Shoreline regulatory criteria protect water quality, aquatic habitats and public health, and public access, which preserve or enhance shoreline characteristics that existed prior to public access, and require preservation of aesthetic, scenic, historic, or ecological qualities (Thurston Regional Planning Council 1990).

National Recreation Trail

The Brown Farm Dike was designated as a National Recreation Trail in 1981 (Boyer 1993) as a result of the National Trails System Act of 1968. National recreation trails provide for a variety of outdoor uses in or near urban areas. The 5½-mile dike trail designation allows for appropriate public uses on Service lands. The Service retains full latitude to control or restrict public use of the Brown Farm Dike in favor of wildlife resources (Waddell 1981; Watt 1981; Heritage Conservation and Recreation Service no date).

3.8.4 Refuge Management Economics

In 1999, the existing Refuge staff consisted of eight permanent and two temporary employees who accounted for an annual payroll (including salaries and benefits) of approximately $380,000. Seventy trained volunteers are part of the Refuge's volunteer program. In 1999, volunteers

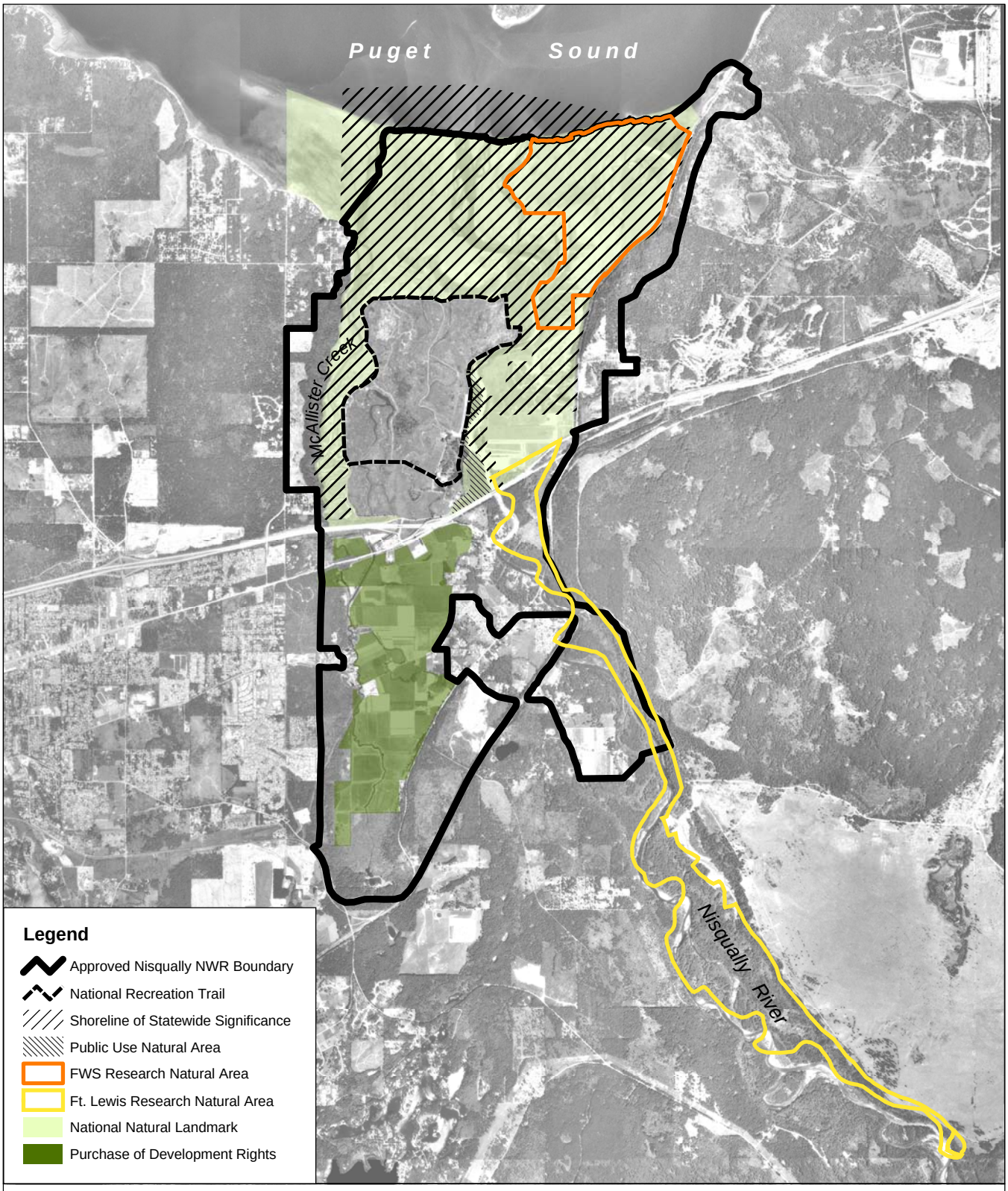

Figure 3.8-1
Special Designated Areas

Aerial Photo 1990

N

0 0.25 0.5 1 Miles

1:70,246

Source: USFWS, 2000; Ducks Unlimited, 1999; EDAW, 2002

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contributed 8,000 hours assisting with the public use and biology programs, and maintenance and administration of the Refuge. Training for new volunteers is conducted once a year. In addition to providing salaries and benefits, the Refuge purchased goods and services totaling approximately $948,000 in 1999, approximately 70% of which was spent in Thurston County.

Some of these expenditures (e.g., for flood damage restoration and maintenance management system projects) were one-time costs and are not expected to be repeated. The baseline non-salary costs of Refuge management were estimated at approximately $197,000 per year, mostly for operations and maintenance activities. Approximately 30% of these purchases involve wildlife- and habitat-related projects, with the remaining 70% involving public use-related projects.

National Wildlife Refuges contribute funds to local counties through two revenue sharing programs, one that applies to Refuge lands reserved from the public domain, and one that applies to lands purchased in fee title. The majority of lands comprising the Refuge are held by the Service in fee title. For fee lands, the Federal government typically pays the counties up to 0.075% of the appraised value of the land each year out of the Refuge Revenue Sharing Fund. In 1999, for example, the Federal government paid $2,613 to Pierce County and $18,167 to Thurston County.

3.8.5 Area Recreation Sector

In 1996, 45% of Washington State's adults age 16 and older participated in outdoor recreational activities that included some form of hunting, fishing, or wildlife-watching. Thirty-nine percent of Washington State's adults participated in wildlife-watching. Additionally, in 1996 almost $3 billion was spent on wildlife-associated recreation in Washington, and over $1.6 billion of the $3 billion was spent on wildlife-watching. Consumer spending for wildlife-watching has a significant effect on local, state, and national economic activity and employment. Wildlife-watching can directly benefit the local economies around the Nisqually Valley. Benefits can be derived through sales of food, lodging, and transportation, as well as through expenditures such as binoculars, cameras, books, wild bird food, and touring vehicles (Gibilisco and Filipek 1998). The increasing economic benefits from wildlife-associated uses create a compelling need for greater conservation of the delta's natural resources, which help generate these funds.

3.8.5.1 Thurston County

The Thurston County Parks and Recreation Department developed a full range of recreation opportunities to support the recreation needs of its residents. Thurston County provides many cultural, historic, natural, passive interpretive, and other recreation opportunities. County Natural Area Preserves focus on preserving natural areas (Thurston County Parks and Recreation Department 1996).

Thurston County policy is to acquire land and develop its resources to support the leisure activities of residents and visitors. Along with State and Federal lands, Thurston County is establishing a coordinated approach to recreation services with the cities of Olympia, Lacey, and Tumwater. These cities maintain approximately 1,222 acres of park lands. Rural Thurston

County cities maintain an additional 80 acres of park lands (Thurston County Parks and Recreation Department 1996).

In 1996, the Thurston County Parks and Recreation Department had a total land inventory of 2,595 acres of park lands, recreation lands, trails, and open space preserves. Twenty-one Thurston County parks include six natural area preserves and 23 miles of trails. Sixteen parks have freshwater and saltwater access. Roughly 7½ miles (39,580 feet) of freshwater waterfront can be accessed, as well as over ½ mile (3,296 feet) of saltwater access (Thurston County Parks and Recreation Department 1996). Trail systems, such as the Chehalis Western Trail (southwest of Nisqually NWR) and the Yelm-Tenino Trail (south of Nisqually NWR), provide a regional system of trails for walking, bicycle, equestrian, and hiking use (Thurston County Parks and Recreation Department 1996).

The Nisqually Sub-Area Land Use Plan recommends that the Thurston County Public Works and the Thurston County Parks and Recreation departments work together with WSDOT, the City of Olympia, and local bicycle clubs to locate park and bike locations at areas such as the Nisqually Interchange, McAllister Springs, Old Nisqually, and the Nisqually Tribal Center. South of McAllister Springs, State Route 510 has an improved bike lane adjacent to the travel lane (Thurston County Planning Department 1992). The Thurston Regional Transportation Plan recommends that bike lanes be constructed with all future road projects of regional significance (Thurston Regional Planning Council 1997).

3.8.5.2 Pierce County

The Pierce County Parks Department maintains over 2,000 acres at over 30 park sites, including two recreation centers, five boat launch sites, trail corridors, and a large variety of passive and active facilities (Pierce County 2001). Pierce County also offers a number of outdoor recreation opportunities. The Foothills Trail is a planned 25-mile trail initiated in 1991 for non-motorized users. The trail parallels the Puyallup River from McMillin to Carbonado. Four trail sections of over 8 miles are open to the public. Popular bicycle trails include a 7-mile trail at Fort Steilacoom Park and a 3-mile Breseman Forest trail system at Spanaway Park. Other shorter trails for non-motorized users can be found at Seeley Lake Park, the wooded Chambers Creek Trail, Sunrise Beach Park, and Lake Tapps Park. Waterfront sites can be found at Half Dollar Park, Orangegate, Parkland Habitat, Rimrock Park, Riverside Park, South Hill Park, Swan Creek Park, and Wilkeson Creek Park (Pierce County 2001). The Pierce County growth management plan also lists a trail in the planning stage from Nisqually NWR to Mount Rainier.

A goal of the 1995 DuPont Comprehensive Plan is to develop a system of parks and open spaces that provides for passive and active outdoor recreation, preserves cultural and archaeological sites, and protects unique physical features. Preservation of oak savannah habitat with limited trails and buffering and providing trails around creeks and wetlands are policies of the plan. A pedestrian trail system is recommended to enhance public enjoyment of natural areas, historic and cultural sites, and scenic views (McConnell/Burke et al. 1995).

3.8.5.3 Nisqually NWR

More than 100,000 people per year visit the Refuge to participate in a variety of wildlife-dependent recreational and educational activities. These include wildlife observation, photography, interpretation, environmental education, and fishing. These visits include approximately 5,000 students and teachers from King, Pierce, Thurston, and Mason counties who visit the Refuge to participate in the environmental education program.

Located adjacent to a major interstate highway, Nisqually NWR is also likely to continue to serve as a secondary destination for visitors en route to better known recreation destinations such as Mount St. Helens National Volcanic Monument and Mount Rainier, North Cascades, and Olympic National Parks.

3.8.6 Agricultural Sector

Approximately 1,108 acres of agricultural lands are located within the CCP Study Area. The principal crops grown in this area that represent the majority of economic activity include hay, corn, and Christmas tree farms. Agricultural uses in Thurston County cover 56,000 acres and produced $36 million worth of farm products in 1997 (Thurston Regional Planning Council 2000). The Nisqually River Management Plan (Nisqually River Task Force 1987) states that enhancement of the natural-resource-based economic sectors and supporting land uses should be preferred to others throughout the river valley.

Agriculture is expected to remain an important component of the south Puget Sound economy, but farmland is increasingly being subdivided and developed for other uses (Pacific Coast Joint Venture 1996). In Thurston County, farmland conversion to non-farm uses is often associated with increases in land values and property tax assessments. Environmental regulations requiring expensive and complex livestock waste management have also resulted in the reduction of land in dairy farms (Klein and Reganold 1997). Traditional local resource-based economies are expected to decline in the area, and commercial activities such as manufacturing, trade, and service-related industries such as outdoor recreation and tourism will continue to grow and diversify (Pacific Coast Joint Venture 1996). The County has addressed this concern through its PDR program (see Section 3.8.3.1).

3.8.7 Commercial Shellfishing

At Nisqually NWR, shellfishing is allowed throughout tidal habitat, under State regulations. RNA closures are currently not being enforced.

Commercial shellfish growers in Thurston County marine waters use about 10,000 acres of commercial shellfish beds. More oysters are grown here than anywhere else in Puget Sound. Shellfish growers support the Puget Sound shellfish industry by producing about 120,000 gallons of oysters and 140,000 pounds of clams annually. Over ten million pounds of geoduck clams, worth $60 million, are found subtidally (Thurston County Advance Planning and Historic Preservation 1994). However, commercial geoduck tracts in the Nisqually Reach have never been open because of seasonal pollution due to heavy rainfall events.

The commercial shellfish growing area incorporating 2,130 acres of the Nisqually Reach was downgraded in 1992 from "Approved" to "Conditionally Approved" by the State Health Department. On November 1, 2000, 74 of these acres near Luhr Beach were further downgraded to "Restricted" meaning no commercial shellfish harvest is allowed. Both downgrades were due to elevated levels of fecal coliform bacteria (S. Davis, pers. comm.). Operations for geoduck harvesting in the delta are being considered by the Nisqually Indian Tribe (Washington State Department of Health 1997).

Chapter 4
Management Direction

CHAPTER 4: MANAGEMENT DIRECTION

4.1 REFUGE MANAGEMENT POLICIES AND GUIDELINES

Management at Nisqually NWR is based on Refuge goals and objectives, NWRS policy and guidelines, and also site-specific considerations. Management decisions are affected by local and regional conditions, including growing urban pressures, habitat loss and degradation, a growing human population, and high public visitation. These factors sometimes mean that more intensive habitat management practices or greater restrictions in public use are needed to ensure sufficient protection of wildlife and habitat and high quality visitor experiences are maintained. Freshwater wetland management will be more intensive to increase the value of the remaining freshwater habitat for some migratory birds. In addition, public restrictions in the form of compatibility stipulations have been identified to protect wildlife and a visitor's experience.

4.2 LAND PROTECTION POLICIES AND GUIDELINES

A significant component of the management direction in the CCP is the Refuge expansion and habitat acquisition program. This section includes information about Service policies and guidelines relevant to protecting lands that are part of the National Wildlife Refuge System, including newly acquired lands. More detail is provided in Appendix K – Land Protection Plan.

4.2.1 Refuge Boundary and Expansion

The former Refuge boundary was approximately 3,936 acres. The acquisition program is ongoing and the Service has acquired approximately 2,925 of the 3,936 acres in fee title, conservation easements, and leases as of August 2004 within the former Refuge boundary. Non-Refuge lands within the former boundary total approximately 1,011 acres. The expansion would add approximately 3,479 acres for a total authorized boundary of 7,415 acres. The expansion includes 512 acres of upland habitat and 2,963 acres of floodplain, riparian, and wetland habitat. The boundary increases habitat protection on the East Bluff north of I-5 to include a forested corridor. It also extends the boundary south of I-5 to include floodplain, bluff, wetland, and upland forested habitats along the Nisqually River and McAllister Creek.

When Nisqually NWR was established in 1974, the original boundary was designed to protect the Delta from specific threats of development. During the ensuing 30 years, increased development has resulted in habitat loss and degradation throughout the Puget Sound area, including the lower Nisqually watershed, contributing to declines of many fish and wildlife species. Refuge expansion will help alleviate the effects of increased habitat degradation, loss, and development pressures in adjacent parts of the lower watershed. Expanding the approved Refuge boundary allows the Service to negotiate with willing participants within the new approved boundary to acquire lands or interests in land and water. Lands, or interests in lands acquired by the Service, will be managed as a part of the National Wildlife Refuge System (System). The System is the largest collection of lands specifically managed for fish and wildlife habitat. The needs of wildlife and their habitats come first on Refuges, in contrast to other public lands managed for multiple uses. The administration, management, and growth of the System are guided by the goals listed in Chapter 1 of this CCP.

4.2.2 Land Protection Methods

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% of 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.

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 with Fort Lewis could involve key partners, including the Nisqually Indian Tribe. Techniques to provide improved protection of USA Trust lands would be restricted to cooperative agreements.

- **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 applied to land under any type of ownership.

- **Conservation Easements**. Conservation easements transfer some, but not all, property rights to the Service as specified by mutual agreement. 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 can negotiate conservation easements on land under any type of ownership.

- **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.

4.2.3 Land Protection Priorities

Appendix L includes a detailed list of the lands within the expansion boundary and within the approved Refuge boundary, by tract number, inset map, total acres, priority, and possible method(s) for resource protection (ownership information is from the Pierce and Thurston County Assessor Offices and subject to change). Tracts are 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 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. However, the expansion boundary provides the Service with future habitat protection options if willing sellers and participants and available funds present themselves in the future.

4.3 MANAGEMENT PLAN FOR NISQUALLY NWR

The CCP for Nisqually NWR was developed from Alternative D (the Preferred Alternative) presented in the CCP/EIS. The most notable elements of the CCP include the following:

- The plan provides for a 3,479-acre expansion of the Refuge boundary, for a total of 7,415 acres.
- The plan maximizes estuarine restoration, while improving freshwater wetland and riparian habitats on the Refuge.
- The environmental education program will be improved and expanded.
- The existing loop trail will change significantly to allow for estuarine restoration.
- A small portion of Refuge lands will be opened to hunting, 7 days per week, with no changes to hunting on WDFW lands. Hunting boundaries will be clarified and enforced.

Components and details of the CCP are illustrated in Figure 4.3-1 and listed in Table 4.3-1. Key elements of the CCP are summarized below.

The plan expands the Refuge boundary, adding an additional 3,479 acres for a total authorized boundary of 7,415 acres. The expansion includes 512 acres of upland habitat and 2,963 acres of floodplain, riparian, and wetland habitat. The boundary increases habitat protection on the East Bluff north of I-5 to include a forested corridor along the crest of the bluff. It also extends the boundary south of I-5 to include floodplain, bluff, wetland, and upland forested habitats along the Nisqually River and McAllister Creek. This boundary expansion will protect the riparian forested river corridor, including a portion of the proposed RNA on Fort Lewis property, as well as greater protection in the floodplain and forested habitat in the Nisqually Valley. Overall, the management plan provides protection for bluffs, floodplain wetlands, and the river corridor south of I-5.

The CCP maximizes estuarine restoration while still providing freshwater wetland and riparian habitat on the Refuge. Under the plan, 699 acres (70%) of the diked area will be restored to estuarine habitat. This component is based on the results of a scientific workshop hosted by the Service in June 1998. The restored area will reconnect a majority of the historic slough systems in the Nisqually delta to Puget Sound, creating a more complete and functional estuarine system. This will require breaching the existing Brown Farm Dike in specific locations and removing much of the dike down to grade. Material from the dike will be used to fill in the associated borrow ditch. Some of the artificial bench of sediments that have accumulated along the outside edge of the dike may be removed to allow full tidal circulation. Small sections of the exterior dike will be left in place to reduce the loss of the largest deciduous trees along the Nisqually River. A new exterior dike will be built to protect the remaining freshwater habitat. The management plan will require the construction of 12,000 linear feet of new exterior dike and 10,500 linear feet of a new interior dike system. New internal and external dikes will be planted with vegetation to stabilize banks, prevent erosion, and provide screening and habitat. Dikes will continue to be maintained with periodic resurfacing (graveling), mowing, brushing, and other techniques. A total of 15,000 linear feet of exterior dike will be maintained.

The remaining 263-acre area within the dike will be managed primarily as freshwater wetlands and riparian habitat. A much more intensive freshwater wetland, grassland, and riparian habitat management regime will be implemented in the remaining diked habitat, except within a smaller area. Internal dikes will be built to create five management units. Grassland habitat will be managed as a smaller component within a mosaic of freshwater wetland habitats, scattered in patches and along the edges of freshwater wetlands. Some riparian plantings will occur north of the headquarters building and along slough systems within the diked area to mimic native riparian habitat historically found in the delta. In addition, 38 acres of riparian/surge plain habitat will be created to increase the acreage of this important habitat along the Nisqually River.

Under the management plan, the environmental education program will serve up to 15,000 students annually. Improvements will include development of site-specific materials and curricula; providing teacher training, field trip support, and enhanced facilities; developing and strengthening partnerships with others to coordinate programs in the area; and serving as a model for other programs. Increased staff support will be required to perform at this improved/expanded level. The Luhr Beach area (Nature Center and boat landing) will be managed under a cooperative management agreement if possible, and use of the Nisqually Reach Nature Center will be coordinated with the Refuge environmental education program.

The management plan will have a large impact on the trail system. The existing 5½-mile loop trail will be reduced to provide an approximately 3½-mile round trip trail by combining the Twin Barns Boardwalk Loop Trail (1 mile), existing and new exterior dike, and a new boardwalk trail extension into the estuary. The trail will no longer be configured in a loop. The boardwalk extension will help offset changes in the trail and improve wildlife viewing opportunities in estuarine habitat. The boardwalk extension along McAllister Creek will be seasonally closed to prevent conflicts with waterfowl hunters on WDFW property. A primitive ½-mile loop trail will

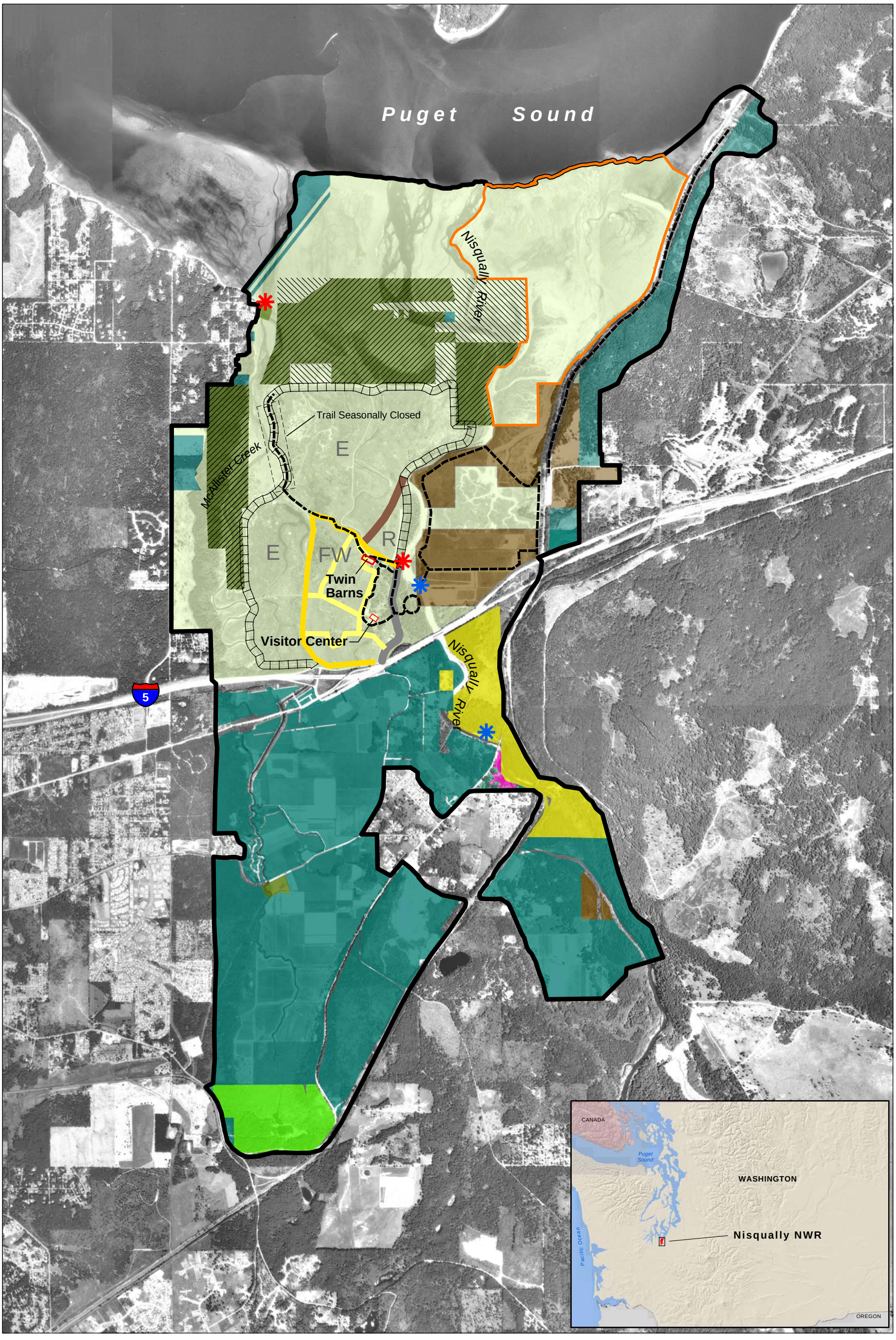

Figure 4.3-1 Management Plan

- Approved Nisqually NWR Boundary
- Research Natural Area
- Accessible Fishing Access
- Bank Fishing Access
- NWR Hunting Area
- WDFW Hunt Area
- Public Recreation Trail
- R Riparian Restoration
- E Estuarine Restoration
- FW Freshwater Wetland Enhancements

Dike Changes

- Berm
- Existing
- Removed
- Internal
- External

Land Ownership

- U.S. Fish & Wildlife Service
- WA Dept. of Fish & Wildlife
- Fort Lewis (U.S. Army)
- Nisqually Tribe
- County Land
- City of Olympia
- Private Land
- No Data

Aerial Photo 1990

N

0 0.15 0.3 0.6 Miles

1:36,000

Source: USFWS, 2000; Ducks Unlimited, 1999; EDAW, 2003

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Table 4.3-1. Components of the CCP.

Resource Area	Components of the CCP (Plan Features)
REFUGE EXPANSION	
Refuge Boundary	Continue to complete the Refuge, acquiring or protecting lands within the former boundary, including cooperative management agreement for Luhr Beach area. Expand Refuge boundary (listed below). Strengthen partnerships within the watershed to improve priority habitat protection.
Acres	Additional 3,479 acres.
East Bluff	Protect 512 acres of a forested corridor along the East Bluff, north of I-5.
Nisqually River Valley	Protect 1,952 acres of freshwater wetland, riparian, and forested habitat.
Nisqually River Corridor	Protect 1,011 acres of the Nisqually River corridor south of I-5.
HABITAT RESTORATION	
Estuarine Habitat	70% full (699 acres) Allow Nisqually River and McAllister Creek to follow more natural flow.
Freshwater Habitat	263 acres Improved management with 5 new interior management units. Freshwater wetland restoration and management on lands acquired south of I-5.
Riparian Habitat	Limited riparian plantings north of headquarters and along sloughs within diked areas; riparian restoration on McAllister Creek and Nisqually River south of I-5; and additional 38 acres of riparian/surge plain restoration along the Nisqually River.
Exterior Dike (linear feet remaining)	A total of 15,000 feet (retain 3,000 feet, new 12,000 feet) Breach and remove dike to grade; fill borrow ditch.
Interior Dike System	10,500 feet 5 diked, freshwater units.
Nisqually Tribal Land, east of River	Estuarine restoration on portions of 325 acres, managed by the Refuge under Cooperative Agreement.
ENVIRONMENTAL EDUCATION	
On-site Program	Expand and improve program. Develop site-specific materials and curricula, provide teacher training, provide increased field trip support, and serve as a model for other programs.
Students Served	15,000

Table 4.3-1. Components of the CCP.

Resource Area	Components of the CCP (Plan Features)
Facility(ies)	Acquire or manage Luhr Beach under cooperative management agreement, including Nisqually Reach Nature Center. Replace Environmental Education Center.
Off-site Program	Develop and strengthen partnerships in the area.
Staffing Needs	Provide increased staff support.
WILDLIFE OBSERVATION, HIKING, AND TRAIL CONFIGURATION	
Dike (main) Trail	3½-mile round-trip trail, including a boardwalk extension into the estuary; no loop configuration.
Twin Barns Boardwalk Loop Trail	Accessible loop trail (1 mile) with interpretive panels remains.
New Trails	Unimproved, primitive ½-mile trail in Nisqually River surge plain forest. Also, new 2½-mile loop trail on tribal and Refuge lands east of the Nisqually River. Possible new trail option on the East Bluff, if acquired.
Facilities	Visitor Center and interpretive displays, focusing on existing habitats and wildlife, with additional interpretation on estuarine restoration. A new Visitor Contact Station at Luhr Beach, plus new Visitor Contact Station and parking on the east side of the Nisqually River.
Seasonal Closures	A portion of main trail would be closed seasonally during waterfowl hunting season. New eastside trail seasonally closed during waterfowl hunting season for the duration of private duck club operation.
WATERFOWL HUNTING	
Refuge Open to Waterfowl Hunting	Refuge will open 191 acres of Refuge lands to a 7 day/week hunt program, creating a single block hunt area with WDFW lands north of the Brown Farm Dike. Quality hunt provision of 25-shell limit on all lands. No limit on number of hunters. Total area available for hunting, including WDFW lands, would be 808 acres.
WDFW Lands	Hunting occurs on 617 acres of WDFW lands; management responsibility by WDFW, with quality hunt provision of 25-shell limit.
Acreage Changes	Refuge opens 191 acres to hunting. Reduce RNA by 73 acres to allow hunting, but add 44 new acres to the south.
Sanctuary	Moderate increase in sanctuary.
Luhr Beach Hunter Access	Hunting on Refuge lands managed by the Service; hunting on WDFW lands managed by WDFW.
Staffing Needs	Provide maximum increased staff support for management of hunting program and enforcement.

Table 4.3-1. Components of the CCP.

Resource Area	Components of the CCP (Plan Features)
FISHING	
General Regulations	Fishing would be allowed by boat, following State regulations, in all Refuge waters outside of the dike, except that the RNA fishing closures would be enforced and any tidal restoration area would be closed to fishing.
McAllister Creek bank fishing area	Bank fishing along McAllister Creek would no longer be available due to dike removal.
RNA closures	The RNA would be closed to fishing and closures enforced.
New fishing opportunities	An improved Nisqually River bank fishing area, if acquired south of I-5 (Trotter's Woods area) would be provided. Accessible fishing site at Luhr Beach would be provided if feasible under cooperative management agreement. A bank fishing area along the Nisqually River north of I-5 (on tribal and Refuge lands east of the river) may be provided. An additional option for accessible fishing site at the Nisqually River Overlook from the Twin Barns Loop Trail would be investigated, and new fishing opportunities on McAllister Creek would be explored in expansion areas if acquired.
BOATING	
General Regulations	A speed limit of 5 mph would be established in all Refuge waters.
RNA closures	All consumptive uses, including associated boating, would be prohibited in the RNA. In addition, the RNA would be closed to all boating from October 1 to March 31 to provide a seasonal sanctuary for migratory birds and other wildlife.
Luhr Beach Boat Ramp Area	Manage through a cooperative management agreement to enhance Refuge outreach efforts and provide Refuge boating regulations and general Refuge and wildlife information at a Visitor Contact Station.

be provided in the surge plain habitat. An approximately 2½-mile loop trail will be developed on tribal and Refuge property east of the Nisqually River, with temporary seasonal closures during the waterfowl hunting season until the private hunt club is discontinued on tribal lands. This trail will provide new wildlife viewing opportunities. A bridge will be needed across Red Salmon Creek to support a loop configuration. The specific design of this trail will be developed during implementation of the CCP. Interpretation will focus on existing habitats, estuarine restoration, improved management, and wildlife. Other new trail options include trails on the East Bluff as part of a larger Pierce County trail system.

Under the CCP, the Service will open 191 acres of Refuge lands to a 7 day/week hunting program during the waterfowl hunting season. These lands are located adjacent to the WDFW parcel north of the Brown Farm Dike. The RNA will be reduced by 73 acres, with the RNA boundary moved to the east to provide a high quality hunting area at the mouth of the river. An additional 44 acres will be added to the RNA at the south end, resulting in a total reduction of 29 acres in the RNA to 764 acres. By opening 191 acres of the Refuge to waterfowl hunting, the

hunting area north of the Brown Farm Dike will be configured in a single rectangular block, reducing confusing boundary issues. Areas designated as "No Hunting Areas" will be posted and enforced, eliminating the unauthorized hunting that has occurred previously on the Refuge.

Waterfowl hunting will continue on all WDFW lands. A 25-shell limit will be instituted on Refuge and WDFW lands. WDFW will maintain jurisdiction and management responsibility over WDFW lands and the Service will manage the hunting program on Refuge lands. Refuge outreach, education, and enforcement programs will benefit hunting programs on State lands as well. The area within the Brown Farm Dike, including the estuarine restoration area, will be closed to hunting.

The bank fishing area along McAllister Creek will no longer be available due to dike removal. However, the closure of the McAllister Creek Hatchery (in July 2002) has reduced fishing opportunity dramatically, lessening the effect of this change. Bank fishing access along McAllister Creek south of I-5 will be provided in the future if acquisition or land protection occurs in appropriate locations. Two new fishing areas along the Nisqually River will also be provided, including the Trotter's Woods area south of I-5 if an agreement is reached with Fort Lewis, and an area off a new loop trail east of the Nisqually River north of I-5 on tribal and Refuge properties. Fishing access on tribal and Refuge property east of the Nisqually River will be associated with the development of the trail, parking area, and visitor contact station, as described above. Accessible fishing access at Luhr Beach will be provided, if feasible, following development of a cooperative management agreement. An additional accessible fishing access only area at the Nisqually River Overlook off the Twin Barns Loop Boardwalk Trail will also be investigated to determine if a stable fishing platform can be maintained along that portion of the river. The RNA will be closed to fishing with closures enforced. The area within the new exterior dike and any tidal restoration area will be closed to fishing.

Under the CCP, recreational shellfishing will continue to be allowed in tidal habitats according to County and State regulations. However, the Luhr Beach area has been closed since summer 2000 because of high levels of fecal coliform contamination. Commercial geoduck harvest will continue under State regulation in waters in or adjacent to the Refuge.

The CCP includes both speed restrictions and seasonal closures for boats. A speed limit of 5 mph will be established for watercraft in all Refuge waters. This will broaden the current 5 mph speed restriction for all watercraft within 200 feet of any shoreline by Thurston County regulation. The RNA will be closed to all boating from October 1 to March 31 to provide a seasonal sanctuary for migratory birds and other wildlife. In addition, boating activity and its potential effects on wildlife will continue to be monitored to ensure that boating remains compatible with Refuge purposes and that new boating restrictions provide sufficient wildlife protection. Future closures or additional restrictions will be considered if undue wildlife disturbance occurs.

Resource monitoring will be an important part of the management plan. Monitoring efforts will focus on key fish, wildlife, and habitats to be used to evaluate habitat management and restoration activities. Biological and public use monitoring will be used to support adaptive management.

4.4 GOALS, OBJECTIVES, AND STRATEGIES

4.4.1 Overview

The following **goals** for Nisqually NWR are broad statements of desired future condition and provide guiding statements for Refuge development and management efforts. They represent a step down from the Refuge vision statement, from National Wildlife Refuge System goals, and from broader regional and national programs.

Nisqually NWR Goals:

I. Conserve, manage, restore, and enhance native habitats and associated plant and wildlife species representative of the Puget Sound lowlands, with a special emphasis on migratory birds and salmonids.

II. Support recovery and protection efforts for Federal and State threatened and endangered species, species of concern, and their habitats of the Nisqually River delta and watershed.

III. Provide quality environmental education opportunities focusing on the fish, wildlife, and habitats of the Nisqually River delta and watershed.

IV. Provide quality wildlife-dependent recreation, interpretation, and outreach opportunities to enhance public appreciation, understanding, and enjoyment of fish, wildlife, habitats, and cultural resources of the Nisqually River delta and watershed.

In contrast, Refuge **objectives** are concise statements of what will be achieved to meet a particular goal. When possible, Refuge objectives should be specific, measurable, achievable, results oriented, and should be time-fixed within the 15-year life span of the CCP.

Refuge **strategies** describe specific actions, tools, and techniques that can be used to meet objectives. In some cases, strategies describe specific projects in enough detail to assess funding and staffing needs. In other cases, further site-specific detail is required to implement a strategy; this usually takes the form of a step-down management plan, restoration plan, or site plan.

The objectives and strategies are listed below as they apply to each of the four Refuge goals.

4.4.2 Detailed Description of the Goals, Objectives, and Strategies

GOAL I: Conserve, manage, restore, and enhance native habitats and associated plant and wildlife species representative of the Puget Sound lowlands, with a special emphasis on migratory birds and salmonids.

Objective 1.1: Restore Estuarine Habitat

Within 3 years of the CCP's approval, implement restoration of 699 acres of estuarine habitat in the Nisqually River delta estuary and nearshore environments. The desired future conditions include: (1) a mosaic of estuarine habitats, including native salt marsh communities; (2) major reduction of invasive reed canary grass; (3) enhanced use by juvenile salmon; (4) most ponds

being connected at low tides to minimize fish entrapment; and (5) increased waterfowl, shorebird, and waterbird use.

Rationale:

During the last century, over 80% of estuarine wetlands in Puget Sound, and up to 33% of its eelgrass beds, have been lost to dredging, filling, diking, and industrial development (Dean et al. 2000; White 1997; Lane and Taylor 1986). Estuarine marsh habitats (salt marsh) are now rare in the Puget Sound region, comprising only 0.3% of the wetland and deepwater resources found here (Tanner 1999). Estuarine areas provide important feeding and rearing habitat for a variety of fish and wildlife, including the threatened chinook salmon. In the Nisqually delta itself, a loss of 54% of intertidal emergent marsh (salt marsh) habitat occurred through agricultural conversion in the early 1900s. Restoration of intertidal wetlands within the Nisqually River delta could substantially increase the amount of salt marsh in south Puget Sound. Restoring 70% of the currently diked area in the Nisqually NWR to tidal influence would increase estuarine habitat in the south Puget Sound area by 46% (Tanner 1999). Protection and restoration of native estuarine and nearshore habitats is a major ecoregional and recovery goal as identified in the North Pacific Coast Ecoregion Plan (1995), Nisqually Basin Fall Chinook Recovery Plan (2001), and the Northern Pacific Coast Regional Shorebird Management Plan (Drut and Buchanan 2000). This objective would benefit estuarine-dependent fish and wildlife species including waterfowl, waterbirds, seabirds, shorebirds, salmon, and invertebrates. Estuarine restoration will also improve the health and function of existing estuarine habitats in the delta. Restoration efforts will focus on habitat-forming processes and functions including tidal influences, sediment delivery, native plant communities, and distributary channel networks.

Strategies:

- Hire a 0.5 full-time equivalent (FTE) Restoration Ecologist, GS-11, to work with partners, including Ducks Unlimited, to develop and implement an estuarine restoration and monitoring plan.

- Develop an estuarine restoration plan by 2006. The plan will include the design for the physical modifications needed to restore 699 acres of estuarine habitats, including removing dikes to grade, filling borrow ditches, and excavating breach sites and historic slough channel depths. Modifications should promote the development of a gradient and mix of estuarine habitat types.

    - In coordination with other CCP restoration programs, obtain permits and implement the estuarine restoration plan within 3 years after CCP approval.

    - Hire a 0.5 FTE Biological Technician, GS-5/6/7, to monitor and manage invasive/exotic species to increase the native species establishment and support an adaptive management approach. This includes identifying all invasive/exotic species that pose a threat to estuarine habitat and associated control methods.

    - Monitor restoration project results to determine the extent of estuarine habitat development. Monitoring should focus on amount, distribution, and processes.

Hire a 0.5 FTE GIS/Data Management Specialist, GS-9, to develop and update GIS data associated with monitoring program.

- Develop and implement a monitoring program to document fish and wildlife response in the estuarine restoration area by 2006. Implementation of this program prior to restoration will allow for the collection of baseline data, resulting in a better assessment of restoration efforts and management decisions. Hire a 0.5 FTE Wildlife Biologist, GS-9/11, to focus on this monitoring program.

Objective 1.2: Reduce Human Disturbance

Reduce human disturbance in estuarine habitat of the Nisqually River delta to protect and enhance fish and wildlife dependent on this resource. Provide a minimum of 764 acres in the RNA and other areas within the approved Refuge boundary where wildlife can rest, feed, and nest with minimal human disturbance.

Rationale:

Refuge estuarine habitat provides crucial feeding and resting areas for a variety of sensitive or declining migratory birds and species of management concern. There are very few areas in Puget Sound that provide long-term, low disturbance areas for fish and wildlife in estuarine habitat. Many areas receive some measure of protection from development, but most allow public access such as boating, PWC use, hunting, or fishing activities. Current public use management is contributing to wildlife disturbance throughout almost all estuarine habitats on the Refuge, providing no sanctuary areas in the estuary. Unauthorized waterfowl hunting is allowed in large portions of Refuge estuary habitat, and required RNA closures to consumptive uses are not enforced. The only remaining substantial eelgrass beds in the Nisqually delta are located in this RNA. Boating occurs year-round with few restrictions throughout Refuge estuarine habitat. There is a need to reduce human disturbance in the estuary, including the RNA and in newly restored estuarine habitat, so natural processes and wildlife response can occur without disturbance from human activities. Implementing use restrictions in the RNA is also consistent with RNA management policy (Refuge Manual 8 RM 10.8). The Service will conserve these areas for scientific research, wildlife and habitat monitoring, and environmental education.

Low disturbance areas are extremely important for wildlife on Refuges that allow hunting and other public uses because they provide high quality habitat for feeding, breeding, resting, and thermal protection. Without these areas, wildlife species exposed to repeated human disturbances may change food habits and distribution patterns, feed only at night, lose weight, have decreased reproductive success, or abandon the feeding, nesting, and resting areas.

Strategies:

- Manage the existing RNA (764 acres instead of 793 acres) to reduce disturbance to estuarine-dependent wildlife by enforcing prohibitions on consumptive uses and establishing seasonal closures, including posting and signing RNA boundaries. The RNA will be closed to boats from October 1 through March 31.

- Designate the restored estuarine habitats within the Brown Farm Dike (699 acres) and Nisqually Indian Tribal land (300 acres), east of the Nisqually River, as a sanctuary for estuarine-dependent wildlife by prohibiting public boating and consumptive uses and restricting public access to trails along the edge of the site.

- Work with surrounding landowners to assist as volunteer observers to monitor effects of human activities in the Nisqually delta to identify the need for additional wildlife protection measures.

- Implement and enforce 5 mph boat speed limit on all Refuge waters to improve wildlife and habitat protection and reduce disturbance.

- Monitor watercraft activity and reevaluate annually to ensure that restrictions are effective in minimizing wildlife and habitat disturbance and use is compatible.

- Hire a 0.5 FTE Refuge Officer, GS-7, to conduct all enforcement patrols associated with boating, hunting, fishing, and trail use activities on Refuge lands and waters.

- Monitor wildlife use distribution and abundance to evaluate effectiveness of public use restrictions to allow for adaptive management.

- Post closure signs at Luhr Beach notifying public of closed Refuge property south of Luhr Beach Nature Center.

- Develop cooperative agreement with WDFW to manage Luhr Beach and establish a visitor contact station that includes information on Refuge regulations and ethical viewing advice to reduce wildlife disturbance.

Objective 1.3: Freshwater Wetlands and Grasslands

By 2020, the Service would protect, restore, and enhance a mosaic of 600 acres of freshwater wetlands and grasslands in the Nisqually River delta and lower Nisqually River watershed to serve as foraging and nesting habitat for a variety of migratory and resident bird species, mammals, and native amphibians. A mix of habitats would generally include 5% permanent freshwater, 10-20% grassland, 15-30% riparian, and at least 60% seasonal freshwater habitat.

Rationale:

Although the actual amount of acres lost is unknown, estimates of freshwater wetlands lost in Washington range from 20% to as much as 50% during the past two centuries (Lane and Taylor 1996). Roughly 500 to 1,000 acres of freshwater wetlands are filled each year in western Washington (White 1997). Current loss and degradation of freshwater wetlands in western Washington are due to urban expansion, forestry and agricultural practices, industrial development, and invasive or exotic plants and animals (Lane and Taylor 1996). Currently, freshwater wetlands comprise only 18% of wetlands in the Puget Sound area (Tanner 1999) yet they provide habitat for many fish and wildlife species observed in South Puget Sound.

Improved management of Refuge lands within the diked area will greatly improve the habitat quality for fish and wildlife.

Much of the lands within the expansion area located south of I-5 were historically freshwater wetland lowlands. There is excellent potential for wetland restoration on these farmed and drained wetlands. A mixture of permanent and seasonal wetlands and scrub-shrub/grassland habitats would provide a mosaic of freshwater wetlands that can be used by a variety of fish and wildlife (waterfowl, raptors, passerines, and small mammals) throughout the year. Freshwater habitat would also provide diverse wildlife viewing opportunities and interpretive programs for visitors.

Wetland Management Strategies:

- In cooperation with partners, develop and implement a restoration plan with adaptive management strategies to restore and enhance 263 acres within the diked area as approximately 5% permanent freshwater, 10% grassland, 25% riparian, and 60% seasonal freshwater habitat within 5 years after CCP approval. This would include providing seasonally flooded wetlands and grasslands to serve as forage areas for waterfowl during the fall and winter months.

- In cooperation with partners, identify and secure funding for restoration 3-4 years after CCP approval.

- Hire a 0.5 FTE Restoration Ecologist, GS-11, within 1 year after CCP approval to supervise implementation of the restoration and monitoring plan.

- The freshwater area would be subdivided into five units by new internal/external dikes to allow intensive management, thereby improving habitat quality and allowing effective reed canary grass control. Internal dikes would have 5 to 1 slopes while the external dikes, constructed to 12 feet in elevation, would have 3 to 1 slopes.

- Seasonal wetlands would be created and enlarged by excavating and sculpting areas with higher elevations. Seeding and planting would be implemented to stabilize soils and speed recovery of wetland plants. Where appropriate, small permanent ponds would be created.

- New water control structures or pumps would be installed between units to allow water movement through the units, and to provide the ability to drain and flood individual impoundments. Units and ponds would be designed to allow flooding in selected areas to at least 3 feet deep for up to 9 months to improve reed canary grass control.

- Management techniques would include a rotating cycle of draining, mowing, discing, scraping, herbicide application, seeding, and flooding to control reed canary grass, prevent brush invasion, and halt succession in these habitats; hire a 1.0 FTE Maintenance Worker, WG-8, within 3 years to conduct this work.

- The water delivery system would be periodically maintained, including the excavation or cleaning of sloughs, ditches, and water control structures, or replacement of water control structures as needed.

- Where appropriate, planting and seeding along the dikes would occur to provide habitat, screening, and erosion control.

- Riparian habitat along the slough would be enhanced with appropriate native plants.

- Work with willing sellers in the expansion area on future possibilities of land acquisition, including focusing on areas with the highest potential for restoration to quality freshwater wetland habitat. If fee title acquisition is not possible, conservation easements or cooperative agreements would be alternatives to ensure long-term protection of these areas.

Grassland Management Strategies:

- Grassland species diversity and palatability will be increased for waterfowl by cutting once in July and again in September. Periodic discing, reseeding, and fertilizing will be conducted to reduce weed species and improve forage quality for waterfowl. Grasslands will be managed to support a variety of non-native grasses (pasture mix) used by waterfowl. Native grass species will be encouraged where possible. Soil tests will be conducted to determine appropriate amounts of fertilizer.

- Surveys for ground-nesting bird species will be conducted prior to haying or mowing before July 1.

Other Management Strategies:

- Develop and implement an Integrated Pest Management Plan for all habitat types on the Refuge to identify invasive species control priorities and preferred control methods for specific species and locations. Include adaptive management strategies and the ability to evaluate the effectiveness of our actions and adjust accordingly.

- Develop and maintain a database and mapping system to track the locations and sizes of non-native invasive species infestations over time.

- Recruit and train volunteers to help with non-native invasive species surveys, monitoring, and control measures, including data collection, entry, and analysis.

- Using the priorities established in the Land Protection Plan (see Appendix K), work with willing sellers in the expansion area on land acquisition, focusing efforts on priority areas including protection of properties that would allow long-term wetland restoration of at least 350-400 acres in the Nisqually Valley lowlands. If acquisition is not possible, conservation easements or cooperative agreements are an alternative to ensure long-term protection and enhancement of these areas.

- As applicable, restoration and management on properties acquired south of I-5 will follow these same strategies. Hire a 1.0 FTE Maintenance Worker, WG-8, to conduct maintenance and operational work on wetlands in the expansion area within 5 years.

- Manage future major flood events inside the diked area by designing and implementing water control methods, which could include spillways, pumps, or water control structures.

- Hire a 0.5 FTE Wildlife Biologist, GS-7/9/11, to provide assistance and technical expertise to interested landowners in the expansion area with programs to enhance habitats and wildlife populations on private land.

- Develop and implement a long-term monitoring and evaluation protocol, including fish and wildlife response, to measure effectiveness of and provide recommendations for current and future management of freshwater wetlands and grasslands. Implementation of this program prior to restoration will allow for the collection of baseline data, resulting in a better assessment of restoration efforts and management decisions. This will require hiring a 0.5 FTE Wildlife Biologist, GS-7/9/11, and 0.5 FTE GIS/Data Management Specialist, GS-9, to focus on this monitoring program.

Objective 1.4: Riparian Habitat

Provide for the protection, restoration, maintenance, and enhancement of the ecological functions of approximately 1,000 acres of riparian mature mixed forest habitat in the Nisqually River delta and corridor to provide foraging and breeding habitat for migratory and resident landbirds and fish. Desired conditions include habitat connectivity; vegetation diversity in terms of age, native plant species composition, and vegetation layers; vegetation vigor; abundance of snags and woody debris; unimpeded occurrences of natural disturbances; minimization of human disturbances; and an irregular shape and a width adequate to retain riparian habitat functions (Knutsen and Naef 1997)

Rationale:

Natural riparian forests are diverse, dynamic, and complex habitats supporting a variety of fish and wildlife. Although riparian areas constitute a small portion of the surface landscape, they are highly productive. Approximately 85% of Washington's wildlife species use riparian habitat associated with rivers and streams (Knutsen and Naef 1997). Habitat for many upland species is also directly enhanced by the presence of adjacent riparian habitat. Riparian areas provide habitat for a variety of bird species, including passerines, woodpeckers, waterfowl, and raptors. As much as 90% of riparian habitat has been lost or modified since the early 1800s (Knutson and Naef 1997). Conditions of several riparian habitats in the expansion area are degraded (EDT Workgroup 1999). Improved protection and enhancement of the Nisqually River corridor will contribute to the conservation of riparian-dependent species and also to salmon recovery. This objective will contribute to ecoregional plan goals, as well as goals of the Conservation Plan for Landbirds in Lowlands and Valleys of Western Oregon and Washington and the Nisqually Basin Fall Chinook Recovery Plan. As a key conservation agency in the Nisqually delta, the Service would play a larger role in protecting and improving riparian habitat on the Fort Lewis Military Reservation and on private lands in the expansion area upriver from the Refuge.

Strategies:

- Develop a riparian restoration project to include planting a variety of native riparian tree and shrub species and restoring natural hydrology on 38 acres of currently diked habitat on the Refuge. This may include constructing a bench that would mimic natural sediment deposition bars along the Nisqually River to reduce frequency of tidal inundation and promote sediment deposition.

- Develop and implement a monitoring program to document habitat development and bird response in the restored area. Implementation of this program prior to restoration will allow for the collection of baseline data, resulting in a better assessment of restoration efforts and management decisions. This will require hiring a 1.0 FTE Fish and Wildlife Biologist, GS-7/9, to conduct monitoring projects.

- Work with Fort Lewis to acquire or manage under a cooperative agreement riparian habitat east of the Nisqually River to protect and restore the native riparian forest. This would require development of a site plan for fishing and vehicle access and hiring a 0.5 FTE Refuge Officer, GS-7 to implement the plan.

- Using the priorities established in the Land Protection Plan, work with willing sellers in the expansion area on future possibilities of land acquisition, including focusing on a 200-foot protection zone of riparian habitat along both sides of the Nisqually River corridor between I-5 and the Nisqually Indian Reservation boundary. In addition, restore riparian habitat along both sides of McAllister Creek, where feasible. If acquisition is not possible, conservation easements or cooperative agreements would be alternatives to ensure long-term protection of these areas.

- Based on the restoration plan, add large woody debris where appropriate and restore function of large woody debris recruitment in the Nisqually River.

- Develop and implement an invasive species monitoring and integrated pest management control program using both manual and chemical treatment methods. This would require hiring a 0.5 FTE Fish and Wildlife Biologist, GS-7/9, to conduct the monitoring program and guide treatment efforts.

- Some riparian plantings will occur north of the headquarters building and along slough systems in the southern portion of the remaining diked area to widen the corridor of riparian habitat, mimicking native riparian habitat historically found in the delta. Since these areas are not directly connected to a system with natural hydrology, they would not function as native riparian systems.

Objective 1.5: Upland Forest

In 15 years, the Refuge would protect and restore 400-600 acres of native upland forest habitat along McAllister Creek and in the eastern and western bluffs of the Refuge. Protection would occur through restoration of 100 acres of upland forest on existing Refuge lands on the West Bluff and acquisition of priority bluff parcels or through easements or cooperative agreements.

Protection and restoration actions would provide habitat for coniferous and deciduous forest dependent species especially tree-nesting species, such as great blue herons and bald eagles, as well as protect water quality, continuous wildlife habitat corridors, and scenic values of the Nisqually delta.

Rationale:

Forested bluff areas in southern Puget Sound are often lost to or compromised by residential development or logging. Urbanization surrounding the Refuge is rapidly occurring. Activities by residents and their pets can disturb nesting birds, and in some cases compromise the stability of the slope, which can lead to erosion and siltation into adjacent Refuge creeks and rivers. Protecting forested habitat would provide a continuous wildlife corridor connecting adjacent habitats with the Refuge. The great blue heron is a monitored and priority species in the State of Washington because of the increasing loss of foraging and breeding habitats and increasing environmental pollutants associated with human expansion and development. Protection of the West Bluff parcel will not only benefit the great blue heron population nesting along McAllister Creek, but also a pair of bald eagles, a Federally listed threatened species, that also nests in the West Bluff area. Maintaining the integrity of the forested bluffs would also be critical in protecting the visual character of the landscape.

Strategies:

- Using the priorities established in the Land Protection Plan, work with willing sellers in the expansion area on land protection, focusing on bluff properties and at least 200 feet along the top of bluff along the eastern boundary of the Refuge and McAllister Creek to protect slope stability, water quality, and foraging and nesting habitats of birds. If acquisition is not possible, conservation easements or cooperative agreements would be alternatives to ensure long-term protection of these areas.

- Work with the Department of Ecology to monitor water quality in McAllister Creek.

- Hire a 0.5 FTE Biological Technician, GS-5/6/7, to assist in monitoring the establishment of invasive species and implementing control measures as necessary.

- Continue to maintain closure to public use on steep bluffs to protect slope integrity and nesting birds (West Bluff parcel).

- Monitor and prevent illegal tree cutting and trespassing on the West Bluff above McAllister Creek.

- Implement an educational program focusing on the importance of forested bluff areas and involve the local community and school groups with restoration efforts.

- Work with landowners and County and City government to manage and control stormwater runoff to maintain slope stability.

- Restore and enhance approximately 100 acres of Douglas-fir dominated mature forest on the West Bluff parcel of the Refuge to reduce fragmentation of forested habitat and provide a habitat and wildlife corridor between Refuge habitats and adjacent lands.

GOAL II: Support recovery and protection efforts for Federal and State threatened and endangered species, species of concern, and their habitats of the Nisqually River delta and watershed.

Objective 2.1: Chinook Salmon and Bull Trout

The Service would protect and restore approximately 4,400 acres of estuarine, freshwater, stream, and riparian habitats to protect declining runs of chinook salmon and bull trout, which are Federally listed as threatened.

Rationale:

The chinook salmon was listed as threatened in 1999 and resides in the Nisqually River and estuary. The Nisqually Chinook Recovery Plan has identified restoration of estuarine habitat within the Nisqually River delta as a top priority component to the recovery of this species (Nisqually Chinook Recovery Team 2001). The bull trout has historically resided in the Nisqually River system. Any protection to spawning, migration, and rearing habitats would support recovery goals of these two species in the Nisqually River watershed.

Strategies:

- Restore 699 acres of estuarine habitat in the delta.

- Hire a 0.5 FTE Fish and Wildlife Biologist, GS-7/9, to monitor response of fish populations to restoration efforts.

- Implement sections of the Cooperative Agreement with the Nisqually Indian Tribe that support estuarine restoration of the eastside parcels (east of Nisqually River).

- Protect and restore approximately 1,000 acres along the Nisqually River, McAllister Creek, and their tributaries through acquisition or other land protection measures to protect riverine and riparian habitats essential to the recovery of chinook salmon and bull trout. Where needed, restoration measures will include planting native tree and shrub species, erosion control measures, control of invasive plant species, and reducing physical damage or disturbance to soils and riparian habitats. Hire a 1.0 FTE Maintenance Worker, WG-5/6, to conduct planting, invasive plant control, and other restoration measures within 5 years.

Objective 2.2 Species Recovery

The Refuge and Service would work with WDFW to support recovery efforts of the western pond turtle and Oregon spotted frog by protecting and restoring suitable habitats and considering future reintroduction in areas of the Refuge.

Suitable habitat for western pond turtle includes a complex of small ponds near sea level; abundant emergent basking sites; isolation from large bodies of water and streams; emergent vegetation and a mud bottom; abundant invertebrate and larval amphibian as prey; few or no non-native predators like largemouth bass and bullfrogs; and diversity of upland habitats, including open grassy areas for nesting and dense clumps of deciduous trees and shrubs for overwintering.

Suitable habitat for Oregon spotted frog includes emergent wetlands associated with lakes, ponds, and slow-moving streams; shallow emergent wetlands, 5-30 cm deep for breeding; few or no non-native predators like largemouth bass, perch, and bullfrogs; and abundant invertebrates and larval amphibians as prey.

Rationale:

Both the Oregon spotted frog and the western pond turtle have highly restricted distributions in western Washington. Spotted frog habitat is scarce, as they now occur in only 10-22% of their historic range in Washington. Only four populations remain within the State (McAllister et al. 2004). The western pond turtle has been extirpated from most of its range in Washington, with only two populations remaining in the Columbia River Gorge (Hays et al. 1999). Re-establishing self-sustaining populations is vital to the recovery of these species. The Oregon spotted frog and western pond turtle need a permanent source of freshwater such as wetlands, ponds, or slow-moving streams.

Strategies:

- Consult with others to identify potential reintroduction sites; if sites are not suitable on Refuge lands, initiate efforts for acquisition within approved acquisition boundaries or pursue other means of protection.

- Identify suitable habitat within the expansion area essential for the protection and conservation of these two species. Assist in developing and implementing improved management practices to enhance habitat and reduce impacts by non-native predators such as the bullfrog.

- Work with WDFW to conduct surveys and promote research and monitoring to better document basic life history information for the two species. Use information for management and recovery of the species.

Objective 2.3: Other Special Status Species

Identify, monitor, and protect all special-status plant and animal species on the Refuge, focusing on species that are State or Federally listed, proposed for listing, or candidates for listing.

Rationale:

The Service manages endangered and threatened species as trust species and, wherever possible, strives to assist in the recovery of endangered and threatened species that occur within the

Refuge System. A high priority management principle is to benefit species proactively before they become listed to prevent further decline. Federal species lists and recovery plans are found at http://www.r1.fws.gov/es/endsp.htm. WDFW maintains a list of special status species through Washington Administrative Codes 232-12-014 and 232-12-011 that can be found through their web site at http://www.wa.gov/wdfw.

Strategies:

- Develop and implement a monitoring program with detailed protocols for monitoring the status of special-status species, including methods to assess habitat needs and management actions.

- Protect the active bald eagle nest from human disturbance, using Recovery Plan (USFWS 1989) guidelines (dates and distances).

- Encourage research on special-status species on the Refuge to investigate ecology relevant to improved conservation measures. Research could be conducted by local universities or other organizations with assistance from the Refuge in the form of funding, supplies, volunteers, or technical assistance.

- Identify special-status species locations outside of Refuge lands and prioritize these areas for acquisition or work with partners to ensure long-term protection.

GOAL III: Provide quality environmental education opportunities focusing on the fish, wildlife, and habitats of the Nisqually River delta and watershed.

Objective 3.1: Environmental Education - Program Management

Provide a quality environmental education program at Nisqually with specific learning objectives and diverse opportunities that: (1) meet State standards for learning; (2) are based on Refuge and Nisqually watershed conservation and management programs; (3) support the mission of the Service; and (4) provide stewardship opportunities.

Rationale:

With its variety of natural resources, facilities, and proximity to major population centers, Nisqually NWR is in a unique position to offer local education agencies, teachers, and students an opportunity to study natural resource management and conservation issues in an outdoor setting. Since the establishment of the Refuge, educators and youth professionals have been using Nisqually NWR as an outdoor classroom to enhance course curricula. The existing program serves approximately 5,000 students per year. The demand for environmental education (EE) is high and expected to grow.

Environmental education in Washington State is strongly supported by the State Superintendent of Public Instruction (SPI). In 1990, the Washington State School Board directed public schools to incorporate environmental education into all appropriate subject areas. Nisqually NWR is in a position to assist local educators in meeting Essential Academic Learning Requirements.

To meet student needs, Refuge staff are committed to looking for ways to teach about wildlife and habitat conservation. The field trip program enhances classroom learning with hands-on outdoor experiences. Summer camps provide students with more in-depth study. As habitat restoration projects are undertaken, students and teachers will be included in hands-on restoration and monitoring activities. These types of activities require management support and commitment of personnel and funds.

Strategies:

- Hire a permanent-full time environmental education specialist (GS-09) to manage the environmental education program, within 2 years after CCP approval.

- Provide for additional program assistance through trained volunteers, interns from local colleges, AmeriCorps, or the Student Conservation Association.

- Hire a second full-time environmental education staff person (GS-09) within 4 years after CCP approval, to serve 15,000 students per year. This staffing would be comparable to other environmental education programs of that size.

- Provide opportunities during the summer for students to participate in an extended, more in-depth study of the natural environment.

- As changes are made to habitats on the Refuge, opportunities would be created to include teachers and students in these long-term restoration activities. These could be one-time activities such as planting, or long-term involvement including planning, design, and actual on-the-ground implementation for a restoration site.

- As changes are made to the habitats on the Refuge, specifically tidal restoration, monitoring activities for students would be developed. Plots could be identified and teachers recruited who would work over the course of the school year to carry out monitoring activities with their students on vegetation, wildlife, and water quality.

- Support the water quality testing projects conducted by the Nisqually River education project and project GREEN.

- Develop a butterfly/native garden in the area of the Education Center.

- Conduct regular evaluations with feedback from teachers and students to improve and modify program as needed.

Objective 3.2: Environmental Education - Students Served

Provide adequate information, site-specific materials, curricula, and facilities to accommodate a year-round field trip program that serves up to 100 students per day, 5 days a week, 15,000 students per year.

Rationale:

Nisqually NWR serves 5,000 students and teachers annually and in 1998, reached approximately 8,000 students and teachers on and off-site. It is estimated that the Refuge could accommodate up to 15,000 on site each year if: (1) an education staff of up to 3 people ran the program full-time; and (2) educators were trained and could be recruited to utilize the Refuge during all months of the school year, not just in May and June. With more opportunities and a more structured program where teachers are trained to use the site and are provided with site-specific materials and tools, educators should be eager to use the Refuge year-round. A triple-wide trailer currently serves as the temporary indoor facility for the EE program. A new 4,000-square-foot EE facility, which will be located near the Visitor Center, is envisioned as the central focus of the EE program with 7 outdoor study sites located on the Refuge.

Strategies:

- The Refuge will have readily available information about the environmental education program, will respond to all inquiries in a timely manner, and will provide information to local schools.

- Groups using the Refuge for environmental education purposes will be limited to 100 students per day and will be required to make reservations in advance through the Refuge Office. Reservations will be taken on a first come-first served basis.

- Group leaders must attend a workshop or orientation session before bringing their classes to the Refuge.

- Groups using the Refuge for environmental education purposes would be limited to the trails and designated environmental education study sites, except by special use permit. Seven environmental education study sites would be designated in the area of the Twin Barns Loop Trail where students can participate in more in-depth study by 2005.

- Develop and provide site-specific materials and tools for educators' use, both on and off site. These materials would include an educator's guide "Where the River Becomes a Delta," which would serve as a site-specific field trip guide and a companion guide to the others that have been developed for the Nisqually River Watershed—"The Living River," "Where the River Begins," and "Where the River Meets the Sound."

- Provide Discovery Packs for use by small groups and non-formal education groups.

- A triple-wide trailer will be used as the temporary indoor classroom facility until a new facility is built by 2007 and would be available for environmental education groups on a reservation basis. Once constructed, the new 4,000-square-foot facility will have small group learning areas, a large group presentation room, bathrooms, a small kitchen, office space, parking, lunch area, and a lab to conduct activities such as water quality testing.

Objective 3.3: Environmental Education - Field Trip Program

Provide a Refuge field trip program where trained educators, volunteer adult leaders, and youth professionals lead their own students in active, hands-on field investigations focusing on the conservation of our natural resources.

Rationale:

Using the "multiplier effect," educators and youth professionals will conduct their own field trips to the Refuge. This allows for the maximum number of students participating in the program with less commitment of staff time. The multiplier effect occurs when the Refuge education staff trains educators who can then use their knowledge and skills year after year with students. Other adults involved in the program also gain new knowledge and awareness and tell their friends and community leaders who influence public policy. Staff are then available to train more educators and work on program growth and development.

Strategies:

- Refuge education staff and volunteers will provide guidance to educators interested in teaching about natural resource issues by assisting in lesson and field trip planning on the phone or in person.

- The Refuge will provide educator workshops and courses sponsored by the Refuge or by Refuge partners on topics related to natural resources and the environment such as Project WET.

- Refuge education staff and volunteers will provide regularly scheduled field trip orientation workshops for educators and youth professionals.

Objective 3.4: Environmental Education Partners and Networking

Refuge staff will work with other agencies and organizations to provide assistance to other programs by designing, conducting, or hosting at least one regionally based environmental education field trip, workshop, seminar, or study course each year.

Rationale:

Many opportunities exist for the Service to work together with partners to both enhance the program at the Refuge but also to provide coordination and assistance to other local programs. Refuge staff will be available and will seek out ways to collaborate in environmental education efforts throughout south Puget Sound, both on and off the Refuge.

The education staff at Nisqually NWR are also in a position to network and provide assistance to other agencies and individuals working in environmental education throughout the region. As a Federal agency with a high profile program, Refuge staff have an opportunity and responsibility to participate on a regional level in coordinating and furthering environmental education efforts.

Strategies:

- Work with partners to strengthen education programs in the Nisqually River watershed including the Nisqually River Council Education Committee, the Nisqually Reach Nature Center, and the Nisqually Indian Tribe.

- Work with partners outside the Nisqually River Watershed including Project GREEN and Sound Stewards.

- Refuge education staff would participate in regional environmental education efforts to coordinate environmental education activities, programs, and curricula with educators throughout the region.

- Nisqually NWR would serve, upon request of the Regional Office, as the Washington State Coordinating office for the Federal Junior Duck Stamp Design Contest.

- Refuge staff, materials, and facilities would be made available to other groups wishing to gather ideas for their programs and would serve as a model for other local, State, and Federal environmental education programs.

GOAL IV. Provide quality wildlife-dependent recreation, interpretation, and outreach opportunities to enhance public appreciation, understanding, and enjoyment of fish, wildlife, habitats, and cultural resources of the Nisqually River delta and watershed.

Objective 4.1: Wildlife Observation

Provide safe, attractive, and accessible wildlife viewing opportunities in all primary habitat types represented on the Refuge including estuarine, freshwater wetland, grassland, riparian forest, riverine, and upland forest.

Rationale:

As a priority public use, wildlife observation programs receive priority consideration in Refuge planning and management, secondary to the needs of fish and wildlife. Wildlife viewing and nature observation are the primary visitor activities at Nisqually NWR. The Refuge is considered by many to be one of the best birding areas in Puget Sound. High quality wildlife viewing will continue to be provided on the Refuge through the development and maintenance of trails, boardwalks, and observation sites (i.e., elevated viewing platforms). Wildlife viewing opportunities will be provided for more than 100,000 visitors who come to Nisqually NWR each year. Estuarine restoration will result in the loss of large portions of the existing 5.5-mile dike loop trail and will require new trails and modifications to existing trails to provide quality wildlife viewing opportunities, access to a variety of habitat types, and to accommodate high visitor demand, while minimizing wildlife disturbance and providing sufficient wildlife sanctuary.

Quality wildlife observation is defined by several elements including: (1) opportunities exist to view wildlife in their habitat and in a natural setting; (2) observation opportunities promote public understanding of Nisqually NWR resources and its role in managing and protecting those

resources; (3) observations occur in places with the least amount of disturbance to wildlife; (4) facilities are safe, fully accessible, and available to a broad spectrum of the public; (5) viewing opportunities are tied to interpretive and educational opportunities; and (6) observers have minimal conflict with other visitors or Refuge operations.

Strategies:

- Within 4 years following approval of the CCP, develop a visitor services plan that covers all Refuge public use programs.

- As part of the estuarine restoration project, provide an accessible 1-mile loop trail and additional trail length with boardwalk extensions. Pursue funding for a 0.75-mile one-way boardwalk spur along McAllister Creek which would provide a 3.5-mile round-trip trail, portions of which would be closed during waterfowl hunting season.

- If interests in Luhr Beach site are developed through cooperative management agreement, maintain and enhance current parking and viewing facilities. Evaluate fee collection at this site. Provide adequate parking, restrooms, signs, and gate. An information kiosk (Visitor Contact Station) will provide public use regulations to visitors to increase safety and reduce the frequency of visitors entering closed areas on the Refuge.

- Establish a 0.5-mile unimproved trail in the surge plain forest. This trail will not be fully accessible.

- In cooperation with the Nisqually Indian Tribe, design, construct, and manage a seasonal loop trail including parking and necessary road improvements, on tribal and Refuge lands east of the Nisqually River. Seasonal closures of this trail will be required during waterfowl hunting season until private hunt club ceases.

- If East Bluff property is acquired or protected, pursue the development of a new East Bluff upland forest trail connecting to the City of DuPont/Northwest Landing trail system, including an overlook and interpretive sites.

- If appropriate areas are acquired south of I-5, develop up to 4 parking areas for a total of 75 cars for public access to overlooks and interpretive sites.

- Maintain habitats to ensure abundance of wildlife for optimum viewing.

- Promote wildlife viewing and interpretation by incorporating Refuge information into Amtrak passenger train service.

- Hire an outdoor recreation planner, GS-9, (0.5 FTE).

Objective 4.2: Wildlife Interpretation

Refuge staff will continue to provide a variety of quality interpretation programs, facilities, and services to Refuge visitors. In addition, each year Refuge staff will identify and serve one new or

non-traditional audience to communicate important messages about fish and wildlife conservation and provide opportunities for people to connect with nature at Nisqually NWR.

Rationale:

The Refuge is located in an ever-growing urban area with decreasing open space and places for people to connect with the natural world. Nisqually NWR, with its visitor facilities and access to wildlife habitat, is a uniquely situated natural area in this region because of its proximity to a major freeway and large urban population.

More than 100,000 people visited the Refuge in 2000. The Refuge provides a variety of programming and services to these visitors, from a state-of-the-art Visitor Center with interpretive exhibits to special events communicating important messages about fish and wildlife conservation and connecting people with nature. But the potential is much greater. Continued growth of the area will mean an increasing need to provide people with information about the Refuge, fish and wildlife conservation, and stewardship of our natural resources. Access to wildlife habitats would continue to be a primary focus for interpretation programs and facilities. Interpretive programs will include interpretation on habitat restoration designed to help visitors understand the importance of this program and its benefits to wildlife. New and non-traditional audiences must be reached. Refuge staff will look for ways, through partnerships, special events, and off-site programs, to reach new audiences with wildlife conservation messages.

Strategies:

- Within 4 years following approval of the CCP, develop a visitor services plan that covers all Refuge public use programs.

- Hire an outdoor recreation planner, GS-9 (0.5 FTE).

- Provide interpretation on Refuge trails through the use of interpretive panels and self-guided trail brochures.

- Maintain visitor center exhibits that interpret broad issues such as the watershed, flyway, and estuary. Replace exhibits as needed to keep them current and well maintained.

- Maintain a rotating wildlife art exhibit in the Visitor Center auditorium.

- Support efforts of the Friends of Nisqually NWR in providing quality educational and interpretive programs, materials, and sales items.

- Work together with partners to produce quality special events at the Refuge such as the Summer Lecture Series, Nisqually Watershed Festival, International Migratory Bird Day, and National Wildlife Refuge Week, which communicate fish, wildlife, and habitat conservation messages. Special events will identify one new or non-traditional audience to include in publicity efforts.

- Provide weekend volunteer naturalist led interpretive programs on topics such as history of the Brown Farm, spring wildflowers, and bird migration.

Objective 4.3: Wildlife Photography

Provide a variety of quality wildlife photography opportunities to increase visitor understanding and appreciation for and enjoyment of Nisqually River delta resources.

Rationale:

Wildlife photography is one of six priority wildlife-dependent recreational uses of the National Wildlife Refuge System. Photographic opportunities promote public understanding and increase public appreciation for America's natural resources and incorporate a message of stewardship and conservation. The Refuge will provide a high quality photography program where compatible with sound principles of fish and wildlife management, other objectives, and other compatible uses.

Strategies:

- Following habitat restoration activities and, as part of a visitor services plan, determine the need for and locations of permanent photo blinds. New photo blinds would be constructed and placed in areas with the least amount of disturbance to wildlife.
- Evaluate current use and needs of photographers on the Refuge.
- In trail development, include spur trails or widened trail or boardwalk push outs to allow photographers space for equipment.
- Provide a wildlife photography interpretive program.
- Have wildlife photo exhibits as part of rotating wildlife art exhibit in the Visitor Center.
- Include information on photography and ethical behaviors in Refuge brochure.
- Conduct regular evaluations, including feedback from photographers, to determine whether objective is being met.

Objective 4.4: Waterfowl Hunting

The Refuge will open 191 acres to waterfowl hunting 7 days per week within 2-3 years after CCP approval. Refuge lands will combine with WDFW lands to create more manageable and enforceable hunt boundaries that will reduce conflicts with other users, reduce confusion for hunters, provide sufficient sanctuary, create uncrowded conditions, and ensure a reasonable harvest. The Refuge will also explore new opportunities for "walk-in" waterfowl hunting as property is acquired south of I-5.

Rationale:

Hunting is a traditional activity in the Nisqually delta and one of the priority public uses of the Refuge System. Waterfowl hunting is open to the public on WDFW lands (617 acres) with around 1,100 visits estimated per year. A private hunt club operates on tribal lands east of the Nisqually River (approximately 325 acres) as part of life tenant uses by the previous landowner. Regulations such as hunting days, maximum number of hunters, etc. are different on these lands. Currently, much of the Refuge tidelands and salt marsh is administratively uncontrollable because of the irregular boundaries of the three WDFW parcels located within Refuge boundaries and the inability to keep these boundaries posted. As a result, unauthorized hunting occurs on large portions of Refuge lands, including the RNA. This unauthorized hunting occurs in spite of the fact that the Refuge has never been officially opened to hunting. This existing condition provides insufficient wildlife sanctuary and allows an unauthorized use to continue on large parts of the Refuge.

By opening a limited portion of Refuge lands (191 acres) to waterfowl hunting, a more manageable block of lands can be posted and enforced, and waterfowl hunting in the Nisqually delta will continue to be provided along with increased sanctuary. The RNA will be reduced by 73 acres to provide additional high quality hunting lands at the mouth of the Nisqually River. However, a 44-acre area will be added to the RNA at the south end. State lands will continue to be open to waterfowl hunting with no changes. Each agency will be responsible for managing its respective hunt program.

Refuge hunt programs are designed to provide high quality experiences. A quality hunting experience means that: (1) hunters are safe; (2) hunters exhibit high standards of ethical behavior; (3) hunters are provided with uncrowded conditions; (4) hunters have reasonable harvest opportunities; (5) hunters are clear on which areas are open and closed to hunting; and (6) minimal conflicts occur between hunters and other visitors, such as kayakers, anglers, and trail users. In general, hunting on Refuges should be superior to that available on other private or public lands, which may require special restrictions (Refuge Manual 8.RM5.14). Measures are often used to ensure quality, including limited hunt days and shell limits and using buffers for public use trails eliminating the need for seasonal trail closures. A limited waterfowl hunt program on the Refuge will accomplish the following:

- Accommodate the existing hunt program on WDFW lands;
- Establish consistent regulations across all lands;
- Provide a quality hunting experience that meets Refuge guidelines and policies; and
- Provide sufficient sanctuary and resolve the current unauthorized hunting situation.

Strategies:

- Write a hunting plan to be consistent with the CCP (hunting location, 7-day/week hunt, 25-shell limit, and 200-yard buffer from trails) and complete process to open Refuge to hunting within 2-3 years after CCP approval.
- Reach agreement with the State to implement a 25-shell limit on WDFW lands.

- Provide sufficient feeding and resting habitat for waterfowl in areas closed to hunting as a sanctuary.

- Post and sign a manageable hunting area including redefining and reducing the RNA by 73 acres at river mouth and add 44 acres to south end.

- Develop a hunting brochure that includes information on hunter ethics, safety precautions, and restrictions.

- Hire a 0.5 FTE Refuge Officer (GS-07) to enforce hunting program regulations, to ensure quality and safety, and to protect natural resources.

- Hire a 0.5 FTE Biological Technician (GS-5/6/7) to conduct hunter bag checks to monitor harvest and compliance with State waterfowl hunting program regulations.

- Manage the Luhr Beach boat landing area through cooperative agreement with WDFW and upgrade facilities to use as a hunter contact station.

- Lands acquired through Refuge expansion south of I-5 will be evaluated for hunting opportunities as they come under Refuge jurisdiction.

- Regularly monitor and evaluate hunting program with feedback from hunters and other users to determine if objectives are being met and to allow for adaptive management.

Objective 4.5: Fishing and Shellfishing

The Refuge will provide a variety of quality boat and bank fishing experiences in selected areas which are safe, consistent with State regulations, and compatible with Refuge resources and purposes. The Refuge fishing and shellfishing program will promote responsible and ethical behavior and a deeper appreciation and understanding of fishery resources of the Nisqually delta.

Rationale:

The Nisqually delta supports a diverse fishery resource including shellfish, bottomfish, anadromous fish, and other freshwater species. Declines in populations of many species and area restrictions require an informed and responsible angler. Fishing is a priority activity of the Refuge System and a traditional form of recreation in the delta. Compatible opportunities can be provided with reasonable restrictions, good compliance with regulations, and if administrative oversight required is minimal. One bank fishing site will be maintained and developed on the existing Refuge, with potential for a second site designated as a disabled visitor access only. Additional bank fishing and water access sites will be considered on lands south of I-5 as they are added to the Refuge. Location criteria for new sites considered will be accessibility, feasibility, minimal conflicts with other users, maintenance, compatibility, and potential to promote a quality fishing experience. The Trotter's Woods fishing site will be designated and managed for fishing if acquired from Fort Lewis or managed under cooperative agreement.

In 2000, recreational shellfish beds were closed in the Nisqually tideflats due to high coliform levels and health concerns. The Service can educate visitors about these closures. If water quality improves, these beds could be opened in the future.

A quality fishing or shellfishing experience means that: (1) anglers/shellfishers are safe; (2) anglers/shellfishers exhibit high standards of ethical behavior; (3) anglers/shellfishers are provided with uncrowded conditions; (4) anglers/shellfishers are clear on which areas are open and closed to fishing; and (5) minimal conflicts occur between anglers/shellfishers and other visitors, such as hikers, hunters, and kayakers.

Strategies:

- Within 3 years after CCP approval, update the fishing management plan to be consistent with the CCP and State regulations.

- As additional lands are acquired, work with partners to select and locate fishing access sites and appropriate parking to provide a range of fishing opportunities in riverine and tidal locations including Trotter's Woods in Fort Lewis on the Nisqually River south of I-5.

- As part of the update of the fishing management plan, determine if an accessible bank fishing site could be located at the boardwalk river overlook on the Twin Barns Loop Trail.

- Work with Nisqually Indian Tribe to provide parking, trail, and a bank fishing site on the east side of the Nisqually River.

- Provide accessible fishing site at Luhr Beach and parking improvements, if feasible, following development of a cooperative management agreement with WDFW.

- Provide safe fishing conditions by maintaining trails, signs, and information to alert anglers of regulations and to hazards.

- Periodically monitor and evaluate fishing program and users to determine if objectives are being met.

- Provide specific information for shellfishing at the Luhr Beach access, including closure information in cooperation with other agencies.

- Restrict boaters from landing and bank fishing in closed areas through policy and regulation.

- Enforce boat speed limits in Refuge waters.

- Hire a 0.5 FTE Refuge Officer (GS-7) to conduct all enforcement patrols associated with boating, hunting, fishing, and trail use activities on Refuge lands and waters.

- Take steps to close the RNA to fishing and shellfishing, including posting, providing information on regulations at Luhr Beach and other appropriate locations, outreach, and conduct monitoring of results.

Objective 4.6: Outreach and Partnerships

The Refuge will take a leadership role in developing and strengthening partnerships, including a volunteer services program, and will conduct a variety of outreach efforts to more effectively achieve Refuge goals and contribution to the protection and enhancement of the Nisqually River watershed.

Rationale:

Strong partnerships will be essential for the Service to achieve its vision and goals for the Refuge. Cooperative efforts with key partners will greatly further habitat protection and restoration, watershed efforts, and education and interpretation. The Refuge's location in the Nisqually delta provides a focal point that encourages participation by a variety partners to come together to strengthen watershed protection. The volunteer services program is a critical part of the Refuge workforce, benefiting all programs and goals, and strengthening community relations. Volunteers contribute the equivalent of 3.7 FTEs annually, donated by more than 70 volunteers. Outreach efforts will enable the Refuge to reach new audiences.

Strategies:

- Within 2 years of CCP approval, hire a GS-7/9 volunteer coordinator to strengthen and enlarge the volunteer services program to provide effective training and program management of the program for a corps of 100 volunteers. Continue to involve volunteers in a variety of Refuge programs to strengthen ties with the community.

- Conduct special events to reach out to new audiences and involve partners, for example the Nisqually Watershed Festival, International Migratory Bird Day, and Summer Lecture Series.

- Work to provide funding and other support to partners to strengthen the outreach and education program through challenge grants and other grant programs.

- Participate in off-site community events to further Refuge goals.

- Continue active participation in critical partnership efforts such as the Nisqually River Council and the Audubon Refuge Keepers.

- Strengthen coordination with the Friends of Nisqually NWR through regular meetings, assisting in providing training, and coordination with the volunteer program.

Objective 4.7: Cultural Resource Program

Implement a proactive cultural resource management program that focuses on meeting the requirements of the National Historic Preservation Act, including consultation, identification, inventory, evaluation, and protection of cultural resources.

Rationale:

The management and protection of cultural resources is an integral element in fulfilling Refuge goals. The Refuge supports a variety of cultural resources and has opportunities to provide interpretation and education to diverse audiences on these unique aspects of the Nisqually delta area. Refuge expansion and changes to Refuge habitats and facilities warrant a comprehensive cultural resource management program.

Strategies:

- Develop an interpretive program that presents accurate information about Native American history of the Nisqually delta and lower watershed.

- Protect and record the values of the Refuge's historical landscape and archaeological resources while managing habitat and wildlife.

- Identify archaeological sites that coincide with existing and planned roads, facilities, public use areas, and habitat projects. Evaluate threatened and impacted sites for eligibility to the National Register of Historic Places. Prepare and implement activities to mitigate impacts to sites as necessary.

- Develop a GIS layer for cultural resources that can be used with other GIS layers for the Refuge, yet contains appropriate locks to protect sensitive information.

- Develop partnership with the Nisqually Indian Tribe for cultural resources inventory, evaluation, and project monitoring, consistent with the regulations of the National Historic Preservation Act.

Objective 4.8: Cultural Resources Education and Interpretation

Develop, in partnership with the Nisqually Indian Tribe and other preservation partners, a program for the education and interpretation of cultural resources of the Nisqually NWR.

Rationale:

Cultural resources are not renewable. Thus, interpretation of cultural resources can instill a conservation ethic among the public and others who encounter or manage them. The goals of the cultural resource education and interpretive program are fourfold: (1) translate the results of cultural research into media that can be understood and appreciated by a variety of publics, (2) engender an appreciation for the Native American culture and perspective on cultural resources, (3) relate the connection between cultural resources and natural resources and the role of humans in the environment, and (4) instill an ethic for the conservation of our cultural heritage.

Strategies:

- Prepare interpretive media (e.g., pamphlets, signs, exhibits) that relate the cultural resources and Native American perspective and Euro-American settlement history of the Refuge for visitors.

- Prepare environmental/cultural education materials for use in education center schools concerning cultural resources, the perspective of Native Americans, the history of the area, and conservation of natural and cultural resources.

- Develop partnerships with educational institutions for the interpretation and protection of cultural resources at the Refuge.

- Consult with the Nisqually Indian Tribe to identify the type of cultural resources information appropriate for public interpretation.

- Develop an outreach program and materials so that the cultural resource messages become part of cultural events in the area, including: Washington Archaeology Month, National Wildlife Refuge Week, and appropriate local festivals.

Chapter 5
Implementation and Monitoring

CHAPTER 5: IMPLEMENTATION AND MONITORING

Following public notification regarding the Service's decision and CCP approval, Refuge staff will begin to implement the CCP. This chapter describes the various components required to implement the plan over the next 15 years.

5.1 FUNDING AND PERSONNEL

Currently a critical staffing level of 11 permanent and no temporary/seasonal positions has been approved by the regional office for Nisqually NWR, but current funding covers only 9 permanent and no temporary/seasonal positions. Current staffing levels are summarized in Table 5.1-1. Current budgeting is listed below.

- Base budget FY 2004 = $600,531
- Fee Funds for FY 2004 = $42,755
- AmeriCorps members = 4 FTEs (6 FTEs in previous years) and 889 Refuge Volunteers contributed 6.6 FTEs for FY 2004.

To complete the extensive restoration, habitat acquisition, habitat and wildlife management, and education/interpretation projects (as well as associated inventorying, monitoring, and mapping projects), more permanent staff will be needed, including up to 27 additional full-time positions in the various disciplines of Refuge management, biology, maintenance, public use, and administration. Projected future staffing requirements are listed in Table 5.1-2, including employment status and salary rating. The highest priority positions are included in the Refuge Operating Needs List (Table 5.4-1). The rate at which this Refuge achieves its full potential of contributing locally, regionally, and nationally to wildlife conservation; appropriate, compatible wildlife-dependent recreation; and environmental education is dependent upon receiving adequate funding and staffing.

5.2 STEP-DOWN MANAGEMENT PLANS

The CCP is one of several plans necessary for Refuge management. The CCP provides guidance in the form of goals, objectives, and strategies for several Refuge program areas but may lack some of the specifics needed for implementation. Step-down management plans will be developed for individual program areas within approximately 5 years after CCP completion. All step-down plans require appropriate NEPA compliance; implementation may require additional permits. Project-specific plans, with appropriate NEPA compliance, may be prepared outside of these step-down plans. Anticipated step-down management plans are listed in Table 5.2-1.

Table 5.1-1. Current Staffing.

Staff Type	Employment Status	Salary Rating
Management		
Project Leader	PFT	GS 13
Deputy Project Leader	PFT	GS 12
Refuge Operations Specialist	PFT	GS 9
Administrative		
Administrative Officer	PFT	GS 9
Receptionist/Clerk	TFT	GS 4
Biology		
Wildlife Biologist	PFT	GS 11
Public Use		
Outdoor Recreation Planner	PFT	GS 11
Park Ranger	PFT	GS 7
Maintenance		
Maintenance worker	PFT	WG 8
Maintenance worker	PFT	WG 8
Maintenance worker	TFT	WG 8

PFT = Permanent Full Time; TFT = Temporary Full Time

Table 5.1-2. Future (Proposed) Staffing.

Staff Type	Employment Status	Salary Rating
Management		
*Project Leader	PFT	GS 13
*Deputy Project Leader	PFT	GS 12
Refuge Manager	PFT	GS 11
Refuge Manager	PFT	GS 11
Refuge Manager	PFT	GS 11
Refuge Operations Specialist	PFT	GS 9/11
Administrative		
*Administrative Officer	PFT	GS 9
*Receptionist/Clerk	PFT	GS 4/5
Receptionist/Clerk	PFT	GS 4/5
Purchasing Agent	PFT	GS 6
Biology		
*Wildlife Biologist	PFT	GS 11
Wildlife Biologist	PFT	GS 9/11
Wildlife Biologist	PFT	GS 7/9/11
Fish and Wildlife Biologist	PFT	GS 7/9
Fish and Wildlife Biologist	PFT	GS 7/9
*Fish and Wildlife Biologist	PFT	GS 7
Restoration Ecologist	PFT	GS 11
Biology Technician	PFT	GS 5/6/7

Table 5.1-2. Future (Proposed) Staffing.

Staff Type	Employment Status	Salary Rating
Biology Technician	PFT	GS 5/6/7
GIS/Data Management Specialist	PFT	GS 9
Public Use		
*Outdoor Recreation Planner	PFT	GS 11
Outdoor Recreation Planner	PFT	GS 9
*Environmental. Education Specialist (Coordinator)	PFT	GS 9/11
Environmental. Education Specialist (Coordinator)	PFT	GS 9/11
Interpretation & Education Specialist	PFT	GS 9
Visual Information Specialist	PFT	GS 7/9
Volunteer Services Coordinator	PFT	GS 7/9
*Park Ranger	PFT	GS 7
Refuge Officer	PFT	GS 7
Refuge Officer	PFT	GS 7
Maintenance		
*Maintenance worker	PFT	WG 8
*Maintenance worker	PFT	WG 8
Maintenance worker	PFT	WG 8
Maintenance worker	PFT	WG 5/6
Maintenance worker	PFT	WG 5/6
Maintenance worker	PFT	WG 5/6
Maintenance worker	PFT	WG 5/6
Engineering Equip. Operator	PFT	WG 8/10

* Indicates Minimum Critical Staffing, includes Black River Unit needs.

Table 5.2-1. Step-down Management Plans.

Step Down Management Plan	Schedule
Estuarine Restoration Plan · Site-specific restoration plan · Compliance process including necessary permits (Sec. 404 wetlands permit, Sec. 7 endangered species consultation, etc.)	2006
Fish and Wildlife Monitoring Plan	2006
Waterfowl Hunt Plan	2006
Environmental Education Plan	Update by 2006
Fishing Plan	2007
Integrated Pest Management Plan	2005
Occupational Safety and Health Plan	2005
Fire Management Plan	Available

5.3 PARTNERSHIP OPPORTUNITIES

The long-term health and protection of Nisqually NWR depends on an informed public and knowledgeable stakeholders. Consistent outreach, good communication, and continued coordination with these Refuge constituents are imperative to successful implementation of the CCP. To maintain and strengthen this important constituency, the CCP provides goals, objectives, and strategies which are not only aimed at protecting, restoring, and conserving wildlife habitat, but also address expanded educational and appropriate, compatible wildlife-dependent recreational opportunities. This section identifies the partnership opportunities, projects (Refuge Operating Needs System List), monitoring, staffing, and funding necessary to successfully implement the CCP.

Because of the Refuge's location within a well-known watershed with numerous partners and in a large metropolitan area, the Refuge is uniquely situated to develop and strengthen unique and creative partnerships in the Puget Sound region. Partnerships will continue to play a crucial role in the protection of the Nisqually delta and the lower watershed and in achieving Refuge goals and objectives. Partnerships will increase our effectiveness, knowledge, and community support as well as reduce costs. There are numerous opportunities to create or strengthen partnerships with community groups, tribes, organizations, agencies, and others. The Nisqually delta, and therefore the Refuge, provides an important focal point and demonstration area within south Puget Sound to increase environmental awareness and community involvement.

Coordinated efforts will focus on habitat restoration, land protection, environmental education, fish and wildlife monitoring, outreach, and quality wildlife-dependent recreation. The Refuge will continue to strengthen partnerships with the Nisqually River Council, Nisqually Indian Tribe, WDFW, WSDOT, land trusts, and other non-profit organizations in the areas of habitat restoration and land protection. The Refuge will strive to exchange information and provide technical assistance to neighboring landowners to further the protection of the lower watershed. A cooperative agreement with the Nisqually Indian Tribe will greatly strengthen coordinated efforts within Refuge boundaries east of the Nisqually River, benefiting habitat restoration and management and public use programs. This effort will strengthen the growing partnership with the Nisqually Indian Tribe. Cooperative agreements with Ducks Unlimited and the Washington Conservation Corps will continue to contribute greatly to habitat restoration and management programs. Partnerships with WSDOT and Federal Highway Administration (FHWA) can provide habitat improvements and wildlife corridors, as well as improve public access to the Refuge.

Access to Nisqually NWR is primarily by road via private motor vehicle. Secondary access to Refuge waters is through the State boat launch at Luhr Beach. The Refuge Roads Inventory shows it has ½ mile of public use roads, one parking lot with capacity for 100 cars, and no bridges. Funding for parking improvements has been requested in the Refuge Roads Program for $500,000. Nisqually NWR does anticipate the need for additional transportation facilities during the 15-year life of this CCP. The Thurston Regional Planning Council is the Metropolitan Planning Organization (MPO) and Regional Transportation Planning Organization (RTPO) in the county. Nisqually is not a Metropolitan Area within the RTPO in the county.

Future transportation changes will be coordinated with FHWA, WSDOT, and Thurston and Pierce counties.

The Service had a Federal Lands Highway Program created in TEA-21, the Refuge Roads Program (RRP). Funds for Refuge public use roads, parking lots, bridges, restrooms, and trails may be sought from the RRP. These funds can also be used for interpretive enhancements associated with these projects, as long as the costs for the interpretive facilities do not exceed 5% of the project budget.

RRP funds can be used as the non-Federal match for FHWA funds available through state departments of transportation. Refuges can also use appropriated Service funds as the non-Federal match for these funds. This matching ability can be used to further city, county, and state transportation and transit funds that could be spent on compatible roads and transit projects adjacent to, connecting to, or running through a refuge.

An essential partner will continue to be the volunteer services program of the Refuge. This large program is instrumental in achieving much more in all program facets than would be possible with staffing alone. This effort also encourages community involvement and support, as numerous people can directly contribute to Refuge programs. The Friends of Nisqually NWR will continue to grow. As a key partner to the Refuge, they will help to further Refuge education, interpretation, and habitat programs.

Collaboration with colleges, universities, local educators, conservation organizations, and environmental education consortiums will enable the Refuge to carry out its plans to improve and enlarge the environmental education, research, and monitoring programs. Cooperative efforts with the Nisqually Reach Nature Center will continue to be strengthened, to improve coordination, and increase the amount and quality of environmental education in the delta area.

Conservation organizations and other non-profit groups will contribute significantly to Refuge and delta protection and enhancement. For example, Tahoma Audubon is an Audubon Refuge Keeper providing support to Nisqually NWR. Black Hills Audubon also provides community support on conservation issues and environmental education.

5.4 PROJECTS

Table 5.4-1 lists the prioritized projects developed as part of the Refuge Operating Needs System (RONS). Brief project descriptions and their associated costs are provided. This list of projects reflects Refuge needs and provides the basis for funding requests from the U.S. Congress, which must be approved by the Service, DOI, and the President's Office of Management and Budget, before being forwarded to Congress.

Table 5.4-1. Projects: Refuge Operating Needs (RONS) List.

	Operating Costs (in thousands of $)			
	FTEs	**One-Time**	**Recurring Base**	**Total 1st Year**
High Priority Projects				
Expand operation of new public use facilities: operating costs Cover recurring base operating costs of providing 7-day a week access to the Refuge and full operation of public use and environmental education programs for the 4 million people within 100 miles of the new Visitor Center/Office complex.			100	100
Restore tidelands of Nisqually River East parcel: Biologist The Refuge and the Nisqually Indian Tribe will cooperatively restore 270 acres to benefit migratory birds, anadromous fish, and endangered and sensitive species.	1	65	61	126
Restore tidelands of Nisqually River East parcel: dike removal and construction Remove and construct dikes to restore this area to tidal action for management under a cooperative agreement between the Service and the Tribe, including accomplishing all compliance requirements. Ducks Unlimited will also be a partner.		125		125
Improve visitor services and administrative efficiency: Office Assistant A Refuge office assistant will serve as receptionist, answer phone inquiries, and provide improved administrative efficiency for growing Refuge programs including enhanced visitor services, new habitat restoration projects, and new Refuge acquisitions.	1	50	40	90
Improve habitat management, restoration, and protection: Assistant Refuge Manager Assistant Refuge Manager will implement, manage, and monitor restoration of the Black River Unit, accomplishing all compliance requirements, as well as provide law enforcement, resource protection, outreach, and visitor safety services.	1	65	74	139
Develop environmental education program: Environmental Education Specialist An Environmental Education Specialist will develop printed curriculum, design and conduct teacher workshops, and implement an education program to reach up to 15,000 students annually.	1	65	74	139
Monitor habitat restoration and associated wildlife and fish use Biologist will conduct migratory bird, amphibian, and fish surveys and habitat monitoring on 1,000 acres of freshwater and tidal wetland restoration areas to assess and improve habitat restoration and management techniques.	1	76	61	137

Table 5.4-1. Projects: Refuge Operating Needs (RONS) List.

	Operating Costs (in thousands of $)			
	FTEs	**One-Time**	**Recurring Base**	**Total 1st Year**
Improve volunteer services program Improve and expand volunteer services program with a volunteer coordinator as well as basic supplies, equipment, and uniforms. Volunteers are used to staff the new Visitor Center, support the growing environmental education program, and help accomplish a diversity of projects, including wildlife surveys, exotic vegetation control, and special events.	1	76	61	137
Brown Farm Marsh wetland enhancement In cooperation with Ducks Unlimited, enhance migratory waterfowl and other waterbird habitat in the Brown Farm Marsh by restoring 2 miles of interior ditches and sloughs to enhance water flow, constructing internal dikes to create manageable wetland units, installing water control structures and pump to allow effective flooding and de-watering, and meeting all compliance requirements.		298	50	348
Restore tidelands within Brown Farm Dike In cooperation with Ducks Unlimited, restore and manage 699 acres of estuarine habitat by removing portions of the Brown Farm Dike to restore tidal action. This project will support the recovery of Nisqually chinook salmon and other declining salmonids, as well as benefit many other estuarine-associated species and meet compliance requirements.	1	2,900	74	2,974
Restore 40 acres of surge plain riparian habitat In cooperation with Ducks Unlimited, restore and manage approximately 40 acres of surge plain riparian habitat along the Nisqually River to benefit migratory bird species, primarily neotropical songbirds. Project includes dike removal and berm construction to allow the Nisqually River to flood the site during high flows and allow tidal influence during extreme high tides.		175	10	185
Install tideland boardwalk trail Install boardwalk with interpretive panels and spotting scopes into estuary along old Brown Farm Dike Trail to provide access and viewing of existing tidelands of McAllister Creek and newly restored tidelands within former diked area.		800	20	810
Install visitor contact station at Luhr Beach public boat launch In cooperation with WDFW, install visitor contact station to provide information and interpretation at Luhr Beach public boat launch, which is the main entrance to public waterways on the Refuge.		39	5	44

Table 5.4-1. Projects: Refuge Operating Needs (RONS) List.

	Operating Costs (in thousands of $)			
	FTEs	**One-Time**	**Recurring Base**	**Total 1st Year**
Expand public use programs including new waterfowl hunt program Expand public use programs through the implementation, management, and enforcement of public waterfowl hunting and implement new public use regulations to reduce wildlife disturbance. A full-time law enforcement officer is needed to conduct enforcement, prevention, ensure visitor safety, and successfully implement new public use programs and regulations.	1	76	61	137
Expand freshwater wetland management A Maintenance Worker will maintain greatly intensified freshwater wetland management through the manipulation of water control structures, dike maintenance, discing, mowing, and planting. Management will also contribute to improved invasive plant control in freshwater wetlands, upland forests, and riparian habitats.	1	65	60	125
Restore riparian corridor along Nisqually River and McAllister Creek Restore and replant a corridor of native riparian habitat along the Nisqually River and McAllister Creek to improve fish and wildlife habitat conditions. More than 1,000 acres of habitat will benefit through site preparation, native tree and shrub planting, invasive plant control, and ongoing maintenance to better protect the river and streams.		115	25	140
Manage and monitor wetland restoration sites A GIS/Data Management Specialist will develop and maintain mapping and monitoring of large-scale restoration sites in various habitats to be used to evaluate restoration programs and conduct adaptive management in response to changing conditions. Mapping will also be used to monitor and assess invasive species, wildlife use, and public use patterns. Specialist will also manage multiple linked databases supporting broad Refuge management programs.	1	65	74	139
Install East Side Loop Trail In cooperation with the Nisqually Indian Tribe, a new 2.5-mile loop trail will be installed on Refuge and tribal lands, under a cooperative management agreement. The trail will be a combination of graveled surface and boardwalk, and provide new wildlife viewing opportunities in a diversity of habitats. Bank fishing access on the Nisqually River, parking, and a visitor contact station will also be installed.		410	10	420

Table 5.4-1. Projects: Refuge Operating Needs (RONS) List.

	Operating Costs (in thousands of $)			
	FTEs	**One-Time**	**Recurring Base**	**Total 1st Year**
Medium Priority Projects				
Improve water management to restore freshwater wetlands Restore and enhance 200 acres of freshwater wetlands by improving the water management and delivery system.		235	10	245
Restore forested uplands for sensitive species In cooperation with many community partners, reforest 100 acres of clear-cut along McAllister Creek with Douglas-fir and other native trees to improve wildlife habitat and watershed protection.		132	20	152
Install visitor contact station and parking lot on Nisqually River east side In cooperation with the Nisqually Indian Tribe, install visitor contact station to provide Refuge information and interpretation at Nisqually Indian Tribe east side property in association with a new public trail and bank fishing site along the Nisqually River.		120	25	135
Install accessible bank fishing site Construct an accessible bank fishing platform on Nisqually River to provide new opportunities for a broader group of anglers and meet accessibility requirements.		120	10	130
Conduct study to enhance salmonid habitat Conduct study to determine importance and contributions of the Nisqually Estuary to salmonids and the effects of estuarine restoration. The information will be used to help contribute to the recovery of the recently listed chinook salmon and monitor the restoration of the Nisqually delta ecosystem.		141		141
Install wildlife observation deck Install wildlife observation deck with benches and interpretive panels along main trail to provide an additional viewing location. Spotting scopes will also be installed at this site and at other trail locations to enhance wildlife observation opportunities for visitors.		88	7	95
Expand environmental education program Following completion of the new Environmental Education Center, an environmental education specialist will be needed to fully implement and operate the expanded education program to reach 15,000 students. This program will reach a more diverse group of students, strengthen partnerships with the community, and greatly enhance the education program at the Refuge.	1	65	74	139

Table 5.4-1. Projects: Refuge Operating Needs (RONS) List.

	Operating Costs (in thousands of $)			
	FTEs	**One-Time**	**Recurring Base**	**Total 1st Year**
Maintain habitat restoration sites A maintenance worker will maintain diverse habitat restoration sites throughout the Refuge, including discing, mowing, invasive species control, water control structure manipulation and replacement, native seeding and planting, and upkeep of additional public use facilities and infrastructure, including Refuge expansion areas. More support is needed to improve and maintain habitat quality and keep facilities safe and functional.	1	65	60	125
Expand priority public use program As restoration is conducted and replacement or new public facilities are completed, the public use program will greatly expand in scope and extent. Public facilities, trails, and uses will occur in multiple locations, and an outdoor recreation planner will be needed to develop, monitor, and support these additional public programs. Additional support will help to maintain the quality of public experiences that are compatible with Refuge purposes.	1	76	63	139
Enforce public use regulations at new Refuge sites and facilities A law enforcement officer will be needed to monitor, enforce, and educate the public regarding uses and regulations in new use areas, along new parking and trail sites, and new fishing and hunting access points on the Refuge, including in expansion areas. Increased law enforcement coverage will be essential to ensure visitor safety, resource protection, and to accomplish outreach and preventive law enforcement in this growing urban area. Enforcement will be conducted throughout the Refuge Complex, including at Black River.	1	76	61	137
Monitor public use activity and effects on wildlife Following the implementation of new public use regulations, uses, and restrictions, a biological technician will monitor the uses to assess the effectiveness of the new programs. Monitoring will include fish and wildlife use, habitat condition, invasive species, and public use activity including waterfowl hunting, trail activity, and boating impacts. Data will be essential to manage and improve public uses, ensure compatibility, and manage special designation areas including the RNA.	1	60	50	110

Table 5.4-1. Projects: Refuge Operating Needs (RONS) List.

	Operating Costs (in thousands of $)			
	FTEs	**One-Time**	**Recurring Base**	**Total 1st Year**
Develop and install interpretive panels on new trails Interpretive panels are needed to provide improved visitor experiences along the new 2.5-mile loop trail on the East Side and to improve education and outreach regarding new estuarine restoration and habitat management programs. Panels will focus on estuarine restoration, native fish and wildlife, cultural resources, and ecosystem function. Panels will be viewed by thousands of visitors using new trails.		55	2	57
Low Priority Projects				
Pest plant control using Washington Conservation Corps members Utilizing WCC crews for mechanical and hand pulling of pest plants reduces the need for chemical control and the amount of staff time required to accomplish pest plant control goals. WCC crews also assist in maintenance, construction, and trail improvements.		15	95	110
House interns, volunteers, temporary staff, and researchers A Refuge housing unit for use by interns, volunteers, temporary employees, and visiting researchers will greatly increase the ability to accomplish important management studies, surveys, and provide improved education and visitor services.		250	15	265
Increase outreach and education with traveling exhibits Design and fabricate two traveling exhibits on refuges in the complex for special events, fairs, public meetings, and loaning to schools and cooperators in the area.		28	5	33
Develop video to increase outreach and education Complete, on contract, Refuge video focusing on wildlife and habitat resources of Nisqually NWR, to enhance outreach efforts and strengthen education program.		54		54

5.5 MONITORING AND EVALUATION

Monitoring is the process of collecting information to evaluate if objectives and anticipated or assumed results of a management program are being realized, or if implementation is proceeding as planned (USDA, USDI 1994).

Adaptive management is a flexible approach to long-term management that is directed by the results of ongoing monitoring activities. Management techniques, objectives, and strategies (Chapter 4) are regularly evaluated over time and the new data are used to adapt both management objectives and techniques to better achieve the Refuge's goals.

Monitoring has been an ongoing activity on Nisqually NWR. Past monitoring efforts on the Refuge have generally focused on key species and habitats, typically those considered sensitive (e.g., threatened or sensitive species), or those identified in Refuge purposes (e.g., migratory waterfowl). While these are adequate to identify trends in relative abundance or habitat use for higher priority species, they usually fail to examine the entire Refuge landscape. Ideally, a Refuge monitoring program would occur across several levels of biological organization including genetic, population/species, community/ecosystem, and regional landscapes. However, limited funding usually results in monitoring programs focused on selected components that are representative of many other species/habitats (considered indicator species). In recent years, most of the monitoring efforts on the Refuge have been concentrated on documenting the location and extent of waterfowl use of estuarine and freshwater habitats.

Monitoring has been identified as a strategy for six of the CCP objectives and will be an ongoing and important program on Nisqually NWR for the life of the CCP. The CCP monitoring program will focus on measuring the success of CCP implementation, particularly the effectiveness of the various habitat restoration projects. The program is designed to provide some flexibility in CCP implementation by allowing the Refuge to change or adapt management practices or monitoring methods as the result of monitoring data.

The various monitoring programs that will be implemented on the Refuge under the CCP are briefly described in Table 5.5-1. This conceptual framework will serve as a starting point for preparation of a step-down monitoring plan, which will provide detailed methods, timing, and costs. Staffing needs have been identified in the strategies for each of the objectives that includes monitoring.

5.6 PLAN AMENDMENT AND REVISION

The CCP is intended to be a dynamic plan based on the concept of adaptive management. Consistent with this concept, the Nisqually NWR CCP will be reviewed annually to decide if it requires any amendments or revisions. The Service will document and make minor plan modifications whenever this review or other monitoring and evaluation determine that changes are needed to achieve Nisqually NWR purpose(s), vision, and goals. Modifications will be coordinated with partners and subject to appropriate NEPA compliance.

The Nisqually NWR CCP will be revised when significant new information becomes available, ecological conditions change, or when the need for major changes has been identified during

annual plan reviews. A revision of the Nisqually NWR CCP should occur in 15 years (2020). A CCP revision would follow the procedures outlined in Service Planning Policy (602 FW 1) for preparing CCPs and would require NEPA compliance including public involvement and tribal consultation.

Table 5.5-1. CCP Monitoring Programs and Projects.

Program/Project	Purpose	Associated Objective (see Chapter 4)	Indicator	Links to Regional Monitoring Efforts
Program: Habitat Monitoring **Associated Goal:** Conserve, manage, restore, and enhance native habitats and associated plant and wildlife species representative of the Puget Sound lowlands, with a special emphasis on migratory birds and salmon.				
Project 1: Estuarine Habitat Mapping	Determine the amount and development of restored estuarine habitat over time	1.1 - Restore 699 acres of estuarine habitat in the Nisqually River delta estuary and near shore environments.... including tidal influences, sediment delivery, native plant communities, and distributary channel networks.	Development of restored estuarine habitat ranging from mudflats to high salt marsh	None
Project 2: **Vegetation Sampling**	Document vegetation response in restored habitats	1.3 - Protect, restore, and enhance a mosaic of 600 acres of freshwater wetlands and grasslands in the Nisqually River delta and lower Nisqually River watershed to serve as foraging and nesting habitat for a variety of migratory and resident bird species, mammals, and native amphibians**.** 1.4 - Protect, restore, maintain, and enhance the ecological functions of approximately 1,000 acres of riparian habitat in the Nisqually River delta and corridor to provide foraging and breeding habitat for migratory and resident land birds and fish. 1.5 - Protect 400-600 acres of native forested bluff habitat along McAllister Creek and the eastern boundary of the Refuge by protecting and restoring existing Refuge lands, and acquiring significant bluff parcels immediately east of the current Refuge boundary and south in the Nisqually Valley.	Vegetation cover and plant species composition	None
Project 3: Water Quality	Monitor water quality in estuarine restoration area	1.1 - Restore 699 acres of estuarine habitat in the Nisqually River delta estuary and near shore environments.... including tidal influences, sediment delivery, native plant communities, and distributary channel networks.	Dissolved oxygen, salinity, water temperature, sediment deposition	None

Table 5.5-1. CCP Monitoring Programs and Projects.

Program/Project	Purpose	Associated Objective (see Chapter 4)	Indicator	Links to Regional Monitoring Efforts
Project 4: Invasive Species Monitoring	Track the locations and abundance of invasive species on the Refuge, monitor new introductions, and incorporate data into an Integrated Pest Management Plan	1.1 - Restore 699 acres of estuarine habitat in the Nisqually River delta estuary and near shore environments.... including tidal influences, sediment delivery, native plant communities, and distributary channel networks. 1.3 - Protect, restore, and enhance a mosaic of 600 acres of freshwater wetlands and grasslands in the Nisqually River delta and lower Nisqually River watershed to serve as foraging and nesting habitat for a variety of migratory and resident bird species, mammals, and native amphibians**.** 1.4 - Protect, restore, maintain, and enhance the ecological functions of approximately 1,000 acres of riparian habitat in the Nisqually River delta and corridor to provide foraging and breeding habitat for migratory and resident land birds and fish. 1.5 - Protect 400-600 acres of native forested bluff habitat along McAllister Creek and the eastern boundary of the Refuge by protecting and restoring existing Refuge lands, and acquiring significant bluff parcels immediately east of the current Refuge boundary and south in the Nisqually Valley.	Invasive species (weeds and exotic wildlife) presence and distribution	None
Program: Wildlife Monitoring **Associated Goal:** Conserve, manage, restore, and enhance native habitats and associated plant and wildlife species representative of the Puget Sound lowlands, with a special emphasis on migratory birds and salmon.				
Project 1: Waterfowl Surveys	Document waterfowl use of restored estuarine and freshwater habitats	1.1 - Restore 699 acres of estuarine habitat in the Nisqually River delta estuary and near shore environments.... including tidal influences, sediment delivery, native plant communities, and distributary channel networks. 1.3 - Protect, restore, and enhance a mosaic of 600 acres of freshwater wetlands and grasslands in the Nisqually River delta and lower Nisqually River watershed to serve as foraging and nesting habitat for a variety of migratory and resident bird species, mammals, and native amphibians**.**	Waterfowl seasonal abundance, distribution, and species composition	The Service's National Pacific Flyway databases for the Midwinter Waterfowl Survey

Table 5.5-1. CCP Monitoring Programs and Projects.

Program/Project	Purpose	Associated Objective (see Chapter 4)	Indicator	Links to Regional Monitoring Efforts
Project 2: Shorebird Surveys	Document shorebird use in estuarine restoration area	1.1 - Restore 699 acres of estuarine habitat in the Nisqually River delta estuary and near shore environments.... including tidal influences, sediment delivery, native plant communities, and distributary channel networks.	Shorebird seasonal abundance, distribution, and species composition	PRISM-Program for Regional and International Shorebird Monitoring-a pilot monitoring program endorsed by the Service and the U.S. Shorebird Council
Project 3: Amphibian Sampling	Document native amphibian species use of restored freshwater wetlands	1.3 - Protect, restore, and enhance a mosaic of 600 acres of freshwater wetlands and grasslands in the Nisqually River delta and lower Nisqually River watershed to serve as foraging and nesting habitat for a variety of migratory and resident bird species, mammals, and native amphibians.	Red-legged frog abundance and distribution	None
Project 4: **Raptor Surveys**	Document raptor use of restored freshwater wetlands and grasslands	1.3 - Protect, restore, and enhance a mosaic of 600 acres of freshwater wetlands and grasslands in the Nisqually River delta and lower Nisqually River watershed to serve as foraging and nesting habitat for a variety of migratory and resident bird species, mammals, and native amphibians.	Raptor abundance and distribution	None
Project 5: Landbird Monitoring	Document migratory and resident landbird use of restored riparian habitat	1.4 - Protect, restore, maintain, and enhance the ecological functions of approximately 1,500 acres of riparian habitat in the Nisqually River delta and corridor to provide foraging and breeding habitat for migratory and resident land birds and fish.	Landbird relative abundance and distribution	Monitoring Avian Populations Database and Washington GAP Analysis Program

Table 5.5-1. CCP Monitoring Programs and Projects.

Program/Project	Purpose	Associated Objective (see Chapter 4)	Indicator	Links to Regional Monitoring Efforts
Program: Threatened, Endangered, and Special Status Species Monitoring **Associated Goal:** Support recovery and protection efforts for Federal and State threatened and endangered species, species of concern, and their habitats of the Nisqually River delta and watershed.				
Project 1: - Fish Monitoring	Document fish response in restored estuarine habitat and support threatened and endangered species recovery efforts	1.1 - Restore 699 acres of estuarine habitat in the Nisqually River delta estuary and near shore environments.... including tidal influences, sediment delivery, native plant communities, and distributary channel networks. 2.1 - Protect and restore approximately 4,400 acres of estuarine, freshwater, stream, and riparian habitats to protect declining runs of the chinook salmon and bull trout, which are Federally listed as threatened.	Salmonid abundance and distribution	None
Project 2: Bald Eagle Monitoring	Monitor bald eagle nesting activity and population trends on the Refuge	1.5 - Protect 400-600 acres of native forested bluff habitat along McAllister Creek and the eastern boundary of the Refuge by protecting and restoring existing Refuge lands, and acquiring significant bluff parcels immediately east of the current Refuge boundary and south in the Nisqually Valley. 2.3 - Identify, monitor, and protect all special-status plant and animal species on the Refuge, focusing on species that are State or Federally listed, proposed for listing, or candidates for listing.	Nesting activity, productivity, abundance, and distribution	WDFW bald eagle nest tracking program; Federal recovery data
Project 3: Great Blue Heron Monitoring	Monitor great blue heron nesting activity and population trends on the Refuge	1.5 - Protect 400-600 acres of native forested bluff habitat along McAllister Creek and the eastern boundary of the Refuge by protecting and restoring existing Refuge lands, and acquiring significant bluff parcels immediately east of the current Refuge boundary and south in the Nisqually Valley. 2.3 - Identify, monitor, and protect all special-status plant and animal species on the Refuge, focusing on species that are State or Federally listed, proposed for listing, or candidates for listing.	Nesting activity, productivity, abundance, and distribution	WDFW studies on great blue herons

Table 5.5-1. CCP Monitoring Programs and Projects.

Program/Project	Purpose	Associated Objective (see Chapter 4)	Indicator	Links to Regional Monitoring Efforts
Program: Environmental Education **Associated Goal:** Provide quality environmental education opportunities focusing on the fish, wildlife, and habitats of the Nisqually River delta and watershed.				
Project 1: Environmental Education Program Monitoring	Monitor effectiveness of environmental education program	3.1 **-** Provide a quality environmental education program at Nisqually with specific learning objectives and diverse opportunities that 1) meet State standards for learning; 2) are based on Refuge and Nisqually watershed conservation and management programs; 3) support the mission of the Service; and 4) provide stewardship opportunities.	Teacher and student evaluations	None
Programs: Wildlife-dependent Recreation **Associated Goal:** Provide quality wildlife-dependent recreation, interpretation, and outreach opportunities to enhance public appreciation, understanding, and enjoyment of fish, wildlife, habitats, and cultural resources of the Nisqually River delta and watershed.				
Project 1: Hunt Program Monitoring	Monitor quality of hunt program	4.1 - Open 191 acres to waterfowl hunting 7 days per week within 2-3 years after CCP approval. Refuge lands would combine with WDFW lands to create more manageable and enforceable hunt boundaries that would reduce conflicts with other users, reduce confusion for hunters, provide sufficient sanctuary, create uncrowded conditions, and ensure a reasonable harvest. The Refuge would also explore new opportunities for "walk-in" waterfowl hunting as property is acquired south of I-5.	Visitor evaluations; hunter bag check; compliance with regulations	None
Project 2: Fishing Program Monitoring	Monitor quality of fishing program	4.2 - Provide a variety of quality boat and bank fishing experiences in selected areas which are safe, consistent with State regulations, and compatible with Refuge resources and purposes.	Visitor evaluations; compliance with regulations	None
Project 3: Wildlife Photography Program Monitoring	Monitor quality of wildlife photography program	4.5 - Provide a variety of quality wildlife photography opportunities to increase visitor understanding and appreciation for and enjoyment of Nisqually River delta resources.	Visitor evaluations	None

APPENDICES

A* **Glossary of Terms/Acronyms & Abbreviations**

B Distribution List

C* **References**

D Applicable Laws and Executive Orders

E* **Nisqually NWR Species List**

E.1 Plant List

E.2 Wildlife List

F[1] Plan Implementation

G* **Compatibility Determinations for Proposed Actions**

G.1 Recreational Boating

G.2 Recreational Fishing

G.3 Waterfowl Hunting

G.4 Environmental Education

G.5 Wildlife Observation, Photography, and Interpretation

G.6 Research

G.7 Agriculture - Haying

H List of Preparers

I[2] Goals, Objectives, and Strategies

J* **Hydrodynamic and Sediment Transport Modeling Summary**

K* **Land Protection Plan**

L* **Wilderness Review**

M Summary of Public Comment and the Service's Responses

N*[3] **Record of Decision (ROD)**

***Appendices in bold and designated with an asterisk (*) are included with this CCP. Unbolded appendices (without an asterisk) are included only with the Final CCP/EIS document, but are cross-referenced as appropriate throughout this CCP.**

[1]Information from this CCP/EIS appendix has been updated and is included as Chapter 5 of this CCP.

[2]Information from this CCP/EIS appendix has been updated and is included as Chapter 4 of this CCP.

[3]New appendix, exclusive to the CCP (not part of the CCP/EIS)

Appendix A
Glossary of Terms
Acronyms & Abbreviations

Appendix A: Glossary of Terms

1. ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
BCC	Birds of Conservation Concern
BNSF	Burlington Northern Santa Fe
BRT	Biological Review Team
CCP	Comprehensive Conservation Plan
CFR	Code of Federal Regulations
cfs	cubic feet per second
cfu	colony-forming units
DDT	Dichlorodiphenyltrichloroethane
DNT/TNT	di- and tri-nitrotoluelenes
DoA	Department of the Army
DOI	Department of the Interior
DPS	Distinct Population Segment
DU	Ducks Unlimited
EA	Environmental Assessment
EE	environmental education
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	evolutionary significant unit
FHWA	Federal Highway Administration
FR	Federal Register
FTE	full-time equivalent
FY	Fiscal Year
GIS	Global Information System
GMA	Growth Management Act
HUD	Housing and Urban Development
I-5	Interstate 5
Improvement Act	National Wildlife Refuge System Improvement Act of 1997
MHHW	mean higher high water
MHW	mean high water
MLLW	mean lower low water
mph	miles per hour
MPO	Metropolitan Planning Organization
NA	Nisqually Agriculture (zoning designation)
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System
OFM	Washington Office of Financial Management
PCBs	polychlorinated biphenyls
PDR	Purchase of Development Rights

PFT	Permanent Full Time
ppm	parts per million
ppt	parts per thousand
PRISM	Program for Regional and International Shorebird Monitoring
PSRC	Puget Sound Regional Council
PUNA	Public Use Natural Area
PWC	personal watercraft
RI/RA/FS	Remedial Investigation/Risk Assessment/Feasibility Study
RM	Refuge Manual
RNA	Research Natural Area
ROD	Record of Decision
RONS	Refuge Operating Needs System
RRP	Refuge Roads Program
RTPO	Regional Transportation Planning Organization
Service	U.S. Fish and Wildlife Service (also, FWS)
SPI	Superintendent of Public Instruction
TFT	Temporary Full Time
TM	Thematic Mapper
TPH	total petroleum hydrocarbon
UGA	Urban Growth Area
USC	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
WDOE	Washington Department of Ecology
WNHP	Washington Natural Heritage Program
WSDOT	Washington State Department of Transportation
WWI	World War I

2. GLOSSARY OF TERMS

Achievement Strategy. See Strategy.

Adaptive Management. Refers to a process in which policy decisions are implemented within a framework of scientifically driven experiments to test predictions and assumptions inherent in management plan. Analysis of results help managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.

Alluvial. Sediment transported and deposited in a delta or riverbed by flowing water.

Alternative. 1. A reasonable way to fix the identified problem or satisfy the stated need (40 CFR 1500.2). 2. Alternatives are different means of accomplishing refuge purposes and goals and contributing to the System mission (draft Service Manual 602 FW 1.5).

Amphipod. Any of a large order of small, usually aquatic crustaceans with a laterally compressed body (for example, beach fleas).

Anadromous. Migratory fishes that spend most of their lives in the sea and migrate to fresh water to breed.

Basin. A region drained by a river system.

Benthic. Refers to organisms associated with the bottom of the sea, lake, or river.

Biological Diversity. The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (USFWS Manual 052 FW 1. 12B). The System's focus is on indigenous species, biotic communities, and ecological processes. Also referred to as Biodiversity.

Bivalve. Common term for pelecypods, members of the Mollusca in which the hard parts are composed of 2 sections fitting together to enclose a space that contains the soft part of the organism.

Brown Farm Dike. The approximately 5-mile long dike that was built in the late 1800s and early 1900s to convert salt marsh areas into farmland by preventing saltwater inundation.

Carrying Capacity. The maximum population of a species able to be supported by a habitat or area.

Categorical Exclusion. A category of actions that do not individually or cumulatively have a significant effect on the human environment and have been found to have no such effect in procedures adopted by a Federal agency pursuant to the National Environmental Policy Act (40 CFR *1508.4).*

Class A Noxious Weed. Those noxious weeds not native to the state that are of limited distribution or are unrecorded in the state and that pose a serious threat to the state.

Class B Noxious Weed. Those noxious weeds not native to the state that are of limited distribution or are unrecorded in a region of the state and that pose a serious threat to that region.

Class C Noxious Weed. Any other noxious weed.

Compatible Use. A wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Director, will not materially interfere with or detract from the fulfillment of the Mission of the System or the purposes of the refuge (Draft Service Manual 603 FW 3.6). A compatibility determination supports the selection of compatible uses and identifies stipulations or limits necessary to ensure compatibility.

Comprehensive Conservation Plan (CCP). A document that describes the desired future conditions of the refuge, and provides long-range guidance and management direction for the refuge manager to accomplish the purposes of the refuge, contribute to the mission of the System, and to meet other relevant mandates (Draft Service Manual 602 FW 1.5).

Concern. See definition of "Issue."

Cover Type. The present vegetation of an area.

Cultural Resources. The remains of sites, structures, or objects used by people in the past.

Cultural Resource Inventory. A professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined geographic area. Inventories may involve various levels, including background literature search, comprehensive field examination to identify all exposed physical manifestations of cultural resources, or sample inventory to project site distribution and density over a larger area. Evaluation of identified cultural resources to determine eligibility for the National Register follows the criteria found in 36 CFR 60.4 (Service Manual 614 FW 1.7).

Delta. The alluvial deposit at the mouth of a river.

Demersal. Organisms living at or near the bottom of a sea or lake but having the capacity for active swimming.

Disturbance. Significant alteration of habitat structure or composition. May be natural (e.g., fire) or human-caused events (e.g., aircraft overflight).

Ecosystem. A dynamic and interrelating complex of plant and animal communities and their associated non-living environment.

Ecosystem Management. Management of natural resources using system-wide concepts to ensure that all plants and animals in ecosystems are maintained at viable levels in native habitats and basic ecosystem processes are perpetuated indefinitely.

Endangered Species (Federal). A plant or animal species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range.

Endangered Species (State). A plant or animal species in danger of becoming extinct or extirpated in Washington within the near future if factors contributing to its decline continue. Populations of these species are at critically low levels or their habitats have been degraded or depleted to a significant degree.

Environmental Assessment (EA). A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).

Environmental Impact Statement (EIS). A detailed written statement required by section 102(2)(C) of the National Environmental Policy Act, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR 1508.11).

Epibenthic. Pertaining to the environment and conditions of organisms living near the water bottom.

Estuarine. Deepwater tidal habitats and adjacent tidal wetlands that are usually partly enclosed by land but have some access to the open ocean and are diluted by freshwater.

Estuary. The wide lower course of a river into which the tides flow. The area where the tide meets a river current.

Euryhaline. Organisms that are tolerant of a wide range of salinity.

Finding of No Significant Impact (FONSI). A document prepared in compliance with the National Environmental Policy Act, supported by an environmental assessment, that briefly presents why a Federal action will have no significant effect on the human environment and for which an environmental impact statement, therefore, will not be prepared (40 CFR 1508.13).

Forb. A broad-leaved, herbaceous plant; for example, a columbine.

Gastropod. Any of a large class of mollusks, usually with a univalve shell or no shell and a distinct head bearing sensory organs, such as snails and slugs.

Gill Net. A type of fishing net utilized by commercial, tribal, and occasionally recreational fishing operations. These nets are the center of much controversy due to the high incidence of by-catch associated with their use.

Goal. Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Draft Service Manual 620 FW 1.5).

Habitat. Suite of existing environmental conditions required by an organism for survival and reproduction. The place where an organism typically lives.

Habitat Type. See Vegetation Type.

Habitat Restoration. Management emphasis designed to move ecosystems to desired conditions and processes, and/or to healthy ecosystems.

Improvement Act. The National Wildlife Refuge System Improvement Act of 1997.

Intergrade. An individual occurring on the boundary between adjacent subspecies and which possesses intermediate characters or traits.

Introgression. The spread of genes of one population into the gene pool of another by hybridization and backcrossing.

Inversion. A state in which the temperature of the air increases with increasing altitude and keeps the surface air and pollutants down.

Issue. Any unsettled matter that requires a management decision (e.g., a Service initiative, opportunity, resource management problem, a threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition) (Draft Service Manual 602FW 1.5).

Lacustrine. Pertaining to, or living in, lakes or ponds.

Landbird. A category of birds that obtains at least part of their food from the land and nest in mainland areas (though some can also be found on islands). Landbirds include raptors and songbirds among others.

Management Alternative. See Alternative.

Migration. The seasonal movement from one area to another and back.

Minimal Critical Staffing. The core staffing needed at Nisqually NWR to meet minimum resource needs, approved by the Service pre-CCP.

Mission Statement. Succinct statement of a unit's purpose and reason for being.

Monitoring. The process of collecting information to track changes of selected parameters over time.

Mysids. A group of crustaceans, also known as opossum shrimps, that feed upon small zooplankton.

National Environmental Policy Act of 1969 (NEPA). Requires all Federal agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision making (from 40 CFR 1500).

National Oceanic and Atmospheric Administration (NOAA) Fisheries. A branch of the Federal government under the U.S. Department of Commerce. The mission of NOAA Fisheries is to rebuild and maintain sustainable fisheries, promote the recovery of protected species under the Endangered Species Act (ESA), and protect and maintain the health of coastal marine habitats for marine animals.

National Wildlife Refuge. A designated area of land, water, or an interest in land or water within the System.

National Wildlife Refuge System. Various categories of areas administered by the Secretary of the Interior for the conservation of fish and wildlife, including species threatened with extinction; all lands, waters, and interests therein administered by the Secretary as wildlife refuges; areas for the protection and conservation of fish and wildlife that are threatened with extinction; wildlife ranges; games ranges; wildlife management areas; or waterfowl production areas.

National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). Under the Refuge Improvement Act, the U.S. Fish and Wildlife Service is required to develop 15-year Comprehensive Conservation Plans for all National Wildlife Refuges outside Alaska. The Act also describes the six public uses given priority status within the NWRS (i.e., hunting, fishing, wildlife observation, photography, environmental education, and interpretation).

National Wildlife Refuge System Mission. The mission 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.

Native Species. Species that normally live and thrive in a particular ecosystem.

Nematodes. Non-segmented roundworms of the phylum Nematoda. They range widely is size and can be free-living or parasitic.

Neritic. Pertaining to the marine zone between low tides and the edge of the continental shelf, a depth of roughly 200 m. A neritic environment supports marine organisms, also described as neritic, that are capable of surviving in shallow water with moderate exposure to sunlight.

Nisqually Reach. Portion of south Puget Sound extending northwest from DuPont Wharf, including Nisqually River delta, to the southern end of Case Inlet at Johnson Point.

Nisqually River Dike. The portion of the Brown Farm Dike that is located along the Nisqually River.

Noxious Weed. A plant species designated by Federal or State law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insect or disease; or non-native, new, or not common to the United States, according to the Federal Noxious Weed Act (PL 93-639), a noxious weed is one that causes disease or had adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the Untied States and to the public health.

Objective. An objective is a concise target statement of what will be achieved, how much will be achieved, when and where it will be achieved, and who is responsible for the work. Objectives are derived from goals and provide the basis for determining management strategies. Objectives should be attainable and time-specific and should be stated quantitatively to the extent possible. If objectives cannot be stated quantitatively, they may be stated qualitatively (Draft Service Manual 602 FW *1.5).*

Obligate Species. Species that require a specific habitat type or plant species for their existence.

Oligohaline. Pertaining to water having low salinity, 0.5-3 ppt for brackish or 17-30 ppt for sea water.

Opisthobranchs. Members of a subclass of gastropods containing such groups as the sea hares and nudibranchs.

Palustrine. Freshwater wetlands that are less than 2 meters deep at low water. They do not include areas regularly impacted by waves or part of a bedrock shoreline. They are familiarly known as marshes, swamps, bogs, wet meadows, prairies, and small shallow ponds.

Passerines. See songbirds.

Pelagic. Referring to organisms that inhabit open waters of the oceans or large lakes.

Personal Watercraft. Personal watercraft (PWC) are small vessels that use inboard motors powering water jet pumps. They are known by such trade names as Jet-ski, Waverunner, and Sea-Doo. Personal watercraft are high performance vessels, designed for speed and maneuverability and are often used to perform stunts. They typically have loud 50 - 100 horsepower engines and are capable of traveling more than 60 mph.

Pinniped. A suborder of carnivores that are marine mammals, have flippers, and eat mostly fish and marine invertebrates (e.g., sea lions, seals).

Plant Association. A classification of plant communities based on the similarity in dominants of all layers of vascular species in a climax community.

Plant Community. An assemblage of plant species unique in its composition; occurs in particular locations under particular influences; a reflection or integration of the environmental influences on the site such as soils, temperature, elevation, solar radiation, slope, aspect, and rainfall; denotes a general kind of climax plant community (e.g., Sitka spruce).

Polychaetes. Any of a class (Polychaeta) of chiefly marine annelid worms (such as clam worms), usually with paired segmental appendages, separate sexes, and a free-swimming trochophore larva.

Preferred Alternative. This is the alternative determined [by the decision maker] to best achieve the Refuge purpose, vision, and goals; contributes to the Refuge System mission, addresses the significant issues; and is consistent with principles of sound fish and wildlife management.

Priority Species. Fish and wildlife species that the Washington Department of Fish and Wildlife believe require protective measures and/or management guidelines to ensure their perpetuation. Priority species include the following: (1) State-listed and candidate species; (2) species or groups of animals susceptible to significant population declines within a specific area or statewide by virtue of their inclination to aggregate (e.g., seabird colonies); and (3) species of recreation, commercial, and/or tribal importance.

Public. Individuals, organizations, and groups; officials of Federal, State, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have indicated an interest in Service issues and those who do or do not realize that Service decisions may affect them.

Purpose(s) of the Refuge. The purpose of a refuge is specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorization, or expanding a refuge, refuge unit, or refuge subunit.

Raptor. A category of carnivorous birds, most of which have heavy, sharp beaks, strong talons, and take live prey (e.g., peregrine falcon, bald eagle).

Refuge Goal. See Goal.

Refuge Purposes. The purposes 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, a refuge unit, or refuge subunit (Draft Service Manual 602 EW 1.5).

Rhizomes. A rootlike stem growing horizontally below the surface. The rhizome is used for food storage and can produce roots and shoots.

Riparian. Refers to an area or habitat that is transitional from terrestrial to aquatic ecosystems; including streams, lakes wet areas, and adjacent plant communities and their associated soils which have free water at or near the surface; an area whose components are directly or indirectly attributed to the influence of water; of or relating to a river; specifically applied to ecology, "riparian" describes the land immediately adjoining and directly influenced by streams. For example, riparian vegetation includes any and all plant life growing on the land adjoining a stream and directly influenced by the stream.

Riverine. Freshwater wetlands and deepwater habitats within a channel containing periodically or continuously moving water. It includes wetlands with primarily or mostly submerged vegetation but does not include those wetlands with mostly emergent vegetation or shrubs and trees. This habitat encompasses a river or stream, its channel, and the associated aquatic vegetation.

Seabird. A group of birds that obtain at least some food from the ocean by traveling some distance over its surface. They also typically breed on islands and along coastal areas. Seabirds include gulls, alcids, pelicans, albatrosses, storm-petrels, and cormorants, among others.

Songbirds (Also Passerines). A category of birds that are medium to small, perching landbirds. Most are territorial singers and migratory.

Spionids. A type of polychaete.

Step-down Management Plans. Step-down management plans provide the details necessary to implement management strategies identified in the Comprehensive Conservation Plan (Draft Service Manual 602 FW *1.5).*

Strategy. A specific action, tool, or technique or combination of actions, tools, and techniques used to meet unit objectives (Draft Service Manual 602 FW 1.5).

Study Area. The area reviewed in detail for wildlife, habitat, and public use potential. For purposes of this CCP/EIS the study area includes the lands within the currently approved Refuge boundary and potential Refuge expansion areas. See page 3-1 for more details.

Sublittoral. Relating to or describing an organism living immediately below low-tide level.

Subsidence. Movement to a lower level or elevation.

Surge Plain. A type of riparian forest flooded during high tides and freshwater storm events from up-river.

Threatened Species (Federal). Species listed under the Endangered Species Act that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

Threatened Species (State). A plant or animal species likely to become endangered in Washington within the near future if factors contributing to population decline or habitat degradation or loss continue.

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

Vegetation Type, Habitat Type, Forest Cover Type. A land classification system based upon the concept of distinct plant associations.

Vision Statement. A concise statement of the desired future condition of the planning unit, based primarily upon the System mission, specific refuge purposes, and other relevant mandates (Draft Service Manual 602 FW 1.5).

Appendix B
Distribution List

[For a copy of this appendix, see the Final CCP/EIS document]

Appendix C
References

APPENDIX C: References

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Appendix D
Applicable Laws and Executive Orders

[For a copy of this appendix, see the Final CCP/EIS document]

Appendix E
Nisqually NWR Species List

Appendix E.1
Plant List

Appendix E: Nisqually NWR Species Lists

E.1 PLANTS

	Genus and Species	Family	Common Name	Wetland Status
	Trees			
	Abies grandis	Pinaceae	grand fir	FACU-
	Acer macrophyllum	Aceraceae	big-leaf maple	FACU
*	*Acer saccharum*	Aceraceae	sugar maple	
	Alnus rubra	Betulaceae	red alder	FAC
	Amelanchier alnifolia	Rosaceae	western serviceberry	FACU
	Arbutus menziesii	Ericaceae	pacific madrone	
	Cornus nuttallii	Cornaceae	pacific dogwood	
	Crataegus douglasii	Rosaceae	Douglas's (black) hawthorn	FAC
*	*Crataegus laevigata* cv.	Rosaceae	Paul's scarlet	
*	*Crataegus x lavallei*	Rosaceae	hawthorn	
*	*Crataegus monogyna*	Rosaceae	common hawthorn	
	Fraxinus latifolia	Oleaceae	Oregon ash	FACW
*	*Ilex aquifolium*	Aquifoliaceae	English holly	
	Malus fusca [*Pyrus f.*]	Rosaceae	Oregon crab apple	FAC+
	Picea engelmannii	Pinaceae	Engelmann spruce	
	Picea sitchensis	Pinaceae	Sitka spruce	FAC
	Pinus contorta var. *c.*	Pinaceae	shore pine	FAC-
*	*Populus alba*	Salicaceae	white poplar	
	Populus balsamifera ssp. *trichocarpa* [*P. t.*]	Salicaceae	black cottonwood	FAC
*	*Populus nigra* var. *italica*	Salicaceae	Lombardy poplar	
	Populus tremuloides	Salicaceae	quaking aspen	FAC+
*	*Prunus avium*	Rosaceae	sweet cherry	
	Prunus emarginata var. *mollis*	Rosaceae	bitter cherry	FACU
	Prunus virginiana var. *demissa*	Rosaceae	choke cherry	FACU
	Pseudotsuga menziesii var. *m.*	Pinaceae	Douglas-fir	
*	*Pyrus communis*	Rosaceae	cultivated pear	
*	*Pyrus malus*	Rosaceae	cultivated apple	
	Rhamnus purshiana [*Frangula p.*]	Rhamnaceae	cascara	FAC-
	Salix scouleriana	Salicaceae	Scouler's willow	FAC
*	*Sorbus aucuparia*	Rosaceae	European mountain ash	
	Taxus brevifolia	Taxaceae	pacific yew	FACU-
	Thuja plicata	Cupressaceae	western redcedar	FAC
	Tsuga heterophylla	Pinaceae	western hemlock	FACU-

* Note: * indicates non-native (introduced)

	Genus and Species	Family	Common Name	Wetland Status
	Shrubs, Brambles & Vines			
	Acer circinatum	Aceraceae	vine maple	FACU+
	Arctostaphylos uva-ursi var. *u.-u.*	Ericaceae	kinnikinnick	FACU-
	Berberis aquifolium Pursh [*Mahonia a.*]	Berberidaceae	tall Oregon-grape	
	Berberis nervosa Pursh [*Mahonia n.*]	Berberidaceae	dull Oregon-grape	FACU
	Ceanothus sanguineus	Rhamnaceae	redstem ceanothos	NI
	Chaenomeles japonica	Rosaceae	flowering quince	
	Chimaphila umbellata	Ericaceae	prince's-pine	
	Clematis vitalba	Ranunculaceae	travelers-joy	
	Cornus sericea ssp. *s.* [*C. stolonifera* var. *o.*]	Cornaceae	red-osier dogwood	FACW
	Corylus cornuta var. *californica*	Betulaceae	hazelnut	NI
*	*Cotoneaster franchetii*	Rosaceae	cv. cotoneaster	
*	*Cytisus scoparius* var. *s.*	Fabaceae	Scot's broom	
*	*Euonymus fortunei*	Celastraceae	euonymus	
	Gaultheria shallon	Ericaceae	salal	FACU
*	*Hedera helix*	Araliaceae	English ivy	
	Holodiscus discolor var. *d.*	Rosaceae	ocean-spray	
*	*Humulus lupulus*	Cannabaceae	hops	NI
	Linnaea borealis ssp. *longiflora*	Caprifoliaceae	western twinflower	FACU-
	Lonicera ciliosa	Caprifoliaceae	orange honeysuckle	
	Lonicera hispidula var. *h.*	Caprifoliaceae	hairy honeysuckle	
	Lonicera involucrata	Caprifoliaceae	bearberry honeysuckle	FAC
	Oemleria cerasiformis	Rosaceae	Indian plum	FACU
	Oplopanax horridus	Araliaceae	Devils'-club	FAC
	Philadelphus lewisii var. *gordonianus*	Philadelphaceae	mock orange	
	Physocarpus capitatus	Rosaceae	pacific ninebark	FAC+
*	*Prunus laurocerasus*	Rosaceae	cherry laurel	
	Ribes divaricatum. var. *d*	Grossulariaceae	straggly gooseberry	NI
	Ribes sanguineum var. *s.*	Grossulariaceae	red-flowering current	NI
	Rosa gymnocarpa var. *g.*	Rosaceae	baldhip rose	NI
	Rosa nutkana var. *n.*	Rosaceae	Nootka rose	NI
	Rosa pisocarpa	Rosaceae	clustered wild rose	FACU
*	*Rubus discolor*	Rosaceae	Himalayan blackberry	NI
*	*Rubus laciniatus*	Rosaceae	evergreen blackberry	FACU+
	Rubus leucodermis var. *l.*	Rosaceae	blackcap	
	Rubus parviflorus var. *p.*	Rosaceae	thimbleberry	FACU+
	Rubus spectabilis var. *s.*	Rosaceae	salmonberry	FAC
	Rubus ursinus ssp. *macropetalus*	Rosaceae	pacific blackberry	FACU
	Salix lucida ssp. *lasiandra* [*S. lasiandra*]	Salicaceae	pacific willow	FACW+
	Salix sitchensis	Salicaceae	Sitka willow	FACW
	Sambucus caerulea	Caprifoliaceae	blue elderberry	FAC-
	Sambucus racemosa ssp. *pubens* var. *arborescens*	Caprifoliaceae	coast red elderberry	FACU
*	*Solanum dulcamara*	Solanaceae	bittersweet	FAC
*	*Spiraea x vanhouttei*	Rosaceae	spiraea	

	Genus and Species	Family	Common Name	Wetland Status
	Shrubs, Brambles & Vines (continued)			
	Spiraea douglasii ssp. *d*.	Rosaceae	Douglas' spirea	FACW
	Symphoricarpos albus var. *laevigatus*	Caprifoliaceae	common snowberry	FACU
	Symphoricarpos hesperius [*S. mollis*]	Caprifoliaceae	creeping snowberry	
	Toxicodendron diversilobum [*Rhus diversiloba*]	Anacardiaceae	poison-oak	FACU
*	*Ulex europaeus*	Fabaceae	gorse	
	Vaccinium ovatum	Ericaceae	evergreen huckleberry	NI
	Vaccinium parvifolium	Ericaceae	red huckleberry	NI
	Grasses			
*	*Agrostis capillaris* [*A. tenuis*]	Poaceae	colonial bentgrass	
	Agrostis exarata var. *e.*	Poaceae	spike bentgrass	FACW
*	*Agrostis gigantea* [*A. alba* var. *a.*]	Poaceae	redtop	FAC
	Agrostis scabra	Poaceae	hair bentgrass	FAC
*	*Agrostis stolonifera* [*A. alba* vars. *major* & *palustris*]	Poaceae	creeping bentgrass	FAC+
*	*Aira caryophyllea*	Poaceae	silver hairgrass	
*	*Aira praecox*	Poaceae	early hairgrass	
*	*Alopecurus geniculatus* var. *g.*	Poaceae	water foxtail	OBL
*	*Alopecurus pratensis*	Poaceae	meadow foxtail	FACW
*	*Anthoxanthum odoratum*	Poaceae	sweet vernalgrass	FACU
*	*Arrhenatherum elatius*	Poaceae	tall oatgrass	
*	*Bromus hordeaceus* subsp. *h*. [*B. mollis*]	Poaceae	soft brome	
	Bromus pacificus	Poaceae	pacific brome	
	Bromus sitchensis var. *s.*	Poaceae	Alaska brome	
*	*Bromus tectorum*	Poaceae	cheatgrass	
	Bromus vulgaris	Poaceae	Columbia brome	UPL
	Cinna latifolia	Poaceae	wood reedgrass	FACW
*	*Cynosurus echinatus*	Poaceae	hedgehog dogtail	
*	*Dactylis glomerata*	Poaceae	orchard grass	FACU
	Deschampsia cespitosa ssp. *beringensis*	Poaceae	tufted hairgrass	FACW
	Deschampsia danthonioides	Poaceae	annual hairgrass	FACW-
	Distichlis spicata var. *s.*	Poaceae	seashore saltgrass	FACW
*	*Echinochloa crus-galli*	Poaceae	large barnyard-grass	FACW
	Elymus glaucus	Poaceae	blue wildrye	FACU
	Elymus mollis ssp. *m.*[*Leymus m.*]	Poaceae	dune wildrye	FACU
	Elymus trachycaulus ssp. *t.*[*Agropyron trachycaulum*]	Poaceae	awned wheatgrass	FAC-
*	*Elytrigia repens* [*Agropyron r.*]	Poaceae	quackgrass	FACU
*	*Festuca arundinacea*	Poaceae	tall fescue	FACU
	Festuca rubra	Poaceae	red fescue	FAC
	Glyceria elata	Poaceae	tall mannagrass	FACW+
	Glyceria leptostachya	Poaceae	slender-spiked mannagrass	OBL
*	*Holcus lanatus*	Poaceae	common velvet-grass	FAC
*	*Holcus mollis*	Poaceae	creeping velvet-grass	
	Hordeum brachyantherum	Poaceae	meadow barley	FACW

	Genus and Species	Family	Common Name	Wetland Status
	Grasses (continued)			
	Hordeum caespitosum [*H. jubatum*]	Poaceae	foxtail barley	FAC
*	*Hordeum murinum*	Poaceae	wall barley	
*	*Hordeum vulgare*	Poaceae	common barley	
	Leersia oryzoides	Poaceae	rice cutgrass	OBL
*	*Lolium multiflorum*	Poaceae	Italian ryegrass	
*	*Lolium perenne*	Poaceae	English ryegrass	FACU
	Melica subulata var. *s.*	Poaceae	Alaska oniongrass	
	Panicum capillare	Poaceae	common witchgrass	FAC
*	*Panicum miliaceum*	Poaceae	broom corn millet	
*	*Phalaris arundinacea*	Poaceae	reed canary grass	FACW
*	*Phleum pratense* var. *p.*	Poaceae	common Timothy	FAC-
*	*Phragmites australis*	Poaceae	Common reed	FACW+
*	*Poa annua*	Poaceae	annual bluegrass	FAC-
	Poa compressa	Poaceae	Canada bluegrass	FACU
*	*Poa pratensis* ssp. *p.*	Poaceae	Kentucky bluegrass	FAC
*	*Poa trivialis*	Poaceae	rough bluegrass	FACW
	Puccinellia nuttalliana	Poaceae	Nuttall's alkali grass	FACW+
*	*Setaria glauca*. [*S. lutescens*]	Poaceae	yellow bristlegrass	
	Torreyochloa pallida var. *pauciflora* [*Puccinella pauciflora*]	Poaceae	weak mannagrass	OBL
	Trisetum cernuum	Poaceae	nodding trisetum	
*	*Vulpia bromoides* [*Festuca b*.]	Poaceae	barren fescue	
*	*Vulpia myuros* var. *m.* [*Festuca m.*]	Poaceae	rat-tail vulpia	
	Sedges and Rushes			
	Carex athrostachya	Cyperaceae	slenderbeaked sedge	FACW
	Carex canescens	Cyperaceae	grey sedge	FACW+
	Carex deweyana. var. *d.*	Cyperaceae	Dewey's sedge	FACU
	Carex hendersonii	Cyperaceae	Henderson's sedge	FAC
	Carex lyngbyei var. *robusta*	Cyperaceae	Lyngbye's sedge	OBL
	Carex obnupta	Cyperaceae	slough sedge	OBL
	Carex stipata	Cyperaceae	sawbeak sedge	OBL
	Eleocharis obtusa var. *ovata* [*E. ovata*]	Cyperaceae	ovate spike-rush	OBL
	Eleocharis palustris	Cyperaceae	creeping spike-rush	OBL
	Eleocharis parvula var. *p*.	Cyperaceae	small spike-rush	OBL
	Juncus articulatus	Juncaginaceae	jointed rush	OBL
	Juncus balticus var. *b.*	Juncaginaceae	baltic rush	FACW+
	Juncus bolanderi	Juncaginaceae	Bolander's rush	OBL
	Juncus bufonius	Juncaginaceae	toad rush	FACW
	Juncus effusus var. *gracilis*	Juncaginaceae	soft rush	FACW
	Juncus gerardii	Juncaginaceae	mud rush	FACW+
	Juncus tenuis var. *t.*	Juncaginaceae	slender rush	OBL
	Luzula multiflora var. *m*. [*L. campestris*]	Juncaginaceae	many-flowered wood-rush	FACU
	Luzula parviflora var. *fastigiata*	Juncaginaceae	small-flowered wood-rush	FAC-
	Scirpus americanus	Cyperaceae	three-square bulrush	OBL
	Scirpus microcarpus	Cyperaceae	small-flowered bulrush	OBL
	Scirpus tabernaemontanii [*S. validus*]	Cyperaceae	soft-stemmed bulrush	OBL

	Genus and Species	Family	Common Name	Wetland Status
	Forbs			
	Achillea millefolium var. *lanulosa*	Asteraceae	common yarrow	FACU
	Achlys californica [split from *A. triphylla*]	Berberidaceae	vanillaleaf	
	Actaea rubra ssp. *arguta*	Ranunculaceae	western red baneberry	
*	*Adenocaulon bicolor*	Asteraceae	trail-plant	
*	*Ajuga reptans*	Lamiaceae	common bugle	
	Alisma plantago-aquatica var. *americanum*	Alismataceae	American waterplantain	OBL
	Allophyllum divaricatum	Polemoniaceae	pink false gilia	
	Amaranthus powellii	Amaranthaceae	Powell's amaranth	
	Ambrosia chamissonis	Asteraceae	heath burweed	
	Amsinckia menziesii	Boraginaceae	small-flowered fiddleneck	
	Anaphalis margaritacea	Asteraceae	pearly everlasting	
	Angelica genuflexa	Apiaceae	kneeling angelica	FACW
	Angelica lucida	Apiaceae	seacoast angelica	FAC
*	*Anthemis cotula*	Asteraceae	mayweed	FACU
*	*Anthriscus caucalis* var. *c*. [*A. scandicina*]	Apiaceae	burr chervil	
*	*Arabidopsis thaliana*	Brassicaeae	thale cress	
*	*Arctium minus*	Asteraceae	common burdock	
	Artemisia suksdorfii	Asteraceae	coastal mugwort	
	Asarum caudatum	Aristolochiaceae	wild ginger	FACU
	Aster subspicatus	Asteraceae	Douglas aster	FAC+
	Atriplex patula	Chenopodiaceae	spearscale	FACW
	Barbarea orthoceras	Brassicaeae	American wintercress	FACW+
	Bidens cernua	Asteraceae	nodding beggar-ticks	FACW+
	Bidens frondosa	Asteraceae	leafy beggar-ticks	FACW+
*	*Brassica rapa* [B. *campestris*]	Brassicaeae	field mustard rape	
	Callitriche heterophylla	Callitrichaceae	diverse-leaved water-starwort	OBL
	Camassia quamash ssp. *breviflora*	Liliaceae	common camas	FACW
	Campanula scouleri	Campanulaceae	Scouler's harebell	
*	*Capsella bursa- pastoris* var. *b.- p*.	Brassicaeae	shepherd's purse	FAC-
	Cardamine angulata	Brassicaeae	angled bitter-cress	FACW
	Cardamine breweri var. *orbicularis*	Brassicaeae	Brewer's bitter-cress	FACW+
	Cardamine nuttallii var. *n*. [*C. pulcherrima* var. *tenella*]	Brassicaeae	Nuttall's bitter-cress	
	Cardamine oligosperma var. *o*.	Brassicaeae	little western bitter-cress	FACW
*	*Centaurium erythraea* Raf. [*C. umbellatum*]	Gentianaceae	European centaury	FAC-
*	*Cerastium fontanum* var. *triviale* [*C. viscosum*]	Caryophyllaceae	sticky chickweed	
*	*Cerastium glomeratum* [*C. vulgatum*]	Caryophyllaceae	mouse-ear chickweed	
	Chamomilla suaveolens [*Matricaria matricarioides*]	Asteraceae	pineapple weed	FACU
*	*Chenopodium album* var. *a.*	Chenopodiaceae	lamb’s quarters	FAC
	Chenopodium hybridum	Chenopodiaceae	sowbane	
	Circaea alpina ssp. *pacifica*	Onagraceae	enchanter's nightshade	FACW
*	*Cirsium arvense* var. *horridum*	Asteraceae	Canada thistle	FACU+

	Genus and Species	Family	Common Name	Wetland Status
	Forbs (continued)			
*	*Cirsium vulgare*	Asteraceae	common thistle	FACU
	Claytonia perfoliata ssp. *p.*[*Montia p.*]	Portulacaceae	miner's-lettuce	FAC
	Claytonia sibirica var. *s.* [*Montia s.*]	Portulacaceae	Siberian miner's-lettuce	FACW
	Collomia grandilora	Polemoniaceae	large-flowered collomia	
	Collomia heterophylla	Polemoniaceae	varied-leaf collomia	
*	*Conium maculatum*	Apiaceae	poison-hemlock	FACW-
*	*Conyza canadensis* [*Erigeron c.*]	Asteraceae	horseweed	FACU
	Corallorhiza maculata ssp. *m.*	Orchidaceae	spotted coral-root	FAC-
	Corydalis scouleri	Papaveraceae	Scouler's corydalis	FAC+
*	*Cotula coronopifolia*	Asteraceae	brass-buttons	FACW+
*	*Crepis capillaris*	Asteraceae	smooth hawksbeard	
	Cuscuta.salina var. *major*	Cuscutaceae	salt-marsh dodder	FACW
*	*Daucus carota*	Apiaceae	Queen-Anne's-lace	
	Dicentra formosa ssp. *f.*	Papaveraceae	pacific bleeding heart	
*	*Digitalis purpurea* var. *p.*	Scrophulariaceae	foxglove	
*	*Dipsacus fullonum* [*D. sylvestris*]	Dipsacaceae	teasel	NI
	Disporum hookeri var. *oreganum*	Liliaceae	Hooker fairy-bell	
	Elodea canadensis	Hydrocharitaceae	waterweed	OBL
	Epilobium angustifolium ssp. *a*.	Onagraceae	fireweed	FACU+
	Epilobium brachycarpum [*E. paniculatum*]	Onagraceae	autumn willow-herb	
	Epilobium ciliatum ssp. *watsonii* [E. *watsonii*]	Onagraceae	hairy willow-herb	FACW-
*	*Erodium cicutarium*	Geraniaceae	stork's-bill geranium	
	Erophila verna [*Draba v.*]	Brassicaeae	vernal whitlow-grass	
	Erythronium oregonum ssp. *o*.	Liliaceae	Oregon fawn lily	
*	*Eschscholtzia californica* ssp. *c.*	Papaveraceae	California poppy	
	Fragaria vesca ssp. *bracteata*	Rosaceae	woods strawberry	
*	*Fragaria virginiana* ssp. *platypetula*	Rosaceae	blueleaf strawberry	
*	*Galanthus nivalis*	Liliaceae	snowdrop	
	Galium aparine	Rubiaceae	cleavers	FACU
	Galium trifidum var. *pacificum*	Rubiaceae	small bedstraw	FACW+
	Galium triflorum	Rubiaceae	sweetscented bedstraw	FACU
*	*Geranium dissectum*	Geraniaceae	cut-leaved geranium	
*	*Geranium molle*	Geraniaceae	dovefoot geranium	
*	*Geranium robertianum*	Geraniaceae	Robert geranium	
	Geum macrophyllum var. *m.*	Rosaceae	Oregon avens	FACW+
	Glaux maritima ssp.*obtusifolia*	Primulaceae	saltwort	FACW+
*	*Glecoma hederacea* var. *micrantha*	Lamiaceae	ground ivy	FACU+
	Gnaphalium canescens ssp. *microcephalum*[*G. m.*]	Asteraceae	slender cudweed	
*	*Gnaphalium uliginosum*	Asteraceae	marsh cudweed	FAC+
	Goodyera oblongifolia	Orchidaceae	rattlesnake-plantain	FACU-
	Grindelia integrifolia var. *macrophylla*	Asteraceae	Puget Sound gumweed	FACW
	Hackelia deflexa	Boraginaceae	nodding stickseed	
	Heracleum lanatum	Apiaceae	cow-parsnip	FAC

	Genus and Species	Family	Common Name	Wetland Status
	Forbs (continued)			
	Hieracium albiflorum	Asteraceae	white-flowered hieracium	
	Hippuris vulgaris	Hippurodaceae	common mare's-tail	OBL
	Hydrocotyle ranunculoides	Apiaceae	marsh-pennywort	OBL
	Hydrophyllum tenuipes	Hydrophyllaceae	pacific waterleaf	FAC
*	*Hypericum perforatum*	Clusiaceae	common St. John's-wort	
*	*Hypochaeris radicata*	Asteraceae	hairy [spotted] cat's-ear	
	Impatiens noli-tangere	Balsaminaceae	touch-me-not	FACW
	Jaumea carnosa	Asteraceae	fleshy Jaumea	OBL
*	*Lactuca serriola*	Asteraceae	prickly lettuce	FAC-
*	*Lamium hybridum*	Lamiaceae	hybrid dead-nettle	
*	*Lamium purpureum*	Lamiaceae	red dead-nettle	
*	*Lapsana communis*	Asteraceae	nipplewort	
*	*Lathyrus latifolius*	Fabaceae	everlasting pea	
	Lathyrus polyphyllus	Fabaceae	leafy peavine	
	Lemna minor	Lemnaceae	small duckweed	OBL
	Lepidium virginicum var. *pubescens*	Brassicaeae	Virginia pepperweed	FACU
*	*Leucanthemum vulgare* [*Chrysanthemum l.*]	Asteraceae	oxeye-daisy	
	Lilium columbianum	Liliaceae	columbia lily	FAC
	Lilaeopsis occidentalis	Apiaceae	western lilaeopsis	OBL
	Listera cordata	Orchidaceae	evergreen orchid	FACU
	Lotus micranthus	Fabaceae	small-flowered deervetch	
*	*Lotus uliginosus*	Fabaceae	big trefoil	
*	*Ludwigia palustris* var. *americana*	Onagraceae	water purslane	OBL
	Lupinus bicolor	Fabaceae	two-color lupine	
	Lupinus rivularis	Fabaceae	stream lupine	FAC
*	*Lychnis coronaria*	Caryophyllaceae	rose campion	
	Lycopus uniflorus	Lamiaceae	northern bugleweed	OBL
	Lysichiton americanum	Araceae	yellow skunk-cabbage	OBL
	Madia madioides	Asteraceae	woodland tarweed	
	Madia sativa var. *s.*	Asteraceae	coast tarweed	
	Maianthemum dilatatum	Liliaceae	false lily-of-the-valley	FACU-
	Maianthemum racemosa ssp. *amplexicaule*	Liliaceae	western Solomon-plume	FAC-
	Maianthemum stellataum	Liliaceae	starry Solomon-plume	FAC
*	*Malva neglecta*	Malvaceae	dwarf mallow	
*	*Medicago lupulina*	Fabaceae	black medic	
*	*Melilotus alba*	Fabaceae	white sweet-clover	FACU
*	*Melilotus officinalis*	Fabaceae	common yellow sweet-clover	FACU
	Mentha arvensis var. *villosa*	Lamiaceae	field mint	FAC
*	*Mentha piperita*	Lamiaceae	peppermint	FACW+
	Mertensia paniculata var. *borealis*	Boraginaceae	tall mertensia	FAC
	Mimulus guttatus	Scrophulariaceae	yellow monkey-flower	OBL
	Mimulus moschatus var. *sessifolius*	Scrophulariaceae	musk-flower	FACW+
	Mitella caulescens	Saxifragaceae	leafy mitrewort	
	Moehringia macrophylla [*Arenaria m.*]	Caryophyllaceae	big-leaved sandwort	
	Monotropa uniflora	Ericaceae	Indian pipe	FACU

	Genus and Species	Family	Common Name	Wetland Status
	Forbs (continued)			
	Montia dichotoma	Portulacaceae	dwarf montia	FAC
*	*Muscari botryoides*	Liliaceae	grape hyacinth	
*	*Mycelis muralis* [*Lactuca m.*]	Asteraceae	wall lettuce	
*	*Myosotis discolor*	Boraginaceae	yellow & blue forget-me-not	FACW
	Myosotis laxa	Boraginaceae	small-flowered forget-me-not	OBL
*	*Myosotis scorpioides*	Boraginaceae	common forget-me-not	FACW
	Myosotis verna	Boraginaceae	spring forget-me-not	FAC-
	Myriophyllum hippuroides	Haloragaceae	western water-milfoil	OBL
*	*Narcissus pseudonarcissus*	Amaryllidaceae	daffodil	
	Navarretia squarrosa	Polemoniaceae	skunkweed	
	Nemophila parviflora var. p.	Hydrophyllaceae	small-flowered nemophila	
	Oenanthe sarmentosa	Apiaceae	pacific water-parsley	OBL
	Osmorhiza chilensis	Apiaceae	mountain sweet-cicely	
*	*Parentucellia viscosa*	Scrophulariaceae	yellow parentucellia	FAC-
	Petasites frigidus var. *palmatus*[*P. p.*]	Asteraceae	sweet coltsfoot	FACU
	Phacelia nemoralis ssp. *oregonensis*	Hydrophyllaceae	woodland phacelia	
	Piperia unalascensis [*Habenaria u.*]	Orchidaceae	Unalaska rein-orchid	FAC
*	*Plantago lanceolata*	Plantaginaceae	English plantain	FACU+
*	*Plantago major* var. *m.*	Plantaginaceae	common plantain	FAC+
	Plantago maritima var. *juncoides*	Plantaginaceae	maritime plantain	FACW+
*	*Polygonum aviculare* var. *a.*	Polygonaceae	common knotweed	FACW-
*	*Polygonum convolvulus* var. *c.*	Polygonaceae	climbing knotweed	FACU-
*	*Polygonum cuspidatum*	Polygonaceae	Japanese knotweed	
	Polygonum hydropiperoides var. *h.*	Polygonaceae	water-pepper	OBL
*	*Polygonum lapathifolium* var. *l.*	Polygonaceae	dockleaf smartweed	FACW+
*	*Polygonum persicaria*	Polygonaceae	spotted ladysthumb	FACW
*	*Potamogeton crispus*	Potamogetonaceae	curled pondweed	OBL
	Potamogeton epihydrus	Potamogetonaceae	ribbon-leaved pondweed	OBL
	Potamogeton foliosus	Potamogetonaceae	close-leaved pondweed	OBL
	Potamogeton pectinatus	Potamogetonaceae	sago pondweed	OBL
	Potentilla anserina ssp. *pacifica* [*P. p.*]	Rosaceae	pacific silverweed	OBL
	Potentilla gracilis var. *g.*	Rosaceae	graceful cinquefoil	FAC
	Prunella vulgaris var. *elongata*	Lamiaceae	self-heal	FACU+
	Pyrola asarifolia	Ericaceae	common pink wintergreen	FACU
*	*Ranunculus acris*	Ranunculaceae	tall buttercup	FACW-
	Ranunculus occidentalis var. *o.*	Ranunculaceae	western buttercup	FACW
*	*Ranunculus repens* var. *r.*	Ranunculaceae	creeping buttercup	FACW
	Ranunculus sceleratus	Ranunculaceae	celery-leaved buttercup	OBL
	Ranunculus uncinatus var. *u.*	Ranunculaceae	small-flowered buttercup	FAC-
*	*Raphanus sativas*	Brassicaeae	wild radish	
	Rorippa curvisiliqua var. *a.*	Brassicaeae	western yellow cress	FACW+
	Rorippa palustris [*R. islandica*]	Brassicaeae	marsh yellow cress	OBL
*	*Rumex acetosella*	Polygonaceae	sheep sorrel	FACU+
*	*Rumex crispus*	Polygonaceae	curly dock	FACW
	Rumex maritimus var. *feuginus*	Polygonaceae	seaside dock	FACW+

	Genus and Species	Family	Common Name	Wetland Status
	Forbs (continued)			
*	*Rumex obtusifolius* ssp. *agrestis*	Polygonaceae	bitter dock	FAC
	Rumex occidentalis	Polygonaceae	western dock	FACW+
	Rupertia physodes [*Psoralea p.*]	Fabaceae	Rupert's scurf-pea	
	Ruppia maritima	Potamogetonaceae	ditch-grass	OBL
	Sagittaria latifolia	Alismataceae	broadleaf arrowhead	OBL
	Salicornia virginica	Chenopodiaceae	American glasswort	OBL
	Sanicula crassicaulis var. c.	Apiaceae	pacific sanicle	
	Satureja douglasii	Lamiaceae	yerba buena	
*	*Scleranthus annuus*	Caryophyllaceae	annual knawel	
	Scutellaria lateriflora	Lamiaceae	blue skullcap	FACW+
*	*Senecio jacobaea*	Asteraceae	tansy ragwort	
*	*Senecio sylvaticus*	Asteraceae	wood groundsel	
*	*Senecio vulgaris*	Asteraceae	common groundsel	FACU
*	*Silene latifolia* ssp. *alba* [*Lychnis a*.]	Caryophyllaceae	white campion	
*	*Sisymbrium altissimum*	Brassicaceae	tall tumble-mustard	
*	*Sisymbrium officinale*	Brassicaeae	hedge mustard	
*	*Solanum sarrachoides*	Solanaceae	hairy nightshade	
	Solidago canadensis var. *salebrosa*	Asteraceae	Canada goldenrod	FACU
*	*Sonchus arvensis*	Asteraceae	perennial sow-thistle	
*	*Sonchus asper*	Asteraceae	prickly sow-thistle	FAC-
	Sparganium emersum [*S. angustifolium*]	Typhaceae	narrow-leaved bur-reed	OBL
*	*Spergularia arvensis*	Caryophyllaceae	spurry	
	Spergularia canadensis	Caryophyllaceae	Canada sand-spurry	FACW
	Spergularia macrotheca	Caryophyllaceae	beach sand-spurry	FAC
*	*Spergularia rubra*	Caryophyllaceae	red sand-spurry	FAC-
	Spiranthes romanzoffiana var. r.	Orchidaceae	hooded ladies'-tresses	OBL
	Spirodela polyrrhiza	Lemnaceae	great duckweed	OBL
	Stachys cooleyae	Lamiaceae	Cooley's hedge-nettle	FACW
*	*Stellaria graminea*	Caryophyllaceae	lesser starwort	FAC-
	Stellaria humifusa	Caryophyllaceae	spreading starwort	OBL
	Stellaria longipes	Caryophyllaceae	longstalk starwort	FACW-
*	*Stellaria media*	Caryophyllaceae	common chickweed	
	Streptopus amplexifolius	Liliaceae	clasping-leaved twisted-stalk	FAC-
	Suaeda maritima [*S. calceoliformis*]	Chenopodiaceae	herbaceous seablite	FACW+
	Synthyris reniformis var. *r.*	Scrophulariaceae	spring queen	
*	*Tanacetum vulgare*	Asteraceae	common tansy	
*	*Taraxacum officinale*	Asteraceae	common dandelion	FACU
*	*Teesdalia nudicaulis*	Brassicaeae	shepherd's cress	
	Tellima grandiflora	Saxifragaceae	fringecup	
	Tiarella trifoliata var. *t*.	Saxifragaceae	trefoil foamflower	FAC
	Tolmiea menziesii	Saxifragaceae	youth-on-age	FAC
*	*Tragopogon dubius*	Asteraceae	yellow salsify	
	Trientalis borealis ssp. *latifolia* [*T l*.]	Primulaceae	western starflower	FAC
*	*Trifolium arvense*	Fabaceae	hare's-foot	
*	*Trifolium dubium*.	Fabaceae	least hop clover	

	Genus and Species	Family	Common Name	Wetland Status
Forbs (continued)				
*	*Trifolium hybridum*	Fabaceae	alsike clover	FACU+
*	*Trifolium pratense*	Fabaceae	red clover	FACU
*	*Trifolium repens*	Fabaceae	white clover	FACU+
*	*Trifolium subterraneum*	Fabaceae	subterranean clover	
	Trifolium wormskjoldii	Fabaceae	springbank clover	FACW+
	Triglochin maritimum	Juncaginaceae	seaside arrow-grass	OBL
	Trillium ovatum ssp. *o.*	Liliaceae	western trillium	NI
	Triphysaria pusilla [*Orthocarpus pusillus*]	Scrophulariaceae	dwarf owl-clover	
	Typha latifolia	Typhaceae	common cat-tail	OBL
	Urtica dioica ssp. *gracilis* var. *lyallii*	Urticaceae	stinging nettle	FAC+
*	*Verbascum blattaria*	Scrophulariaceae	moth mullein	
*	*Verbascum thapsus*	Scrophulariaceae	common mullein	
	Veronica beccabunga ssp. *americana* [*V. a*.]	Scrophulariaceae	American brooklime	OBL
*	*Veronica arvensis*	Scrophulariaceae	wall speedwell	NI
*	*Veronica serpyllifolia* var. s.	Scrophulariaceae	thyme-leaved speedwell	FAC
	Vicia americana ssp. *a.*.	Fabaceae	American vetch	FAC+
*	*Vicia cracca*	Fabaceae	bird vetch	
*	*Vicia hirsuta*	Fabaceae	tiny vetch	
	Vicia nigricans ssp. *gigantea* [*V. g*.]	Fabaceae	giant vetch	
*	*Vicia sativa*	Fabaceae	common vetch	
*	*Vicia villosa*	Fabaceae	hairy vetch	
*	*Vinca major* cv.	Apocynaceae	periwinkle	
	Viola sempervirens	Violaceae	evergreen violet	
	Wolffia borealis [*W. punctata*]	Lemnaceae	dotted water-meal	OBL
	Zostera marina	Zosteraceae	eel-grass	OBL
Ferns & Allies				
	Adiantum aleuticum [*A. pedatum*]	Pteridaceae	maidenhair fern	FAC
	Athyrium filix-femina var. *cyclosorum*	Dryopteridaceae	northern lady fern	FAC
	Azolla mexicana	Azollaceae	Mexican mosquito fern	OBL
	Blechnum spicant	Blechnaceae	deer fern	FAC+
	Dryopteris expansa [*D. austriaca*]	Dryopteridaceae	spreading wood fern	
	Equisetum arvense	Equisetaceae	field horsetail	FAC
	Equisetum hyemale var. *affine*	Equisetaceae	scouring-rush	FACW
	Equisetum telmateia var. *braunii*	Equisetaceae	giant horsetail	FACW
	Polypodium glycyrrhiza	Polypodiaceae	licorice fern	
	Polystichum munitum	Dryopteridaceae	sword fern	
	Pteridium aquilinum var. *pubescens*	Dennstaedtiaceae	western bracken	FACU
Lichens				
	Botrydina vulgaris [*B. botryoides*]. Lichenized with *Omphalina ericetorum* (lichen agaric), a Basidomycete fungus.			
	Cladonia coniocraea	Cladoniaceae	cup lichen	
	Evernia prunastri	Parmeliaceae	antlered-perfume	

Genus and Species	Family	Common Name	Wetland Status
Lichens (continued)			
Hypogymnia physodes	Parmeliaceae	hooded-bone	
Letharia vulpina	Parmeliaceae	wolf lichen	
Melanelia elegantula	Parmeliaceae	elegant parmelia	
Melanelia exasperatula	Parmeliaceae	roughened parmelia	
Parmelia sulcata	Parmeliaceae	waxpaper-lichen	
Peltigera canina	Peltigeraceae	dog-lichen	
Peltigera polydactylon	Peltigeraceae	frog-pelt	
Physcia sp.	Physciaceae	lichen	
Platismatia glauca	Parmeliaceae	ragged lichen	
Usnea subfloridana [*U. comosa*]	Parmeliaceae	beard lichen	
Xanthoria candelaria	Teloschistaceae	orange wall lichen	
Mosses & Liverworts			
Atrichum sp.	Polytrichaceae	atrichum moss	
Aulacomnium androgynum	Aulacommiaceae	lover's-moss	
Bryum capillare	Bryaceae	capillary moss	
Climacium dendroides	Climaciaceae	tree moss	
Conocephalum conicum	Conocephalaceae	snake-liverwort	
Dichodontium pellucidum	Dicranaceae	wet-rock moss	
Dicranoweisia cirrata	Dicranaceae	curly-thatch moss	
Dicranum tauricum	Dicranaceae	tauricum moss	
Dicranum sp.	Dicranaceae	bryoid fissidens moss	
Drepanocladus uncinatus var. *symmetricus*	Amblystegiaceae	hook-leaved moss	
Fissidens adianthoides	Fissidentaceae	adiantum moss	
Fissidens bryoides	Fissidentaceae	bryoides fissidens moss	
Fontinalis antipyretica var. *a.*	Fontinalaceae	common water moss	
Funaria hygrometrica	Funariaceae	cord-moss	
Grimmia pulvinata	Grimmiaceae	cushion moss	
Homalothecium fulgescens	Brachytheciaceae	yellow moss	
Hylocomium splendens	Hylocomiaceae	step-moss	
Hypnum circinale	Hypnaceae	coiled-leafmoss	
Hypnum subimponens	Hypnaceae	curly hypnum	
Isothecium stoloniferum [*I. spiculiferum*]	Brachytheciaceae	cat-tail moss	
Kindbergia oregana [*Eurhynchium oreganum*]	Brachytheciaceae	Oregon beaked moss	
Leucolepis acanthoneuron [*L. menziesii*]	Mniaceae	Menzies' tree moss	
Marchantia polymorpha	Marchantiaceae	lung-liverwort	
Neckera douglasii	Neckeraceae	Douglas' neckera	
Orthotrichum consimile	Orthotrichaceae	bristle moss	
Orthotrichum lyellii	Orthotrichaceae	Lyell's bristle moss	
Orthotrichum sp.	Orthotrichaceae	little bristle moss	
Plagiomnium insigne [*Mnium i*.]	Mniaceae	badge moss	
Plagiomnium venustum	Mniaceae	magnificent moss	
Plagiothecium undulatum	Plagiotheciaceae	wavy-leaved cotton moss	
Polytrichum juniperinum	Polytrichaceae	juniper moss	

Genus and Species	Family	Common Name	Wetland Status
Mosses & Liverworts			
Racomitrium canescens	Grimmiaceae	roadside rock moss	
Rhizomnium glabrescens [*Mnium g.*]	Mniaceae	fan-moss	
Rhytidiadelphus loreus	Hylocomiaceae	lanky-moss	
Rhytidiadelphus triquetrus	Hylocomiaceae	goose-necked moss	
Riccia fluitans	Ricciaceae	floating liverwort	
Scleropodium cespitans var *c*.	Brachytheciaceae	flat-moss	
Tortula princeps	Pottiaceae	princely moss	

Appendix E.2
Wildlife List

E.2 WILDLIFE

This list includes wildlife species that have been observed at least once on Nisqually NWR. The birds' common and scientific names and taxonomic order are categorized into family and subfamily groups in accordance with the 7th edition (1998) of the A. O. U. Checklist of North American Birds. * Indicates bird species known to nest on Nisqually delta.

Common Name	Scientific Name	Common Name	Scientific Name
Birds		White-winged Scoter	*Melanitta fusca*
Red-throated Loon	*Gavia stellata*	Black Scoter	*Melanitta nigra*
Pacific Loon	*Gavia immer*	Long-tailed Duck	*Clangula hyemalis*
Common Loon	*Gavia immer*	Bufflehead	*Bucephala albeola*
Yellow-billed Loon	*Gavia adamsii*	Common Goldeneye	*Bucephala clangula*
Pied-billed Grebe*	*Podilymbus podiceps*	Hooded Merganser*	*Lophodytes cucullatus*
Horned Grebe	*Podiceps auritus*	Common Merganser	*Mergus merganser*
Red-necked Grebe	*Podiceps grisegena*	Red-breasted Merganser	*Mergus serrator*
Eared Grebe	*Podiceps nigricollis*	Ruddy Duck	*Oxyura jamaicensis*
Western Grebe	*Aechmophorus occidentalis*	Osprey	*Pandion haliaetus*
Laysan Albatross	*Phoebastria immutabilis*	White-tailed Kite	*Elanus leucurus*
Short-tailed Shearwater	*Puffinus tenuirostris*	Bald Eagle*	*Haliaeetus leucocephalus*
Leach's Storm-petrel	*Oceanodroma leucorhoa*	Northern Harrier*	*Circus cyaneus*
American White Pelican	*Pelecanus erythrorhynchos*	Sharp-shinned Hawk	*Accipiter striatus*
Brown Pelican	*Pelecanus occidentalis*	Cooper's Hawk	*Accipiter cooperii*
Brandt's Cormorant	*Phalacrocorax penicillatus*	Northern Goshawk	*Accipiter gentilis*
Double-crested Cormorant	*Phalacrocorax auritus*	Red-shouldered Hawk	*Buteo lineatus*
Pelagic Cormorant	*Phalacrocorax pelagicus*	Red-tailed Hawk*	*Buteo jamaicensis*
American Bittern*	*Botaurus lentiginosus*	Rough-legged Hawk	*Buteo lagopus*
Great Blue Heron*	*Ardea herodias*	American Kestrel*	*Falco sparverius*
Great Egret	*Ardea alba*	Merlin	*Falco columbarius*
Green Heron*	*Butorides virescens*	Gyrfalcon	*Falco rusticolus*
Turkey Vulture	*Cathartes aura*	Peregrine Falcon	*Falco peregrinus*
Greater White-fronted Goose	*Anser albifrons*	Prairie Falcon	*Falco mexicanus*
Snow Goose	*Chen caerulescens*	Ring-necked Pheasant*	*Phasianus colchicus*
Canada Goose*	*Branta canadensis*	Ruffed Grouse	*Bonasa umbellus*
Brant	*Branta bernicla*	Lesser Scaup	*Aythya affinis*
Trumpeter Swan	*Cygnus buccinator*	Mountain Quail	*Oreortyx pictus*
Tundra Swan	*Cygnus columbianus*	California Quail*	*Callipepla californica*
Wood Duck*	*Aix sponsa*	Northern Bobwhite	*Colinus virginianus*
Gadwall*	*Anas strepera*	Virginia Rail*	*Rallus limicola*
Eurasian Wigeon	*Anas penelope*	Sora*	*Porzana carolina*
American Wigeon	*Anas americana*	American Coot*	*Fulica americana*
Mallard*	*Anas platyrhynchos*	Sandhill Crane	*Grus canadensis*
Blue-winged Teal*	*Anas discors*	Barrow's Goldeneye	*Bucephala islandica*
Cinnamon Teal*	*Anas cyanoptera*	Black-bellied Plover	*Pluvialis squatarola*
Northern Shoveler*	*Anas clypeata*	American Golden Plover	*Pluvialis dominica*
Northern Pintail*	*Anas acute*	Semipalmated Plover	*Charadrius semipalmatus*
Green-winged Teal*	*Anas crecca*	Killdeer*	*Charadrius vociferus*
Canvasback	*Aythya valisineria*	Black-necked Stilt	*Himantopus mexicanus*
Ring-necked Duck*	*Aythya collaris*	American Avocet	*Recurvirostra americana*
Greater Scaup	*Aythya marila*	Greater Yellowlegs	*Tringa melanoleuca*
Surf Scoter	*Melanitta perspicillata*	Lesser Yellowlegs	*Tringa flavipes*

Common Name	Scientific Name	Common Name	Scientific Name
Birds (continued)		Vaux's Swift	*Chaetura vauxi*
Willet	*Catoptrophorus semipalmatus*	Rufous Hummingbird*	*Selasphoras rufus*
		Belted Kingfisher	*Ceryle alcyon*
Spotted Sandpiper*	*Actitis macularia*	Lewis' Woodpecker	*Melanerpes lewis*
Whimbrel	*Numenius phaeopus*	Red-breasted Sapsucker*	*Sphyrapicus ruber*
Red Knot	*Calidris canutus*	Downy Woodpecker*	*Picoides pubescens*
Sanderling	*Calidris alba*	Hairy Woodpecker*	*Picoides villosus*
Western Sandpiper	*Calidris mauri*	Northern Flicker*	*Colaptes auratus*
Least Sandpiper	*Calidris minutilla*	Pileated Woodpecker*	*Dryocopus pileatus*
Baird's Sandpiper	*Calidris bairdii*	Olive-sided Flycatcher	*Contopus cooperi*
Pectoral Sandpiper	*Calidris melanotos*	Western Wood-pewee*	*Contopus sordidulus*
Sharp-tailed Sandpiper	*Calidris acuminata*	Willow Flycatcher*	*Empidonax traillii*
Dunlin	*Calidris alpina*	Pacific-slope Flycatcher*	*Empidonax difficilis*
Short-billed Dowitcher	*Limnodromus griseus*	Western Kingbird	*Tyrannus verticalis*
Long-billed Dowitcher	*Limnodromus scolopaceus*	Northern Shrike	*Lanius excubitor*
Common Snipe*	*Gallinago gallinago*	Cassin's Vireo*	*Vireo cassinii*
Wilson's Phalarope*	*Phalaropus tricolor*	Hutton's Vireo*	*Vireo huttoni*
Red-necked Phalarope	*Phalaropus lobatus*	Warbling Vireo*	*Vireo gilvus*
Parasitic Jaeger	*Stercorarius parasiticus*	Red-eyed Vireo*	*Vireo olivaceus*
Franklin's Gull	*Larus pipixcan*	Steller's Jay	*Cyanocitta stelleri*
Black-headed Gull	*Larus ridibundus*	Western Scrub-jay	*Aphelocoma californica*
Bonaparte's Gull	*Larus philadelphia*	Black-billed Magpie	*Pica hudsonia*
Heermann's Gull	*Larus heermanni*	American Crow*	*Corvus brachyrhynchos*
Mew Gull	*Larus canus*	Horned Lark	*Eremophila alpestris*
Ring-billed Gull	*Larus delawarensis*	Tree Swallow*	*Tachycineta bicolor*
California Gull	*Larus californicus*	Violet-green Swallow*	*Tachycineta thalassina*
Herring Gull	*Larus argentatus*	Northern Rough-winged Swallow*	*Stelgidopteryx serripennis*
Thayer's Gull	*Larus thayeri*		
Slaty-backed Gull	*Larus schistisagus*	Bank Swallow	*Riparia riparia*
Western Gull	*Larus occidentalis*	Cliff Swallow*	*Petrochelidon pyrrhonota*
Glaucous-winged Gull	*Larus glaucescens*	Barn Swallow*	*Hirundo rustica*
Glaucous-winged/Western Hybrid	*Larus* sp.	Black-capped Chickadee*	*Parus atricapillus*
		Chestnut-backed Chickadee*	*Parus rufescens*
Glaucous Gull	*Larus hyperboreus*		
Caspian Tern	*Sterna caspia*	Bushtit*	*Psaltriparus minimus*
Common Tern	*Sterna hirundo*	Red-breasted Nuthatch*	*Sitta canadensis*
Common Murre	*Uria aalge*	Brown Creeper*	*Certhia americana*
Pigeon Guillemot	*Cepphus columba*	Bewick's Wren*	*Thryomanes bewickii*
Marbled Murrelet	*Brachyramphus marmoratus*	House Wren	*Troglodytes aedon*
Ancient Murrelet	*Synthliboramphus antiquus*	Winter Wren*	*Troglodytes troglodytes*
Rhinoceros Auklet	*Cerorhinca monocerata*	Marsh Wren*	*Cistothorus palustris*
Rock Dove	*Columba livia*	Golden-crowned Kinglet*	*Regulus satrapa*
Band-tailed Pigeon*	*Columba fasciata*	Ruby-crowned Kinglet	*Regulus calendula*
Mourning Dove	*Zenaida macroura*	Western Bluebird	*Sialia mexicana*
Barn Owl*	*Tyto alba*	Townsend's Solitaire	*Myadestes townsendi*
Great Horned Owl*	*Bubo virginianus*	Swainson's Thrush*	*Catharus ustulatus*
Snowy Owl	*Nyctea scandiaca*	Hermit Thrush	*Catharus guttatus*
Northern Pygmy-Owl	*Glaucidium gnoma*	American Robin*	*Turdus migratorius*
Long-eared Owl	*Asio otus*	Varied Thrush	*Ixoreus naevius*
Short-eared Owl*	*Asio flammeus*	Northern Mockingbird	*Mimus polyglottos*
Common Nighthawk	*Chordeiles minor*	European Starling*	*Sturnus vulgaris*
Black Swift	*Cypseloides niger*	American Pipit	*Anthus rubescens*

Common Name	Scientific Name
Birds (continued)	
Cedar Waxwing*	*Bombycilla cedrorum*
Orange-crowned Warbler*	*Vermivora celata*
Nashville Warbler	*Vermivora ruficapilla*
Yellow Warbler*	*Dendroica petechia*
Yellow-rumped Warbler*	*Dendroica coronata*
Black-throated Gray Warbler*	*Dendroica nigrescens*
Townsend's Warbler	*Dendroica townsendi*
MacGillivray's Warbler*	*Oporornis tolmiei*
Common Yellowthroat*	*Geothlypis trichas*
Wilson's Warbler*	*Wilsonia pusilla*
Western Tanager*	*Piranga ludoviciana*
Spotted Towhee*	*Pipilo maculatus*
American Tree Sparrow	*Spizella arborea*
Chipping Sparrow	*Spizella passerina*
Vesper Sparrow	*Pooecetes gramineus*
Sage Sparrow	*Amphispiza belli*
Savannah Sparrow*	*Passerculus sandwichensis*
Fox Sparrow	*Passerella iliaca*
Song Sparrow*	*Melospiza melodia*
Lincoln's Sparrow	*Melospiza lincolnii*
White-throated Sparrow	*Zonotrichia albicollis*
Harris' Sparrow	*Zonotrichia querula*
White-crowned Sparrow*	*Zonotrichia leucophrys*
Golden-crowned Sparrow	*Zonotrichia atricapilla*
Dark-eyed Junco*	*Junco hyemalis*
Snow Bunting	*Plectrophenax nivalis*
Black-headed Grosbeak*	*Pheucticus melanocephalus*
Lazuli Bunting	*Passerina amoena*
Red-winged Blackbird*	*Agelaius phoeniceus*
Western Meadowlark*	*Sturnella neglecta*
Yellow-headed Blackbird*	*Xanthocephalus xanthocephalus*
Brewer's Blackbird*	*Euphagus cyanocephalus*
Brown-headed Cowbird*	*Molothrus ater*
Bullock's Oriole*	*Icterus bullockii*
Purple Finch*	*Carpodacus purpureus*
House Finch*	*Carpodacus mexicanus*
Red Crossbill	*Loxia curvirostra*
Pine Siskin*	*Carduelis pinus*
American Goldfinch*	*Carduelis tristis*
Evening Grosbeak	*Coccothraustes vespertinus*
Mammals	
Virginia Opossum	*Didelphis virginiana*
Pacific Water Shrew	*Sorex bendirii*
Trowbridge's Shrew	*Sorex trowbridgii*
Vagrant Shrew	*Sorex vagrans*
Shrew-mole	*Neurotrichus gibbsii*
Coast Mole	*Scapanus orarius*
Townsend's Mole	*Scapanus townsendii*
Masked Shrew	*Sorex cinerus*
Long-eared Myotis	*Myotis evotis*
Little Brown Myotis	*Myotis lucifugus*
Yuma Myotis	*Myotis yumanensis*
Hoary Bat	*Lasiurus cinereus*
Silver-haired Bat	*Lasionycteris noctivagans*
Townsend's Big-eared Bat	*Plecotus townsendii*
Eastern Cottontail	*Sylvilagus floridanus*
Snowshoe Hare	*Lepus americanus*
Mountain Beaver	*Aplondontia rufa*
Townsend's Chipmunk	*Tamias townsendii*
Eastern Gray Squirrel	*Sciurus carolinensis*
Douglas' Squirrel	*Tamiasciurus douglasii*
Northern Flying Squirrel	*Glaucomys sabrinus*
American Beaver	*Castor canadensis*
Deer Mouse	*Peromyscus maniculatus*
Columbian Mouse	*Peromyscus oreas*
Bushy-tailed Woodrat	*Neotoma cinerea*
Western Red-backed Vole	*Clethrionomys californicus*
Long-tailed Vole	*Microtus longicaudus*
Creeping Vole	*Microtus oregoni*
Townsend's Vole	*Microtus townsendii*
Common Muskrat	*Ondatra zibethicus*
Norway Rat	*Rattus norvegicus*
Black Rat	*Rattus rattus*
House Mouse	*Mus musculus*
Pacific Jumping Mouse	*Zapus trinotatus*
Common Porcupine	*Erethizon dorsatum*
False Killer Whale	*Pseudorca crassidens*
Killer Whale	*Orcinus orca*
Dall's Porpoise	*Phocoena dallii*
Gray Whale	*Eschrichtius robustus*
Minke Whale	*Balaenoptera acutorostrata*
Coyote	*Canis latrans*
Red Fox	*Vulpes vulpes*
Northern Sea Lion	*Eumetopias jubatus*
California Sea Lion	*Zalophus californianus*
Harbor Seal	*Phoca vitulina*
Raccoon	*Procyon lotor*
Short-tailed Weasel	*Mustela erminea*
Long-tailed Weasel	*Mustela frenata*
Mink	*Mustela vison*
Western Spotted Skunk	*Spilogale gracilis*
Striped Skunk	*Mephitis mephitis*
Northern River Otter	*Lutra canadensis*
Mountain Lion	*Felis concolor*
Bobcat	*Lynx rufus*
Mule Deer aka "Black-tailed Deer"	*Odocoileus hemionus*
White-tailed Deer	*Odocoileus virginianus*

Common Name	Scientific Name
Amphibians	
Northwestern Salamander	*Ambystoma gracile*
Long-toed Salamander	*Ambystoma macrodactylum*
Rough-skinned Newt	*Taricha granulosa*
Western Red-backed Salamander	*Plethodon vehiculum*
Pacific Treefrog	*Hyla regilla*
Red-legged Frog	*Rana aurora*
Bullfrog	*Rana catesbeiana*
Fish	
River Lamprey	*Lampetra ayresi*
Western Brook Lamprey	*Lampetra richardsoni*
Pacific Lamprey	*Lampetra tridentata*
Spotted Ratfish	*Hydrolagus colliei*
Spiny Dogfish	*Squalus acanthias*
American Shad	*Alosa sapidissima*
Pacific Herring	*Clupea harengus*
Longnose Dace	*Rhinichythys cataractae*
Largescale Sucker	*Catostomus macrocheilus*
Brown Bullhead	*Ameiurus nebulosus*
Surf Smelt	*Hypomesus pretiosus*
Cutthroat Trout	*Oncorhynchus clarki*
Pink Salmon	*Oncorhynchus gorbuscha*
Chum Salmon	*Oncorhynchus keta*
Coho Salmon	*Oncorhynchus kisutch*
Steelhead (Rainbow Trout)	*Oncorhynchus mykiss*
Sockeye Salmon	*Oncorhynchus nerka*
Chinook Salmon	*Oncorhynchus tshawytscha*
Mountain Whitefish	*Prosopium williamsoni*
Bull Trout	*Salvelinus confluentus*
Dolly Varden	*Salvelinus malma*
Pacific Cod	*Gadus macrocephalus*
Pacific Hake	*Merluccius productus*
Pacific Tomcod	*Microgadus proximus*
Walleye Pollock	*Theregra chalcogrammus*
Plainfin Midshipman	*Porichthys notatus*
Northern Clingfish	*Gobiesox meandricus*
Tube-Snout	*Aulorhynchus flavidus*
Three Spine Stickleback	*Gasterosteus aculeatus*
Bay Pipefish	*Syngnathus leptorhynchus*
Brown Rockfish	*Sebastes auriculatus*
Copper Rockfish	*Sebastes caurinus*
Quillback Rockfish	*Sebastes maliger*
Sablefish	*Anoplopoma fimbria*
Kelp Greenling	*Hexagrammos decagrammus*
Rock Greenling	*Hexagrammos lagocephalus*
White-spotted Greenling	*Hexagrammos stelleri*
Painted Greenling	*Oxylebius pictus*
Padded Sculpin	*Artedius fenestralis*
Smoothhead Sculpin	*Artedius lateralis*
Silverspotted Sculpin	*Blepsias cirrhosus*
Reticulate/Riffle Sculpin	*Cottus perplexus/gulosus*
Torrent Sculpin	*Cottus rhotheus*
Buffalo Sculpin	*Enophrys bison*
Red Irish Lord	*Hemilepidotus hemilepidotus*
Pacific Staghorn Sculpin	*Leptocottus armatus*
Great Sculpin	*Myoxocephalus polyacanthocephalus*
Sailfin Sculpin	*Nautichthys oculofasciatus*
Tidepool Sculpin	*Oligocottus maculosus*
Tadpole Sculpin	*Psychrolutes paradoxus*
Soft Sculpin	*Psychrolutes sigalutes*
Grunt Sculpin	*Rhamphocottus richardsoni*
Cabezon	*Scorpaenichthys marmoratus*
Manacled Sculpin	*Synchirus gilli*
Northern Spearnose Poacher	*Agonopsis vulsa*
Pygmy Poacher	*Odontopyxis trispinosa*
Tubenose Poacher	*Pallasina barbata*
Sturgeon Poacher	*Agonus acipenserinus*
Blacktip Poacher	*Xeneretmus latifrons*
Ringtail Snailfish	*Liparis rutteri*
Pumpkinseed	*Lepomis gibbosus*
Largemouth Bass	*Micropterus salmoides*
Black Crappie	*Pomoxis nigromaculatus*
Yellow Perch	*Perca flavescens*
Shiner Perch	*Cymatogaster aggregata*
Striped Seaperch	*Embiotoca lateralis*
Pile Perch	*Rhacochilus vacca*
Slender Cockscomb	*Anoplarchus insignis*
High Cockscomb	*Anoplarchus purpurescens*
Pacific Snake Prickleback	*Lumpenus sagitta*
Penpoint Gunnel	*Apodichthys flavidus*
Rockweed Gunnel	*Apodichthys fucorum*
Crescent Gunnel	*Pholis laeta*
Saddleback Gunnel	*Pholis ornata*
Pacific Sand Lance	*Ammodytes hexapterus*
Arrow Goby	*Clevelandia ios*
Bay Goby	*Lepidogobius lepidus*
Pacific Sanddab	*Citharichthys sordidus*
Speckled Sanddab	*Citharichthys stigmaeus*
Rex Sole	*Errex zachirus*
Calico Sculpin	*Clinocottus embryum*
Coastrange Sculpin	*Cottus aleuticus*
Prickly Sculpin	*Cottus asper*
Flathead Sole	*Hippoglossoides elassodon*
Dover Sole	*Microstomus pacificus*
Starry Flounder	*Platichythys stellatus*
Rock Sole	*Pleuronectes bilineata*

Common Name	Scientific Name	Common Name	Scientific Name
Fish (continued)			
Butter Sole	*Pleuronectes isolepsis*		
English Sole	*Pleuronectes vetulus*		
Roughback Sculpin	*Chitonotus pugetensis*		
Sharpnose Sculpin	*Clinocottus acuticeps*		
Shorthead Sculpin	*Cottus confusus*		
C-O Sole	*Pleuronichthys coenosus*		
Sand Sole	*Psettichthys melanostictus*		
White Sturgeon	*Acipenser transmontanus*		

Insects

Common Name	Family Name		
Shield Bugs	Acanthosomatidae	Scavenger Beetles	Lathridiidae
Treehoppers	Aetalionidae	Seed Bugs	Lygaeidae
Mining Bees	Andrenidae	Plant Bugs	Miridae
Deathwatch Beetles	Anobiidae	House Flies	Muscidae
Anthomyiid Flies	Anthomyiidae	Fungus Gnats	Mycetophilidae
Aphids	Aphididae	Pine Flower Snout Beetles	Nemonychidae
Bees	Apidae	Onychiurid Springtails.	Onychiuridae
Weevils	Apionidae	Stink Bugs	Pentatomidae
Stilt Bugs	Berytidae	Humpbacked Flies	Phoridae
March Flies	Bibionidae	Large Caddis Flies	Phryganeidae
Braconid Wasps	Braconidae	Parasitic Wasps	Proctotrupidae
Moss Beetles	Byrrhidae	Barklice	Psocoptera*
Soldier Beetles	Cantharidae	Psyllids	Psyllidae
Ground Beetles	Carabidae	Scentless Plant Bugs	Rhopalidae
Spittlebugs	Cercopidae	Dung Flies	Scatophagidae
Leaf Beetles	Chrysomelidae	Dark-winged Fungus Gnats	Sciaridae
Green Lacewings	Chrysopidae	Bark and Ambrosia Beetles	Scolytidae
Leafhoppers	Cicadellidae	Carrion Beetles	Silphidae
Tiger Beetles	Cicindellidae	Globular Springtails	Sminthuridae
Ladybug Beetles	Coccinellidae	Rove Beetles	Staphylinidae
Narrow-winged Damselflies	Coenagrionidae	Hover Flies	Syrphidae
Snout Beetles and Weevils	Curculionidae	Tachinid Flies	Tachinidae
Click Beetles	Elateridae	Darkling Beetles	Tenebrionidae
Balloon Flies	Empididae	Sawflies	Tenthredinidae
Entomobryid Springtails	Entomobryidae	Pygmy Grasshoppers	Tetrigidae
Ants	Formicidae	Lace Bugs	Tingidae
Earwigs	Forficulidae	Crane Flies	Tipulidae
Metallic Bees	Halictidae	Xylophagid Flies	Xylophagidae
Heleomyzid Flies	Heleomyzidae		
Hypogastrurid Springtails	Hypogastruridae		
Ichneumons (Parasitic Wasps)	Ichneumonidae		
Isotomid Springtails	Isotomidae		

Appendix F
Plan Implementation

[For a copy of this appendix, see the Final CCP/EIS document]

Note: Information from this CCP/EIS appendix has been updated and is included as Chapter 5 of this CCP.

Appendix G
Compatibility Determinations for Proposed Actions

Appendix G.1
Recreational Boating

COMPATIBILITY DETERMINATION
(August 2004)

Use: Recreational Boating

Refuge Name: Nisqually National Wildlife Refuge, located in Thurston and Pierce counties, Washington.

Establishing and Acquisition Authorities: Nisqually National Wildlife Refuge (NWR) was established on January 22, 1974 with approval by the Migratory Bird Conservation Commission. Approximately 2,925 acres of the approved 3,936 acres have been acquired. Legal authorities used for establishment of the Refuge include: Migratory Bird Conservation Act, as amended (16 U.S.C. 715-715d, 715e, 715f - 715r); and Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a - 742j).

Refuge Purposes: Nisqually NWR purposes include:

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

...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).

National Wildlife Refuge System Mission: "To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd et seq.]).

Description of Use: Recreational boating use addressed in this compatibility determination includes motorboats and non-motorized boats, including kayaks and canoes, in all waters of the Refuge outside the Brown Farm Dike, including the Research Natural Area (RNA). It does not include personal watercraft (PWC) use. Motor boats include a variety of crafts powered by 2-cycle or 4-cycle engines. Although the Refuge does not closely monitor all boat use that occurs on Refuge waters, approximately 6,700 boats per year are estimated to use the Refuge based on various public use data (USFWS, unpubl. data). Current Thurston County regulations require a 5 mph speed limit for all watercraft within 200 feet of any shoreline. However, this speed limit of 5 mph is currently not enforced by the U.S. Fish and Wildlife Service (Service) and is minimally enforced by the State or County. Pierce County does not have a similar regulation.

The Comprehensive Conservation Plan (CCP) Proposed Action would continue to provide recreational boating opportunities with an emphasis on use supporting priority public uses, including wildlife observation/photography, interpretation, environmental education, waterfowl hunting, and fishing. New restrictions would be aimed at minimizing impacts to wildlife and

habitat as well as conflicts with other users. These restrictions include a seasonal closure (October 1-March 31) in the RNA and a 5 mph speed limit throughout Refuge waters, including portions of the Refuge in Pierce County. This would expand the current 5 mph speed limit within 200 feet of any shoreline (Thurston County regulations) to include all Refuge waters. The area within the Brown Farm Dike and any estuarine restoration area (formerly diked areas) will remain closed to boating. Commercial vendors that lead organized groups will be required to apply for a Refuge Special Use Permit for each trip. A new visitor contact station would be constructed at Luhr Beach if acquisition or development of a cooperative agreement is accomplished with the State.

Uses within the Proposed Expansion Area: Chapters 2 and 3 of the Final CCP/Environmental Impact Statement (EIS) for Nisqually NWR identify areas in which the Service would seek to acquire land from willing sellers outside of the current Refuge boundary (USFWS 2002). Motorized and non-motorized boating currently occurs in McAllister Creek and the Nisqually River, upstream from the current Refuge boundary, although use is limited, particularly in McAllister Creek, which becomes extremely narrow and shallow in this area. The proposed Refuge boating restrictions described above would be applied to any newly acquired lands or waters.

Availability of Resources: The following funding/annual costs would be required to administer and manage boating activities as described above:

	One-time Costs	**Recurring Costs**
Maintenance of Parking Area and Ramp (Luhr Beach Boat Ramp)		25K
Visitor Contact Station	5K	1K
Law Enforcement		20K
Survey and posting	15K	
Signs	4K	2K
Outreach, Education, and Monitoring		5K
Administration	5K	5K
TOTAL	$39K	$58K

Additional funds would be required to construct, operate, and maintain visitor facilities and interpretive materials (see summary table above). Law enforcement staffing would also be needed. Funding would be sought through the Service budget process. Other sources will be sought through strengthened partnerships, grants, coordination with other law enforcement agencies, and additional Refuge operations funding to support a safe, quality public use program as described above.

Anticipated Impacts of Use: Nisqually NWR provides crucial foraging and resting habitat for wintering migratory birds, including waterfowl, shorebirds, seabirds, and other waterbirds. Recreational boating affects their use in Refuge waters (also see Chapter 4 in the Final CCP/EIS for Nisqually NWR). Boating activity, both motorized and non-motorized, can alter distribution, reduce use of particular habitats or entire areas by waterfowl and other birds, alter feeding behavior and nutritional status, and cause premature departure from areas (Knight and Cole 1995). More sensitive species may find it difficult to secure adequate food or loafing sites as

their preferred habitat becomes fragmented and recreation-related disturbances increase (Skagen et al. 1991; Pfister et al. 1992). Motorized boats generally have more impact on wildlife than non-motorized boats because motorboats produce a combination of movement and noise (Tuite et al. 1983, Knight and Cole 1995). For example, a significant decrease in the proportion of bald eagles feeding at a site was observed when motorized boating activity occurred within 200 meters of that area in the preceding 30 minutes (Skagen 1980). Motorized boats can also cover a larger area in a relatively short time, in comparison to non-motorized boats. Boating pressure on wintering waterfowl in Germany had reached such a high level that it was necessary to establish larger sanctuaries and implement a seasonal closure on water sports and angling (Bauer et al. 1992).

Even canoes and kayaks can cause significant disturbance effects based on their ability to penetrate into shallower areas of the marsh (Speight 1973, Knight and Cole 1995). In the Ozark National Scenic Riverway, green-backed heron activity declined on survey routes when canoes and boat use increased on the main river channel (Kaiser and Fritzell 1984). Canoes or slow-moving boats have also been observed to disturb nesting great blue herons (Vos et al. 1985). Huffman (1999) found that non-motorized boats within 30 meters of the shoreline in south San Diego Bay caused all wintering waterfowl to flush between the craft and shore. However, compared to motorboats, canoes and kayaks appear to have less disturbance effects on most wildlife species (Jahn and Hunt 1964, Huffman 1999, DeLong 2002).

In Denmark, fast-moving boats were observed to have the greatest impact on red-breasted merganser broods (Kahlert 1994). The presence of fast-moving boats also caused the most significant modifications to the amount of time animals spent feeding and resting. In England, an increased rate of disturbance from boats partly caused a decline in roosting numbers of shorebird species (Burton et al. 1996). In addition, boaters have been observed to cause massive flights of diving ducks on the Mississippi River (Thornburg 1973). Motorized boats within 100 meters of shore caused all wintering waterfowl and shorebirds to flush between the craft and shore in south San Diego Bay, regardless of speed (Huffman 1999). However, disturbance to birds in general was reduced when boats traveled at or below the 5 mph speed limit.

Impacts of boating can occur even at low densities, given their noise, speed, and ability to cover extensive areas in a short amount of time. The total number of boats and people can be an inappropriate measure of recreational intensity because the presence of a single boat might be just as disturbing as that of many (Tuite et al. 1983, Knight and Knight 1984). This is especially the case in the RNA and McAllister Creek, both areas with high waterfowl use. USFWS survey data show that the RNA provides important resting and feeding habitat for large numbers of wintering waterfowl, including many wigeon, the predominant waterfowl species on the Refuge. Typically, the largest waterfowl concentrations are found in the RNA during the winter months.

The habitat along McAllister Creek is a relatively narrow tidal system that receives high use by a variety of waterfowl, wading birds, other waterbirds, and raptors. Because boats in confined areas are generally closer to shorelines, waterbirds in tidal creeks and rivers may be exposed to more human activity than birds in other shoreline habitats (Bratton 1990). Even low levels of boating activity affect the duration and pattern of use by wildlife in this narrow system. In addition, disturbance to nesting birds is caused by boat activity. An active bald eagle nest is located along McAllister Creek. The nesting period identified in the Bald Eagle Recovery Plan identifies January 1 as the beginning of the nesting season when special protective measures

should begin (USFWS 1986). A great blue heron nesting colony, located along McAllister Creek since the 1970s, has been declining for several years. Nesting great blue herons are sensitive to a variety of human disturbances. Great blue herons were one of the more sensitive of 23 waterbird species, when measuring flush distances from motorized watercraft (Rodgers and Schwikert 2002). Washington State requires a minimum 300-m buffer zone to protect colonies from human disturbances (WDFW 2001). However, boating activity in McAllister Creek falls within this buffer zone. Boating activities may be one of the contributing factors affecting these nesting birds.

Motorized boats introduce noise and pollution, in the form of gas and oil in water, and particulates in the air in estuarine and riverine habitats at the Refuge. An EPA report indicates that two-stroke engines, found on many motorized boats, discharge as much as 25% of unspent oil and gas directly into the water. Increased speeds of two-stroke engines can result in greater discharge of unspent oil and gas. Hydrocarbons in gas and oil released from two-stroke engines float on the surface and settle within shallow estuarine habitats. Hydrocarbon pollution has been found to bioaccumulate within the complex food web, posing a serious threat to the marine environment (Tjarnlund et al. 1993). Hydrocarbons can also be transferred to eggs from the plumage of incubating birds. Extremely small amounts of petroleum hydrocarbons can be toxic to eggs and birds that may ingest these contaminants (Hoffman 1989).

Anticipated Impacts of Uses within the Proposed Expansion Area: The following conditions must be met before allowing existing uses to occur on an interim basis on newly acquired lands: (1) There is no indirect, direct, or cumulative threat anticipated to human health or safety; (2) There is no indirect, direct, or cumulative threat anticipated to natural or cultural resources; (3) The use is consistent with management of existing Nisqually NWR lands and would contribute to achieving Refuge goals. In particular, existing Refuge regulations would not be compromised; (4) The newly acquired lands represent a meaningful unit within which to manage the activity; and (5) There are no anticipated conflicts with priority public uses.

The only major waterways within the expansion area are McAllister Creek and the Nisqually River. If property is acquired that includes McAllister Creek or the Nisqually River, boating regulations described above would also apply to these areas. No waterways other than McAllister Creek and Nisqually River will be open to boating. Anticipated impacts would be similar to that described above.

Public Review and Comment: Public review and comments were solicited in conjunction with the Draft CCP/EIS for Nisqually NWR, released in December 2002. Few comments were received on the Compatibility Determinations. Also see the Summary of Changes document and Appendix M (Comments and Responses). No changes were necessary based on comments received.

Determination:

_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

Stipulations necessary to ensure compatibility: The following stipulations are required to ensure that motorized and non-motorized boating is compatible:

1. A 5 mph speed limit for all boats will be implemented throughout Refuge waters.

2. The RNA will be closed to boats from October 1 through March 31 to reduce disturbance to wintering waterfowl populations.

3. Estuarine restoration areas, including the site currently within the Brown Farm Dike (699 acres) will be closed to boats year round to serve as a sanctuary area. No motorized or non-motorized boats will be allowed into this area, and all public access will occur on trails only.

4. Signs will be installed and maintained to mark closed areas, seasonal closures, and to indicate 5 mph speed limit regulations on the Refuge. The RNA boundary will be posted and signs will include seasonal closure dates.

5. Periodic law enforcement will help ensure compliance with speed limit regulations and area closures. Regulations will be described in brochures and posted at a new Visitor Contact Station at Luhr Beach. Coordination with other law enforcement agencies, including the State and County, will be strengthened. Motorboat operators are required to be in compliance with all applicable Refuge, U.S. Coast Guard, and State of Washington laws. Outreach and education efforts will address groups associated with boating in the south Sound.

6. The Service remains concerned about impacts to wildlife using McAllister Creek. Waterfowl and waterbird use, great blue heron, bald eagle, salt marsh habitat, and boat activity will be monitored in McAllister Creek to document impacts. This Compatibility Determination will be re-evaluated in 3 - 5 years or sooner to assess whether other protective measures should be implemented in McAllister Creek.

7. If property is acquired that includes McAllister Creek or the Nisqually River, boating regulations described above would also apply to these areas. No waterways other than McAllister Creek and Nisqually River in the expansion area would be open to boating.

8. Monitoring of boating activities and associated effects on waterfowl, waterbirds, and other migratory birds will be conducted and evaluated annually. Monitoring data will be used by the Refuge Manager in the periodic re-evaluation of this Compatibility Determination.

Justification: Boating itself is not considered wildlife-dependent recreation, but many wildlife-dependent recreational activities (fishing, waterfowl hunting, environmental education, interpretation, and wildlife observation/photography) are associated with boating. Providing opportunities for wildlife-dependent priority public uses would contribute toward fulfilling provisions under the National Wildlife Refuge System Administration Act as amended in 1997. Although boating has a potential to impact wetland wildlife, implementing the prescribed measures listed in the Stipulations section should reduce many of these impacts. It is anticipated that an adequate amount of estuary habitat would be available to the majority of waterfowl and other wetland birds because some high wildlife use areas will be closed to boating, and boating regulations would be maintained and enforced. Thus, it is anticipated that birds will find sufficient food resources and resting places such that their abundance and use of the Refuge will not be measurably lessened, the physiological condition and production of waterfowl and other waterbirds will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall status will not be impaired. The Refuge will also implement a monitoring program to help assess disturbance effects on wildlife and habitat. Improved outreach and educational information for Refuge visitors involved in activities associated with boating would also help to reduce the impacts associated with boating activities.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

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

__X__ Mandatory 10-year Re-Evaluation, Date to be provided in Final EIS/CCP (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

___ 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

Refuge Determination

Prepared by: _____ (Signature) 10-15-04 (Date)

Refuge Manager/
Project Leader
Approval: _____ (Signature) 10-15-04 (Date)

Concurrence

Refuge Supervisor: _____ (Signature) 10-27-04 (Date)

Regional Chief,
National Wildlife
Refuge System: _____ (Signature) 10/28/04 (Date)

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Appendix G.2
Recreational Fishing

COMPATIBILITY DETERMINATION
(August 2004)

Use: Recreational Fishing (bank, boat and shellfishing)

Refuge Name: Nisqually National Wildlife Refuge, located in Thurston and Pierce counties, Washington.

Establishing and Acquisition Authorities: Nisqually National Wildlife Refuge (NWR) was established on January 22, 1974 with approval by the Migratory Bird Conservation Commission. Approximately 2,925 acres of the approved 3,936 acres have been acquired. Legal authorities used for establishment of the Refuge include: Migratory Bird Conservation Act, as amended (16 U.S.C. 715-715d, 715e, 715f - 715r); and Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a - 742j).

Refuge Purposes: Nisqually NWR purposes include:

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

...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).

National Wildlife Refuge System Mission: "To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd et seq.]).

Description of Use:
Currently, recreational fishing occurs in McAllister Creek, in the Nisqually River, and on the tideflats at the mouth of McAllister Creek and north of the Brown Farm Dike. Boat launch sites providing access to McAllister Creek and the Nisqually River are primarily from the Luhr Beach Boat Ramp, but also include other launching facilities in southern Puget Sound. The Refuge offers a walk-in bank fishing area along McAllister Creek. Anglers must pay the Refuge entrance fee and hike approximately ¾ mile on the Refuge trail to the designated fishing area. Illegal access occurs frequently at the southern boundary of the Refuge, where McAllister Creek flows under I-5. Some fishing activity also occurs at a pier located at the Luhr Beach boat ramp. Fish caught by Refuge visitors primarily include chinook and chum salmon, but also some cutthroat and steelhead. Although the Refuge does not closely monitor all fishing on the Refuge, use is estimated to be approximately 3,800 anglers per year based on various public use data. During low spring and summer tides, shellfishers access the Refuge and State tideflats from Luhr Beach. Although the intertidal area at the mouth of McAllister Creek has been closed to shellfishing due to elevated levels of fecal coliform bacteria since 2000, this closure is not enforced and some shellfishing does still occur.

The CCP Proposed Action would continue to provide fishing opportunities from boats in the isqually River and McAllister Creek. The Research Natural Area (RNA) would be posted closed to fishing and the closure enforced to comply with Refuge RNA policy. However, since estuarine restoration along McAllister Creek would remove the dike on which the current bank fishing occurs, this fishing area will no longer be available. The Service would investigate the feasibility of establishing a new bank fishing area along the east bank of the Nisqually River, north of I-5, on Nisqually Indian Tribal and Refuge property. The development of this site would need to be coordinated with the development of a trail system and visitor contact station/parking area located in the uplands above this property. The Refuge would also investigate fishing opportunities for disabled users at Luhr Beach and along the Nisqually River.

Shellfishing will remained closed in the tideflats as directed by the Washington State Department of Health. The Refuge would re-evaluate this compatibility determination if recreational shellfishing is opened in the future because of improved water quality.

Uses within the Proposed Expansion Area: Chapters 2 and 3 of the Final CCP/EIS for the Nisqually NWR identify areas in which the Service would seek to acquire land from willing sellers outside of the current Refuge boundary (USFWS 2002).

There are several public recreational fishing sites in the proposed expansion area. The majority of fishing use occurs on the Nisqually River accessed from Fort Lewis property (Trotter's Woods) on the east side of the river or from a State owned (WDFW) bank fishing site on the west side of the river. This WDFW site was designed to be completely accessible; however, changes in the river have made this site less usable. The numbers of anglers using these sites are not known, but observations indicate very heavy use when salmon runs are occurring. The remote nature of these sites and the low level of enforcement have resulted in high amounts of fishing litter and debris at some of these sites. Use in the Trotter's Woods area is largely unregulated, and evidence of habitat deterioration from vehicle use and extensive litter exists in this riparian forest. If Trotter's Woods is managed by the Service through acquisition or a cooperative management agreement, the area will be managed to reduce habitat damage and improve the fishing program. This includes development of a parking area, improved vehicle traffic management within the forested areas, and riparian restoration. In addition, bank fishing opportunities south of I-5 on McAllister Creek would be established if appropriate parcels are acquired, to replace the site (north of I-5) that will be lost due to dike removal for estuarine restoration.

The CCP Proposed Action in the expansion area is to provide quality fishing opportunities by maintaining selected traditional bank fishing and water access sites, improve facilities, and close other sites to protect habitat values, for example, limiting vehicle access in sensitive riparian habitats. Location criteria for new sites considered will be accessibility, feasibility, minimal conflicts with other users, maintenance, compatibility, wildlife and habitat disturbance potential, and potential to promote a quality fishing experience.

Availability of Resources: The following funding/annual costs would be required to administer and manage fishing activities as described above:

	One-time Cost	Recurring Cost
Bank fishing area (development, eastside)	18K	
Law Enforcement		35K
Posting/signing	16K	2K
Outreach, Education, and Monitoring	3K	5K
Development of Accessible Sites (Luhr Beach, Nisqually River)	60K	3K
Development and maintenance of Trotter's Woods Site	50K	15K
Maintenance of Parking Area		10K
Administration	18K	5K
TOTAL	$165K	$75K

Additional funds would be required to construct, operate, and maintain visitor facilities and interpretive materials. Law enforcement staffing would also be needed. Funding would be sought through the Service budget process. Other sources will be sought through strengthened partnerships, grants, coordination with other law enforcement agencies, and additional Refuge operations funding to support a safe, quality public use program as described above.

Anticipated Impacts of Use: Fishing as a solitary and stationary activity 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. Furthermore, despite the potential impacts of fishing, a major goal of Nisqually NWR is to provide opportunities for wildlife-dependent recreation. Fishing is one of the six priority public uses on the National Wildlife Refuge System. Of key concern then, is to manage the activity to keep adverse impacts to within acceptable limits.

Angler activities while on Refuge are and will remain consistent with State guidelines. Harvest-related impacts for fish stocks associated with sportfishing in the Nisqually River and McAllister Creek are estimated annually and taken into consideration by the State in their development of annual pre-season fishing agreements and associated regulations. Therefore, impacts to fish populations should be minimized.

Additional disturbance would be caused to birds and other wildlife using the open waters and rivers/creeks where fishing would occur. Fishing activities may influence the composition of bird communities, as well as distribution, abundance, and productivity of waterbirds (Tydeman 1977, Bouffard 1982, Bell and Austin 1985, Bordignon 1985, Edwards and Bell 1985, and Cooke 1987). 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 from using otherwise suitable habitat (Jahn and Hunt 1964). In Britain, anglers displaced waterfowl from their preferred feeding and roosting areas and caused wigeon, green-winged teal, pochard, and

mallard to depart from a reservoir prematurely (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 waterbirds, 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. This is especially the case in the RNA and McAllister Creek, both areas with high waterfowl use. The habitat along McAllister Creek is a relatively narrow tidal system that receives high use by a variety of waterfowl, waterbirds, wading birds, and raptors. In addition, an active bald eagle nest is located along McAllister Creek. The nesting period identified in the Bald Eagle Recovery Plan identifies January 1 as the beginning of the nesting season when special protective measures should begin (USFWS 1996). A great blue heron nesting rookery has been located along McAllister Creek for several years, with nesting activity beginning as early as February. Washington State requires a minimum 300-meter buffer zone to protect colonies from human disturbances (WDFW 2001). Boating activity in this area would affect the duration and pattern of use by wildlife in this narrow system (see Compatibility Determination for "Recreational Boating").

If recreational shellfish harvest activity is re-opened at the mouth of McAllister Creek, it will be managed consistent with State guidelines. Harvest-related impacts to shellfish stocks are estimated annually and taken into consideration by the State in their development of annual seasonal harvest dates and allowances. Therefore, impacts to shellfish populations should be reduced. However, activity associated with shellfishing may result in disturbance to the habitat caused by foot traffic and digging activity on mudflats, aquatic plants, and nearby salt marshes. Additional disturbances would occur as described above associated with fishing activity.

Anticipated Impacts from Uses within the Proposed Expansion Area: The following conditions must be met before allowing existing uses to occur on an interim basis on newly acquired lands: (1) There is no indirect, direct, or cumulative threat anticipated to human health or safety; (2) There is no indirect, direct, or cumulative threat anticipated to natural or cultural resources; (3) The use is consistent with management of existing Nisqually NWR lands and would contribute to achieving Refuge goals. In particular, existing Refuge regulations would not be compromised; (4) The newly acquired lands represent a meaningful unit within which to manage the activity; and (5) There are no anticipated conflicts with priority public uses.

Anticipated impacts from fishing in the expansion area would be the same as described above.

Public Review and Comment: Public review and comments were solicited in conjunction with the Draft CCP/EIS for Nisqually NWR, released in December 2002. Few comments were received on the Compatibility Determinations. Also see the Summary of Changes document and Appendix M (Comments and Responses). No changes were necessary based on comments received.

Determination:

_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

Stipulations necessary to ensure compatibility: Sanctuary areas will be designated to provide high quality habitat for feeding, resting, breeding, and thermal protection for waterfowl and other wildlife species. The RNA, a mixture of nearshore, intertidal, and salt marsh habitat, will be closed to fishing year round and to boating from October 1 to March 31. In addition, the restored estuarine area will be closed to fishing and other public use activities, except for wildlife observation from trails at the edges, to allow undisturbed research and monitoring of wildlife and habitat response to restoration activities. Some of the freshwater units will serve as sanctuary for waterfowl that prefer to move between the estuary and freshwater wetlands.

Boating associated with fishing has high potential for adversely impacting wildlife in the estuary. Three factors that exert the most disturbance to wildlife due to boating are noise, speed, and significantly increased access to more parts of the estuary. Thus, boating regulations to ensure compatibility during the fishing season will include the following: (1) 5 mph speed limit for boats in all Refuge waters; (2) the RNA will be closed to boats from October 1 through March 31 to reduce disturbance to wintering waterfowl populations; and (3) the estuarine restoration area currently within the Brown Farm Dike will be closed to boats year round. No motorized or non-motorized boats will be allowed into this area and all public access will occur on trails only. Signs will be installed to mark closed areas. The Refuge remains concerned about impacts to wildlife using McAllister Creek. Monitoring would be conducted to ensure that these stipulations are sufficient to minimize disturbance to wildlife.

The Refuge will provide information on fishing and shellfishing regulations at the Luhr Beach boat ramp, Visitor Contact Stations, and through printed brochures. Information will also include current migratory bird and Refuge regulations, and maps of closed areas. Refuge officers will enforce closed areas and boat speed limits. The Refuge will monitor and evaluate the fishing program and users to determine if objectives are being met.

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. This program as described was determined to be compatible despite the potential impacts that fishing and supporting activities (boating) can have on the Service's ability to achieve Refuge purposes. Sufficient restrictions will be placed on fishing, boating, and other public uses to ensure that an adequate amount of high quality feeding, breeding, and resting habitat would be available for migratory birds in relatively undisturbed areas (sanctuaries). Although boating has the greatest potential to impact wetland wildlife, implementing the prescribed measures listed in the Stipulations section should reduce many of these impacts. In addition, the majority of waterfowl use on the Refuge occurs in the winter and spring months, with some birds arriving as early as September and October. Since 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: (1) some high wildlife use areas will be set aside as sanctuary; (2) new boating regulations would be

implemented and enforced; and (3) bank fishing activity will be confined to designated areas and enforced. Thus, it is anticipated that wildlife, primarily waterbirds, will find sufficient food resources and resting places such that their abundance and use of the Refuge will not be measurably lessened, fishing pressure will not cause fish stocks to decline, the physiological condition and production of waterfowl and other waterbirds will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be impaired. A program will be implemented to monitor some of these factors.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

__X__ Mandatory 15-year Re-Evaluation Date to be provided in Final EIS/CCP (for priority public uses)

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

NEPA Compliance for Refuge Use Decision (check one below):

_____ 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

Refuge Determination

Prepared by: _____ (Signature) 10-15-04 (Date)

Refuge Manager/
Project Leader
Approval: _____ (Signature) 10-15-04 (Date)

Concurrence

Refuge Supervisor: _____ (Signature) 10-27-04 (Date)

Regional Chief,
National Wildlife
Refuge System: _____ (Signature) 10/28/04 (Date)

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Appendix G.3
Waterfowl Hunting

COMPATIBILITY DETERMINATION
(August 2004)

Use: Waterfowl Hunting

Refuge Name: Nisqually National Wildlife Refuge, located in Thurston and Pierce counties, Washington.

Establishing and Acquisition Authorities: Nisqually National Wildlife Refuge (NWR) was established on January 22, 1974 with approval by the Migratory Bird Conservation Commission. Approximately 2,925 acres of the approved 3,936 acres have been acquired. Legal authorities used for establishment of the Refuge include: Migratory Bird Conservation Act, as amended (16 U.S.C. 715-715d, 715e, 715f - 715r); and Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a - 742j).

Refuge Purposes: Nisqually NWR purposes include:

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

...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).

National Wildlife Refuge System Mission: "To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd et seq.]).

Description of Use: Nisqually NWR lands are not open to waterfowl hunting. Waterfowl hunting is allowed on 617 acres of WDFW lands within the approved Refuge boundary. Due to the irregular shape and scattered locations of these inholdings, and difficulty in posting and maintaining boundary signs, unauthorized hunting occurs on up to 1,189 acres of adjacent Refuge lands. This hunting activity has been considered administratively uncontrollable, so where signing is absent, hunting closures have not been enforced. Since the unauthorized hunting occurs on 63% of the estuarine habitat within the Refuge, including the Research Natural Area (RNA), current hunting activity provides insufficient sanctuary for estuarine-dependent wildlife and allows an unauthorized use to continue on large parts of the Refuge.

The CCP Proposed Action includes formally opening a total of approximately 191 acres of waters and tideflats of Nisqually NWR lands to waterfowl hunting (USFWS 2002). These lands are contiguous with the WDFW parcel north of the Brown Farm Dike. The RNA boundary will be moved to the east to provide high quality hunting area at the mouth of the River, reducing the RNA by 73 acres. However, a 44-acre area will be added to the RNA at the south end. By

opening 191 acres of the Refuge to waterfowl hunting, the hunting area north of the Brown Farm Dike will be configured in a single rectangular block, greatly reducing confusing boundary issues. Areas designated as "No Hunting Areas" will be posted and enforced, eliminating the unauthorized hunting that has occurred on the Refuge in the past. Waterfowl hunting will continue on all WDFW lands. A 25-shell limit will be instituted on Refuge and WDFW lands. WDFW will continue to have jurisdiction and management responsibility over WDFW lands, and the Service will manage the hunting program on Refuge lands. Hunting will be allowed consistent with annual State hunting regulations and seasons, and will be permitted by boat access only in the posted Refuge hunt area. The area within the Brown Farm Dike, including the estuarine restoration area, will remain closed to hunting. The waterfowl hunting season generally falls within the period from October through January. There will be no limit on the number of hunters, hunt days, and no designated blind sites. The State will manage their own hunt program on WDFW lands.

Uses within the Proposed Expansion Area: Chapters 2 and 3 of the Final CCP/EIS for Nisqually NWR identify areas in which the Service would seek to acquire land from willing sellers outside of the current Refuge boundary (USFWS 2002). Some private hunting occurs on property within the expansion area. The Medicine Creek Hunt Club consists of a small number of hunters using private property south of I-5. Waterfowl hunting also takes place in Trotter's Woods by approximately 3-4 hunters. Should these areas be acquired by the Service, the Refuge would consider allowing walk-in waterfowl hunting with set blinds if sufficient lands have been acquired to allow for adequate wildlife sanctuary and minimal conflicts with other priority public uses. This Compatibility Determination will be updated in the future to include walk-in hunting in the expansion area as needed.

Availability of Resources: The following funding/annual costs would be required to administer and manage waterfowl hunting activities as described above:

	One-time Cost	**Recurring Cost**
Survey and Post	75K	10K
Maintenance of Parking Area		10K
Law Enforcement		20K
Administration	25K	15K
Outreach, Education, and Monitoring	15K	10K
TOTAL	$115K	$65K

Additional funds would be required to construct, operate, and maintain a hunt program, visitor facilities, and interpretive materials. Law enforcement staffing would be needed. Funding would be sought through the Service budget process. Other sources will be sought through strengthened partnerships, grants, and additional Refuge operations funding to support a safe, quality public use program as described above.

Anticipated Impacts of Use: By its very nature, waterfowl hunting has very few if any positive effects on waterfowl and other birds while the activity is occurring, but it is well recognized that this activity has given many people a deeper appreciation of wildlife and a better understanding of the importance of conserving their habitat, which has ultimately contributed to the Refuge System mission. Furthermore, despite the potential impacts of hunting, a goal of Nisqually

NWR is to provide opportunities for quality wildlife-dependent recreation. By law, hunting is one of the six priority public uses of the National Wildlife Refuge System. Of key concern is to offer a safe and quality program and to maintain adverse impacts within acceptable limits.

Although hunting directly impacts individual birds, the amount of waterfowl harvest is not expected to have a measurable effect on Refuge populations, especially since waterfowl hunting activity is not extremely high in the delta. For example, the average hunter visit per day was 8.4 during the 1998/99 season (USFWS unpublished data). 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 multi-state Flyway councils, the Service and WDFW 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 (Owens 1977, Raveling 1979, White-Robinson 1982, Thomas 1983, Bartelt 1987, Madsen 1985, and Cole and Knight 1990). 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 and marshes on the Nisqually delta 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 (Belanger and Bedard 1995, 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 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 5-year period, these sanctuaries became two of the most important staging areas for coastal waterfowl. Numbers of dabbling ducks and geese increased 4 to 20 fold within the sanctuary (Madsen 1995). Thus sanctuary areas are very important to minimize disturbance to waterfowl populations to ensure their continued use of the Nisqually delta.

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, 3-16% 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 program at Nisqually NWR will not be intermittent in order to provide consistent management with the existing program on adjacent WDFW lands and waters, preventing confusion among hunters on the delta.

Boating activity associated with hunting during the fall and winter can alter distribution, reduce use of particular habitats or entire areas by waterfowl and other birds, alter feeding behavior and nutritional status, and cause premature departure from areas (Knight and Cole 1995). In the upper Midwest, motor boating and hunting have been found to be the two main activities that disturb waterfowl (Korschgen et al. 1985). In Connecticut, selection of feeding sites by lesser scaup was influenced by disturbances from hunters, anglers, and pleasure boaters (Cronan 1957). In Germany, boating pressure on wintering waterfowl had reached such a high level that it was necessary to establish larger sanctuaries, implement a seasonal closure on water sports and angling, and impose a permanent ban on hunting (Bauer et al. 1992). Impacts of boating can occur even at low densities, given their noise, speed, and ability to cover extensive areas in a short amount of time. This is especially important in the RNA and McAllister Creek. These are both areas with high waterfowl use. The habitat along McAllister Creek is a relatively narrow tidal system that receives high use by a variety of waterfowl, waterbirds, wading birds, and raptors. In addition, an active bald eagle nest is located along McAllister Creek. The nesting period identified in the Bald Eagle Recovery Plan identifies January 1 as the beginning of the nesting season when special protective measures should begin (USFWS 1986). A great blue heron nesting colony, located along McAllister Creek since the 1970s, has been declining for several years. Nesting great blue herons are sensitive to a variety of human disturbances. Washington State requires a minimum 300-meter buffer zone to protect colonies from human disturbances (WDFW 2001). It is possible that hunting and associated boating activities may be one of the contributing factors affecting these nesting birds, as well as other wildlife using this narrow system.
Additional impacts from hunting activity include conflicts with individuals participating in wildlife-dependent priority public uses, such as canoers, kayakers, and other wildlife observers. The Refuge has received numerous comments from canoers and kayakers indicating concern for their safety while boating during the waterfowl hunting season.

Anticipated Impacts of Uses within the Proposed Expansion Area: The following conditions must be met before allowing existing uses to occur on an interim basis on newly acquired lands: (1) There is no indirect, direct, or cumulative threat anticipated to human health or safety; (2) There is no indirect, direct, or cumulative threat anticipated to natural or cultural resources; (3) The use is consistent with management of existing Nisqually NWR lands and would contribute to achieving Refuge goals. In particular, existing Refuge regulations would not be compromised; (4) The newly acquired lands represent a meaningful unit within which to manage the activity; and (5) There are no anticipated conflicts with priority public uses.

Anticipated impacts associated with a new walk-in hunting program would be addressed in the updated Compatibility Determination to be developed in the future.

Public Review and Comment: Public review and comments were solicited in conjunction with the Draft CCP/EIS for Nisqually NWR, released in December 2002. Few comments were received on the Compatibility Determinations. Also see the Summary of Changes document and Appendix M (Comments and Responses). Minor changes were made to reflect RNA acreages accurately.

Determination:

_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

Stipulations necessary to ensure compatibility: Refuge hunt programs will be designed to provide high quality experiences. A quality hunt experience means that: (1) hunters are safe; (2) hunters exhibit high standards of ethical behavior; (3) hunters are provided with uncrowded conditions; (4) hunters have reasonable harvest opportunities; (5) hunters are clear on which areas are open and closed to hunting; and (6) minimal conflicts occur between hunters and other visitors, especially those engaging in wildlife-dependent priority public uses. The 7-day per week hunt program proposed on the Refuge would include the following restrictions to reduce impacts: (1) a limited hunting area (area will be posted and enforced); (2) a 25-shell limit; (3) redefining and reducing the RNA by 73 acres to allow for hunting at the mouth of the Nisqually River, but adding 44 acres to the south end of the RNA; (4) a 200-yard buffer from trails; (5) sufficient feeding and resting habitat for waterfowl in areas closed to hunting (sanctuary); and (6) periodic biological and social monitoring and evaluation of hunting program, including feedback from users to determine if objectives are being met.

Sanctuary areas must provide high quality habitat for feeding, resting, and thermal protection. Since the waterfowl hunt in the delta is focused in estuarine habitat, it is important that sufficient estuarine habitat on the Refuge be set aside as sanctuary. The RNA (764 acres), a mixture of nearshore, intertidal, and salt marsh habitat, will be closed to all consumptive uses year-round and boating during the waterfowl hunting season (October 1 - March 31) to provide this sanctuary. Estuarine habitat within McAllister Creek will also be closed to hunting. The newly restored estuarine area (699 acres) will be closed to public access to ensure successful restoration and to allow undisturbed research and monitoring to evaluate wildlife and habitat response to restoration activities. This area thus will also serve as a sanctuary site. The majority of the remaining diked area (263 acres) will serve as sanctuary for waterfowl that prefer to move between the estuary and

freshwater wetlands. Some of the freshwater units would include public access on trails and therefore would not function as complete sanctuary. Monitoring must demonstrate that sanctuary units are functional, including receiving significant daytime use by waterfowl throughout the hunting season.

Boating associated with hunting has high potential for adversely impacting wildlife in the estuary. Three factors that exert the most disturbance to wildlife due to boating are noise, speed, and significantly increased access to more parts of the estuary. Thus, boating regulations to ensure compatibility during the hunting season will include the following: (1) 5 mph speed limit for boats in all Refuge waters; (2) the RNA will be closed to boats from October 1 through March 31 to reduce disturbance to wintering waterfowl populations; and (3) estuarine restoration areas, including the site currently within the Brown Farm Dike will be closed to boats year round. No motorized or non-motorized boats will be allowed into this area and all public access will occur on trails only. Monitoring would be conducted to evaluate whether these stipulations are sufficient to minimize disturbance to wildlife.

Hunter compliance with current migratory bird and Refuge regulations would be achieved through a combination of printed information, signing, outreach efforts, and enforcement of regulations by Refuge officers.

Justification: Hunting is one of the six priority public uses of the National Wildlife Refuge System. Providing a quality hunting program contributes to achieving one of the Refuge goals. This program as described was determined to be compatible, in view of the potential impacts that hunting and supporting activities (boating) can have on the Service's ability to achieve Refuge purposes and goals. The Refuge would be opened to waterfowl hunting, with sufficient restrictions in place on hunting, boating, and other public uses to ensure that an adequate amount of high-quality feeding and resting habitat would be available in relatively undisturbed areas (sanctuaries) for the majority of waterfowl and other wetland birds using Nisqually NWR. Although boating has the greatest potential to impact wetland wildlife, implementing the prescribed measures listed in the Stipulations section and in the Recreational Boating Compatibility Determination should reduce major impacts to acceptable levels.

Refuge hunt programs are designed to provide high quality experiences. In general, hunting on Refuges should be superior to that available on other private or public lands, which may require special restrictions (Refuge Manual 8RM5). Measures are often used to ensure quality, including limited hunt days and shell limits and using buffers for public use trails eliminating the need for seasonal trail closures. The limited hunt program is proposed on the Refuge to accomplish the following: (1) accommodate the existing hunt program on WDFW lands; (2) establish consistent regulations across all lands and waters within the Nisqually delta; (3) provide a quality hunting experience that meets Refuge guidelines and policies; and (4) provide sufficient waterfowl sanctuary and resolve the current unauthorized hunting situation.

It is anticipated that an adequate amount of quality, non-hunted estuarine habitat would be available to the majority of waterfowl and other wetland birds because: (1) some high wildlife use areas will be set aside as sanctuary (764 acres in the RNA and 699 acres of restored estuarine area); (2) boating regulations would be maintained and enforced; and (3) hunting activity will be confined to designated areas because "no hunting zones" will be posted and enforced. Consolidation of the

hunting area into a single block of land provides a distinct, manageable unit that can be more easily delineated, posted, and enforced, resulting in larger sections of estuary in the delta that are available for waterfowl use. Thus, it is anticipated that birds will find sufficient food resources and resting places such that their abundance and use of the Refuge will not be measurably lessened, hunting pressure will not cause premature departure from the area, the physiological condition and production of waterfowl and other waterbirds will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall status will not be impaired. A program will be implemented to monitor waterfowl population numbers and habitat use.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

__X__ Mandatory 15-year Re-Evaluation Date will be provided in the Final EIS/CCP (for priority public uses)

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

NEPA Compliance for Refuge Use Decision (check one below):

_____ 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

Refuge Determination

Prepared by: _____ (Signature) 10-15-04 (Date)

Refuge Manager/
Project Leader
Approval: _____ (Signature) 10-15-04 (Date)

Concurrence

Refuge Supervisor: _____ (Signature) 10-27-04 (Date)

Regional Chief,
National Wildlife
Refuge System: _____ (Signature) 10/28/04 (Date)

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Appendix G.4
Environmental Education

COMPATIBILITY DETERMINATION
(August 2004)

Use: Environmental Education

Refuge Name: Nisqually National Wildlife Refuge, located in Thurston and Pierce counties, Washington.

Establishing and Acquisition Authorities: Nisqually National Wildlife Refuge (NWR) was established on January 22, 1974 with approval by the Migratory Bird Conservation Commission. Approximately 2,925 acres of the approved 3,936 acres have been acquired. Legal authorities used for establishment of the Refuge include: Migratory Bird Conservation Act, as amended (16 U.S.C. 715-715d, 715e, 715f - 715r); and Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a - 742j).

Refuge Purposes: Nisqually NWR purposes include:

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

...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).

National Wildlife Refuge System Mission: "To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd et seq.]).

Description of Use: Currently, the environmental education program at Nisqually NWR serves 5,000 students a year. The environmental education program is designed to provide effective resources, tools, and training which facilitates the teaching of accurate scientific and environmental information about the Nisqually River watershed, Delta, and surrounding areas. The environmental education program works with students and educators to foster an understanding of and appreciation for resource management, the human impacts on wildlife habitats, and to encourage active participation in resource protection.

With a full-time environmental education staff, up to 15,000 students a year will participate in the Refuge environmental education program. Educators will attend a teacher orientation and will design, schedule, and run their own field trips on the Refuge. Refuge staff will provide teacher training, site-specific curricula, materials, and activities, and field trip assistance to enhance learning in an outdoor setting. The temporary Education Center, or new education facility, will be the focus area of the education program. Environmental education study sites in the area of the Twin Barns Loop Trail will provide areas for more in-depth study. Students and

teachers will participate in restoration and monitoring activities through one-time activities or more long-term monitoring studies.

Uses within the Proposed Expansion Area: Chapters 2 and 3 of the Final CCP/EIS for Nisqually NWR identify areas in which the Service would seek to acquire land from willing sellers outside of the current Refuge boundary (USFWS 2002). The Refuge would acquire from or develop a cooperative management agreement with WDFW to cooperatively manage the Luhr Beach area and Nisqually Reach Nature Center. Because of similar objectives, the education program at the Nisqually Reach Nature Center would be incorporated into the Refuge environmental education program through a cooperative agreement, providing an even stronger program for educating the public on the marine resources of the Nisqually Delta.

As property is acquired south of I-5 and on the East Bluff, each parcel will be reviewed to determine whether it may be incorporated into the existing Refuge environmental education program. The Refuge environmental education program will continue to focus within the Environmental Education Center and Twin Barns Loop Trail areas. However, future environmental education opportunities on newly acquired lands will include student and teacher participation in habitat restoration and monitoring activities that would be incorporated into the overall program. This compatibility determination will be re-evaluated if new activities in the expansion area are anticipated to significantly change the level of use.

Availability of Resources: The following funding/annual costs would be required to administer and manage environmental education activities as described above:

	One-Time Cost	**Recurring Cost**
Construct and Outfit Education Center	950K	
Establish Study Sites	45K	
Maintenance and operation of Education Center, Maintenance of study sites		35K
Staffing (teacher training, student support, curriculum development, administration)		150K
Equipment, materials, and supplies	100K	15K
TOTAL	$1,095K	$200K

Funds are anticipated to be available through the Service budget process for construction of a new education center, establishment of study sites, and potentially some operational costs. Additional funding for staffing and operational costs would be needed. Other sources will be sought through strengthened partnerships, grants, and additional Refuge operations funding to support a safe, quality environmental education program as described above.

Anticipated Impacts of Use: The environmental education program would use existing public facilities including parking areas, the Visitor Center, trails, observation platforms and overlooks, and the temporary Education Center. Direct impact to wildlife would occur, as with any group along the trail, if birds (mostly songbirds and waterfowl) near the trail are disturbed. This disturbance is considered to be of minimal impact because: (1) the total number of students

permitted through the reservation system is limited to 100 per day; (2) students and teachers will be instructed in trail etiquette and the best ways to view wildlife with minimal disturbance; (3) education groups will be required to have a sufficient number of adults to supervise the group; (4) trail design will provide adequate cover for wildlife; and (5) observation areas and scopes are provided to view wildlife at a distance which reduces disturbance.

Establishment of environmental education study sites would create some off-trail disturbance of habitat. Again, this disturbance is considered minimal as study sites will be placed in areas already impacted by trail users and Refuge staff, and all off-trail activity will be focused in these small areas. Educators will be instructed on use of the study areas during teacher orientation workshops. Collection of samples for study (i.e., mud, water, plants) will be restricted to study areas, and samples must be used on site. Collection will be of materials needed to enhance hands-on learning and investigation and will be designed as part of structured activities and lessons, guided by teachers, and monitored by Refuge staff. These activities are an integral part of the education program design and philosophy and their impacts are considered minimal.

Education staff will coordinate with Biology staff regarding activities associated with restoration or monitoring projects to ensure that impacts to both wildlife and habitat are minimal. As with any restoration and monitoring activities conducted by Refuge personnel, these activities conducted by students would be at a time and place where the least amount of disturbance would occur.

Anticipated Impacts of Uses within the Proposed Expansion Area: Similar to the management of uses on existing lands, the following conditions must be met before allowing existing uses to occur on an interim basis on newly acquired lands: (1) There is no indirect, direct, or cumulative threat anticipated to human health or safety; (2) There is no indirect, direct, or cumulative threat anticipated to natural or cultural resources; (3) The use is consistent with management of existing Nisqually NWR lands and would contribute to achieving Refuge goals. In particular, existing Refuge regulations would not be compromised; (4) The newly acquired lands represent a meaningful unit within which to manage the activity; and (5) There are no anticipated conflicts with priority public uses.

Future environmental education opportunities in the expansion area associated with habitat restoration and monitoring will have similar impacts as described above.

Public Review and Comment: Public review and comments were solicited in conjunction with the Draft CCP/EIS for Nisqually NWR, released in December 2002. Few comments were received on the Compatibility Determinations. Also see the Summary of Changes document and Appendix M (Comments and Responses). No changes were necessary based on comments received.

Determination:

_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

Stipulations necessary to ensure compatibility: Participants in the Refuge's environmental education program will be restricted to established trails, study sites, and other facilities including buildings, boardwalks, photo blinds, observation decks, and platforms. Existing and new trails and facilities would be designed, constructed, and operated to provide adequate sanctuary for wildlife populations.

All groups using the Refuge for environmental education will be required to make reservations in advance through the Refuge office. A daily limit of 100 students participating in the education program will be maintained through this reservation system. Efforts will be made to spread out use by large groups while reservations are made, reducing disturbance to wildlife and over-crowding of Refuge facilities during times of peak demand.

Environmental education study sites will be located where minimal impact to Refuge resources will occur. Boardwalks, railings, or platforms will be used as appropriate to minimize disturbance by eliminating repeated foot traffic directly in the habitat. Periodic monitoring and evaluation of sites and programs will be conducted to assess if objectives are being met and the resource is not being degraded.

Trail etiquette and ways to reduce wildlife disturbance will be discussed with teachers during orientation workshops and with students upon arrival during their welcome session. Observation platforms and scopes will be provided to view wildlife at a distance, which will reduce disturbance.

Students participating in restoration and monitoring activities will work as described in the program and as permitted in their reservation form. Students will be trained by Refuge staff before they start restoration and monitoring projects to ensure their safety while out in the field and to minimize wildlife and habitat disturbance. Periodic monitoring and evaluation of activities will be conducted to assess if objectives are being met.

Justification: Environmental education is a priority public use of the National Wildlife Refuge System. Providing a quality environmental education program is a Refuge goal. To achieve this goal, the Refuge environmental education program would provide a diversity of environmental education opportunities to students and teachers. These include: (1) facilities, materials, and training; (2) access to a variety of Refuge habitats; and (3) the ability to observe wildlife and conduct hands-on exploration. The program is intended to foster a better understanding of Refuge ecosystems and wildlife resources, and in turn build a public that is more knowledgeable about and involved in natural resource stewardship. Although there is some impact to Refuge lands and wildlife in having an environmental education program, efforts will be made to ensure that they are minimal. The benefits of an environmental education program to resource management well into the future far outweigh the short-term impacts described above.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

__X__ Mandatory 15-year Re-Evaluation Date, will be provided in Final EIS/CCP (for priority public uses)

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

NEPA Compliance for Refuge Use Decision (check one below):

_____ 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

Refuge Determination

Prepared by: _____ (Signature) 10-15-04 (Date)

Refuge Manager/
Project Leader
Approval: _____ (Signature) 10-15-04 (Date)

Concurrence

Refuge Supervisor: _____ (Signature) 10-27-04 (Date)

Regional Chief,
National Wildlife
Refuge System: _____ (Signature) 10/28/04 (Date)

References

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Appendix G.5
Wildlife Observation, Photography, and Interpretation

COMPATIBILITY DETERMINATION
(August 2004)

Use: Wildlife Observation, Photography, and Interpretation

Refuge Name: Nisqually National Wildlife Refuge, located in Thurston and Pierce counties, Washington.

Establishing and Acquisition Authorities: Nisqually National Wildlife Refuge (NWR) was established on January 22, 1974 with approval by the Migratory Bird Conservation Commission. Approximately 2,925 acres of the approved 3,936 acres have been acquired. Legal authorities used for establishment of the Refuge include: Migratory Bird Conservation Act, as amended (16 U.S.C. 715-715d, 715e, 715f - 715r); and Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a - 742j).

Refuge Purposes: Nisqually NWR purposes include:

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

...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).

National Wildlife Refuge System Mission: "To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd et seq.]).

Description of Use: Wildlife observation, photography, and interpretation are considered together in this Compatibility Determination because all are considered to be wildlife-dependent, non-consumptive uses and many elements of these programs are similar. Currently, over 100,000 visitors per year participate in these Refuge programs. The Refuge will continue to provide public facilities, including a Visitor Center with interpretive displays, focusing on Refuge habitats and wildlife. Interpretive panels will also be located along Refuge trails. Interpretation would focus on Refuge habitats, estuarine restoration, improved management, and fish and wildlife. All three of these public uses are dependent upon the Refuge trail system. Below is a description of Refuge trails:

1. An existing accessible 1-mile loop boardwalk trail will be maintained. This self-guided trail surrounds permanent and seasonal wetlands and riparian habitat and has 5 wildlife observation overlooks, a viewing platform, interpretive panels, and permanently mounted scopes and binoculars.

2. There would be a 1½-mile trail on a new exterior dike and boardwalk extension that would be linked with the existing Twin Barns Loop Trail, providing a 3½-mile round-trip walk. This trail would take visitors out past freshwater wetland and riparian restoration areas into the native estuarine and restoration area with a view of Puget Sound.
3. An unimproved, primitive ½-mile trail would be established in the Nisqually River surge plain forest, providing access farther into one of Washington's diminishing habitats than the current trail.
4. A new loop trail (2.5-mile) would be developed on tribal and Refuge lands east of the Nisqually River (Eastside). This trail will lead visitors through pastures, freshwater wetland or riparian restoration areas, and existing and restored estuarine areas. Seasonal closures during the waterfowl hunting season would be required because of activities from a private hunt club. A new visitor contact station and parking area would be constructed to support this trail.
5. Another new trail would include a trail on the East Bluff in an upland coniferous dominated forest. This trail would be elevated and could provide some viewpoints to overlook the delta. Development of this trail would occur after acquisition of the East Bluff parcel has been completed.

Uses within the Proposed Expansion Area: Chapters 2 and 3 of the Final CCP/EIS for Nisqually NWR identify areas in which the Service would seek to acquire land from willing sellers outside of the current Refuge boundary (USFWS 2002). Current levels of wildlife-dependent public use are minimal. The Nisqually Reach Nature Center provides the only public access for wildlife observation, interpretation, and photography. However, this facility does not include a trail system. The Refuge would acquire from or develop a cooperative management agreement with WDFW to cooperatively manage the Luhr Beach Boat Ramp and Nisqually Reach Nature Center to improve the interpretation of Refuge resources from this access point. As property is acquired south of I-5 and on the East Bluff, each parcel will be reviewed to determine whether public access trails or viewing areas could be established. Criteria that will be used for determining the development of new trails include the availability of wildlife sanctuary in the immediate area:

Availability of Resources: The following funding/annual costs would be required to administer and manage wildlife observation, photography, and interpretation activities as described above:

	One-Time Cost	Recurring Cost
Maintenance and operation of Visitor Center, including staff, support materials (brochures), and special events		350K
Construct east side visitor facilities	120K	15K
Construct east side trail with interpretive panels	125K	
Maintenance of new Visitor Contact Station(s), parking area (s), and trails		75K
Law enforcement		45K
Signs/Interpretive panels		15K
Administration		30K
TOTAL	$245K	$530K

Additional funds would be required to construct, operate, and maintain visitor facilities and interpretive materials. Law enforcement staffing would also be needed. Funding would be sought through the Service budget process. Other sources will be sought through strengthened partnerships, grants, and additional Refuge operations funding to support a safe, quality public use program as described above.

Anticipated Impacts of Use:
Wildlife Observation and Interpretation: The construction and maintenance of trails and boardwalks will impact soils, vegetation, and in some instances hydrology around the trails. This could include an increased potential for erosion, soil compaction (Liddle 1975), reduced seed emergence (Cole and Landres 1995), alteration of vegetative structure and composition, and sediment loading (Cole and Marion 1988).

Human activities on trails can result in direct effects on wildlife through harassment, a form of disturbance that can cause physiological effects, behavioral modifications, or death (Smith and Hunt 1995). Birds can be impacted from human activities on trails when they are disturbed and flushed from feeding, resting, or nesting areas. Flushing, especially repetitive flushing, can strongly impact habitat use patterns of many birds species. Flushing from an area can cause birds to expend more energy, be deterred from using desirable habitat, affect resting or feeding patterns, increase exposure to predation or cause birds to abandon sites with repeated disturbance (Smith and Hunt 1995). For example, flocks of geese and ducks are repeatedly flushed by pedestrians on dike trails leading to McAllister Creek during fall and winter months. Extent and duration of bird disturbance can vary depending on the length of time visitors are present or the frequency of disturbance, which varies throughout the year. In some cases, birds will return to the site once people depart; however, in come cases, birds move elsewhere and do not return. An example of longer term impacts is that bird distribution and habitat use of areas in close proximity to the trail are altered throughout much of the fall and winter. For example, when a portion of the dike trail is closed during the hunting season for public safety and to provide improved protection for waterfowl, ducks use the borrow ditch paralleling the trail more, and are quickly flushed from it when the trail is opened.

Migratory birds are observed to be more sensitive than resident species to disturbance (Klein 1989). Herons and shorebirds were observed to be the most easily disturbed (when compared to gulls, terns and ducks) by human activity and flush to distant areas away from people (Burger 1981). A reduced number of shorebirds were found near people who were walking or jogging, and about 50% of flushed birds flew elsewhere (Burger 1981). In addition, the foraging time of sanderlings decreased and avoidance (e.g., running, flushing) increased as the number of humans within 100 meters increased at a coastal bay refuge on the Atlantic (Burger and Gochfeld 1991). Nest predation for songbirds (Miller et al. 1998), raptors (Glinski 1976), colonial nesting species (Buckley and Buckley 1978), and waterfowl (Boyle and Samson 1985) tends to increase in areas more frequently visited by people. In addition, for many passerine species, primary song occurrence and consistency can be impacted by a single visitor (Gutzwiller et al. 1994). This could potentially limit the number of breeding pairs of certain passerine species, thus limiting production within refuge riparian habitats (Reijnen and Foppen 1994).

Wildlife Photography: Of the wildlife observation techniques, wildlife photographers tend to have the largest disturbance impacts (Klein 1993, Morton 1995, Dobb 1998). While wildlife observers frequently stop to view species, wildlife photographers are more likely to approach wildlife (Klein 1993). Even slow approach by wildlife photographers tends to have behavioral consequences to wildlife species (Klein 1993). Other impacts include the potential for photographers to remain close to wildlife for extended periods of time, in an attempt to habituate the wildlife subject to their presence (Dobb 1998) and the tendency of casual photographers, with low-power lenses, to get much closer to their subjects than other activities would require (Morton 1995), including wandering off trails. This usually results in increased disturbance to wildlife and habitat, including trampling of plants. Nisqually NWR is very popular with wildlife photographers. Although all visitors must remain on trails, photographers tend to remain in an area longer, which may lengthen the duration of disturbance to wildlife in a particular area. For example, some photographers have been observed attempting to approach wildlife more closely, typically causing wildlife to depart the area or at least move farther away.

Anticipated Impacts of Uses within the Proposed Expansion Area: The following conditions must be met before allowing existing uses to occur on an interim basis on newly acquired lands: (1) There is no indirect, direct, or cumulative threat anticipated to human health or safety; (2) There is no indirect, direct, or cumulative threat anticipated to natural or cultural resources; (3) The use is consistent with management of existing Nisqually NWR lands and would contribute to achieving Refuge goals. In particular, existing Refuge regulations would not be compromised; (4) The newly acquired lands represent a meaningful unit within which to manage the activity; and (5) There are no anticipated conflicts with priority public uses.

Future wildlife observation, interpretation, and photography opportunities in the expansion area will have similar impacts would as described above.

Public Review and Comment: Public review and comments were solicited in conjunction with the Draft CCP/EIS for Nisqually NWR, released in December 2002. Few comments were received on the Compatibility Determinations. Also see the Summary of Changes document and Appendix M (Comments and Responses). No changes were necessary based on comments received.

Determination:

_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

Stipulations necessary to ensure compatibility: Adequate areas would be designated as wildlife sanctuary with no public use activities to provide high quality habitat for feeding, resting, and thermal protection. Trails will be designed to provide adequate sanctuary areas with minimal fragmentation of habitats. For example, the RNA (764 acres) provides sanctuary because no trails would be developed in this area and seasonal closures and a prohibition on consumptive uses will be enforced. In addition, the restored estuarine area (699 acres) will be closed to all public uses, except for monitoring and research studies. There would be no loop trail in the restored estuarine area because activity in the middle of the restored estuary would be disturbing to wildlife species that use that habitat. In addition, only a short section of boardwalk would remain near McAllister Creek, eliminating much of the current trail activity within this narrow and sensitive area. There would also be no cross trails that would lead visitors into the interior of freshwater habitats to minimize disturbance and maximize bird use in these smaller areas. Where feasible, native trees and shrubs will be planted to create screening along trails to reduce disturbance. These measures will also enhance viewing opportunities and provide quality wildlife observation experiences.

All of the above described uses will be restricted to designated trails and public facilities. Elevated boardwalks with the pin foundation system (no pilings in the ground) will be used in sensitive habitats to reduce effects on soils, vegetation, and hydrology. Observation areas and scopes will be provided to allow visitors to view wildlife at a distance with less or with minimal disturbance. The design of new trails will follow the criteria described above. Any proposed trail developments will only occur after adequate wildlife sanctuary areas have been identified. Visitors will not be allowed into off-trail sanctuary areas unless given permission through the Refuge's Special Use Permitting system for special circumstances. Refuge staff will enforce Refuge regulations prohibiting unauthorized off-trail activities.

Public use on the Refuge will be restricted to daylight hours only. The capacity of the Refuge will be limited to the 100-car capacity parking lot. When the lot is full, the Refuge trails and facilities will be considered to be full. Regulations and wildlife friendly behavior will be described in brochures and posted at the Visitor Center and Visitor Contact Station(s).

Monitoring protocol would be developed to examine impacts associated with differing levels and types of public use. Monitoring data will be critically analyzed and used by the Refuge Manager to develop future modifications if necessary to ensure compatibility of the wildlife observation, photography, and interpretation programs.

Justification: These wildlife-dependent uses are priority public uses of the National Wildlife Refuge System. Providing opportunities for wildlife observation, photography, and environmental interpretation would contribute toward fulfilling provisions of the National Wildlife Refuge System Administration Act, as amended in 1997, and one of the goals of Nisqually NWR. Wildlife observation, photography, and interpretation would provide an

excellent forum for allowing public access and increasing understanding of Refuge resources. The educational possibilities provided by these opportunities would outweigh anticipated impacts associated with implementation of the program. The stipulations outlined above should minimize potential impacts relative to wildlife/human interactions.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

__X__ Mandatory 15-year Re-Evaluation, Date will be provided in Final EIS/CCP (for priority public uses)

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

NEPA Compliance for Refuge Use Decision (check one below):

_____ 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

Refuge Determination

Prepared by: _____ (Signature) 10-15-04 (Date)

Refuge Manager/
Project Leader
Approval: _____ (Signature) 10-15-04 (Date)

Concurrence

Refuge Supervisor: _____ (Signature) 10-27-04 (Date)

Regional Chief,
National Wildlife
Refuge System: _____ (Signature) 10/28/04 (Date)

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Appendix G.6
Research

COMPATIBILITY DETERMINATION
(August 2004)

Use: Research

Refuge Name: Nisqually National Wildlife Refuge, located in Thurston and Pierce counties, Washington.

Establishing and Acquisition Authorities: Nisqually National Wildlife Refuge (NWR) was established on January 22, 1974 with approval by the Migratory Bird Conservation Commission. Approximately 2,925 acres of the approved 3,936 acres have been acquired. Legal authorities used for establishment of the Refuge include: Migratory Bird Conservation Act, as amended (16 U.S.C. 715-715d, 715e, 715f - 715r); and Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a - 742j).

Refuge Purposes: Nisqually NWR purposes include:

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

...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).

National Wildlife Refuge System Mission: "To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd et seq.]).

Description of Use: Nisqually NWR receives 1-4 requests per year to conduct scientific research on the Refuge. Priority would be given to studies that contribute to the enhancement, protection, preservation, and management of native Refuge plant and wildlife populations and their habitats. 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 or habitat, including disturbance (short and long term), injury, or mortality. This includes a description of measures the researcher will take to reduce disturbance or impacts; (5) personnel required; (6) costs to Refuge, if any; and (7) progress reports and end products (i.e., reports, publications). Research proposals would be reviewed by Refuge staff and others, as appropriate, and Special Use Permits will be issued if approved.

Evaluation criteria will include, but not be limited to, the following:

1) Research that will contribute to specific Refuge management issues will be given higher priority over other requests.

2) Research that will conflict with other ongoing research, monitoring, or management programs will not be granted.

3) Research projects that can be done off-Refuge are less likely to be approved.

4) Research which causes undue disturbance or is intrusive will likely not be granted. Level and type of disturbance will be carefully weighed when evaluating a request.

5) Research evaluation will determine if any effort has been made to minimize disturbance through study design, including considering adjusting location, timing, scope, number of permittees, study methods, number of study sites, etc.

6) If staffing or logistics make it impossible for the Refuge to monitor researcher activity in a sensitive area, this may be reason to deny the request, depending on the specific circumstances.

7) The length of the project will be considered and agreed upon before approval. Projects will be reviewed annually.

Uses within the Proposed Expansion Area: Chapters 2 and 3 of the Final CCP/EIS for the Nisqually NWR identify areas in which the Service would seek to acquire land from willing sellers outside of the current Refuge boundary (USFWS 2002). If property is acquired that includes areas of research interest, the same Special Use Permit process and evaluation criteria as described above will be followed.

Availability of Resources: The following funding/annual costs would be required to administer and manage research activities as described above:

	Recurring Costs
Administration (Evaluation of applications, management of permits, and oversight of research projects)	12K
TOTAL	$12K

Refuge operational funds are currently available through the Service budget process to administer this program.

Anticipated Impacts of Use: Some level of disturbance is expected with all research activities since most researchers will be entering areas that are normally closed to the public, including going off designated trails, and may be collecting samples or handling wildlife. However, minimal impact to Refuge wildlife and habitats will be expected with research studies because Special Use Permit conditions will include conditions to ensure that impact to wildlife and habitats are kept to a minimum (see discussion above).

Anticipated Impacts of Uses within the Proposed Expansion Area: The following conditions must be met before allowing existing uses to occur on an interim basis on newly acquired lands: (1) There is no indirect, direct, or cumulative threat anticipated to human health or safety; (2) There is no indirect, direct, or cumulative threat anticipated to natural or cultural resources; (3) The use is consistent with management of existing Nisqually NWR lands and would contribute to achieving Refuge goals. In particular, existing Refuge regulations would not be compromised; (4) The newly acquired lands represent a meaningful unit within which to manage the activity; and (5) There are no anticipated conflicts with priority public uses.

If researchers are granted Special Use Permits to conduct research in the expansion area, anticipated impacts would be similar to that described above.

Public Review and Comment: Public review and comments were solicited in conjunction with the Draft CCP/EIS for Nisqually NWR, released in December 2002. Few comments were received on the Compatibility Determinations. Also see the Summary of Changes document and Appendix M (Comments and Responses). No changes were necessary based on comments received.

Determination:

_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

Stipulations necessary to ensure compatibility: Extremely sensitive wildlife habitat areas will be provided sufficient protection from disturbance by limiting proposed research activities in these areas. All Refuge rules and regulations must be followed unless otherwise excepted by Refuge management.

The criteria for evaluating a research proposal, outlined in the Description of Use section above, will be used when determining whether a proposed study will be approved on the Refuge. If proposed research methods are evaluated and determined to have potential impact on Refuge resources (habitat or wildlife), it must be demonstrated that the research is necessary for Refuge resource conservation management. Measures to minimize potential impacts would need to be developed and included as part of the study design. In addition, these measures will be listed as conditions on the Special Use Permit.

Refuge staff will monitor researcher activities for compliance with conditions on the Special Use Permit. At any time, Refuge staff may accompany the researchers to determine potential impacts. Staff may determine that previously approved research and special use permits be terminated due to observed impacts. The Refuge Manager will also have the ability to cancel a Special Use Permit if the researcher is out of compliance or to ensure wildlife or habitat protection.

Justification: This program as described is determined to be compatible. Potential impacts of research activities on Refuge resources will be minimized because sufficient restrictions would be included as part of the study design and researcher activities will be monitored by Refuge staff. Research projects will contribute to the enhancement, protection, preservation, and management of native Refuge wildlife populations and their habitats.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

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

__X__ Mandatory 10-year Re-Evaluation, Date will be provided in Final EIS/CCP (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

_____ 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

Refuge Determination

Prepared by: _____ (Signature) 10-15-04 (Date)

Refuge Manager/
Project Leader
Approval: _____ (Signature) 10-15-04 (Date)

Concurrence

Refuge Supervisor: _____ (Signature) 10-27-04 (Date)

Regional Chief,
National Wildlife
Refuge System: _____ (Signature) 10/28/04 (Date)

References

USFWS. 2002. Nisqually National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Impact Statement. U.S. Fish and Wildlife Service, Region 1.

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Appendix G.7
Agriculture – Haying

COMPATIBILITY DETERMINATION
(August 2004)

Use: Agriculture - Haying

Refuge Name: Nisqually National Wildlife Refuge, located in Thurston and Pierce counties, Washington.

Establishing and Acquisition Authorities: Nisqually National Wildlife Refuge (NWR) was established on January 22, 1974 with approval by the Migratory Bird Conservation Commission. Approximately 2,925 acres of the approved 3,936 acres have been acquired. Legal authorities used for establishment of the Refuge include: Migratory Bird Conservation Act, as amended (16 U.S.C. 715-715d, 715e, 715f - 715r); and Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a - 742j).

Refuge Purposes: Nisqually NWR purposes include:

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

...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).

National Wildlife Refuge System Mission: "To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd et seq.]).

Description of Use: The existing haying program is conducted to provide browse for wintering waterfowl, particularly American wigeon and Canada geese. Approximately 250 acres of Refuge grasslands are hayed annually by a local farmer under a Special Use Permit. Haying operations are not allowed to begin until after July 1 so that most ground nesting birds can finish nesting. No pesticides or herbicides are associated with this use. Fertilizers may be added annually to some hay fields to provide nutrients for better grass production. A Cooperative Land Management Agreement will be developed and the cooperator will be required to provide service or materials to the Refuge that will enhance the habitat in exchange for the hay removed.

As a result of estuarine restoration and freshwater enhancement activities, the haying program will be greatly reduced as the proportion of freshwater wetlands within the diked area increases. By the completion of major restoration activities (2005), less than 100 acres of grasslands will be managed by the Service. These grasslands will be interspersed among permanent and seasonal freshwater wetlands. Once restoration is completed, haying on this reduced acreage may not be cost-effective for a cooperator. If there is a willing cooperator, the haying program will continue

through a Cooperative Land Management Agreement, as described above. However, if no cooperators are interested, the management of the remaining grasslands will become part of routine Refuge habitat management activities.

Uses within the Proposed Expansion Area: Chapters 2 and 3 of the Final CCP/EIS for the Nisqually NWR identify areas in which the Service would seek to acquire land from willing sellers outside of the current Refuge boundary (USFWS 2002). If property is acquired that include agricultural and grassland areas, each parcel will be reviewed to determine whether a haying program will be established. If established, the program will operate in the same manner as described above.

Availability of Resources: The following funding/annual costs would be required to administer and manage haying activities, as described above:

	Recurring Costs
Administration	5K
TOTAL	$5K

Refuge operational funds are currently available through the Service budget process to administer this program.

Anticipated Impacts of Use: Anticipated impacts include: (1) short-term disturbance to wildlife caused by presence and activities of equipment and vehicles in fields; (2) detrimental effects of mowing on late ground-nesting birds (after July 1); (3) disturbance to soils or plants associated with mowing and fertilizing; (4) adverse impacts to species associated with dense native grasses, sedges, and rushes; (5) decline in natural biological diversity; and (6) potential introduction of invasive plant species from cooperator equipment. While some conflicts with natural biological diversity principles are evident, management of grasslands benefit wintering waterfowl and would occur in limited areas only. The resulting browse, when flooded in the fall and winter months, created by haying and mowing activities provides important food for wintering waterfowl that is not readily available in other areas during this time. The small acreage of grasslands will be managed as part of a mosaic of permanent and seasonal wetlands, grasslands, and shrub/scrub habitats to provide a diversity of habitats for a variety of migratory birds.

Anticipated Impacts of Uses within the Proposed Expansion Area: The following conditions must be met before allowing existing uses to occur on an interim basis on newly acquired lands: (1) There is no indirect, direct, or cumulative threat anticipated to human health or safety; (2) There is no indirect, direct, or cumulative threat anticipated to natural or cultural resources; (3) The use is consistent with management of existing Nisqually NWR lands and would contribute to achieving Refuge goals. In particular, existing Refuge regulations would not be compromised; (4) The newly acquired lands represent a meaningful unit within which to manage the activity; and (5) There are no anticipated conflicts with priority public uses.

If a haying program is implemented in the expansion area, anticipated impacts would be similar to that described above.

Public Review and Comment: Public review and comments were solicited in conjunction with the Draft CCP/EIS for Nisqually NWR, released in December 2002. Few comments were received on the Compatibility Determinations. Also see the Summary of Changes document and Appendix M (Comments and Responses). No changes were necessary based on comments received.

Determination:

_____Use is Not Compatible

__X__Use is Compatible with the Following Stipulations

Stipulations necessary to ensure compatibility: A Special Use Permit (SUP) will be issued to all cooperators associated with haying activities. All haying activities will be restricted to designated areas, limiting activity to these annually disturbed sites. Haying activities will start after July 1 each year, so that the majority of the ground-nesting birds have the opportunity to complete nesting, and be completed by November 1 to provide undisturbed winter and spring habitat for migratory waterfowl. Habitat needs in these areas will be reviewed annually to determine whether haying continues to be the appropriate management strategy for each site. Refuge staff will monitor activities of permittee or cooperator to ensure that special conditions required under the SUP or Cooperative Land Management Agreement are met.

Justification: Haying will provide feeding areas for migratory birds, primarily wintering waterfowl, a primary purpose for the establishment of this Refuge. Managing limited grassland areas as designated haying sites with a permittee or cooperator allows the Refuge to achieve specific habitat management objectives for these sites with minimal Service resources. These grasslands would be managed as part of a complex of freshwater wetlands and riparian areas, providing a more diverse mix of habitats for various migratory bird species. In addition, a haying program will complement Refuge reed canary grass control efforts at minimal cost to the Refuge.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

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

___X___ Mandatory 10-year Re-Evaluation, Date will be provided in Final EIS/CCP (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

_____ 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

Refuge Determination

Prepared by: _____ (Signature) 10-15-04 (Date)

Refuge Manager/
Project Leader
Approval: _____ (Signature) 10-15-04 (Date)

Concurrence

Refuge Supervisor: _____ (Signature) 10-27-04 (Date)

Regional Chief,
National Wildlife
Refuge System: _____ (Signature) 10/28/04 (Date)

References

USFWS (U.S. Fish and Wildlife Service). 2002. Nisqually National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Impact Statement. U.S. Fish and Wildlife Service, Region 1.

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Appendix H
List of Preparers

[For a copy of this appendix, see the Final CCP/EIS document]

Appendix I
Goals, Objectives, and Strategies

[For a copy of this appendix, see the Final CCP/EIS document]

Note: Information from this CCP/EIS appendix has been updated and is included as Chapter 4 of this CCP.

Appendix J
Hydrodynamic and Sediment Transport Modeling Summary

Appendix J: Hydrodynamic and Sediment Transport Modeling Summary

Introduction

A hydrodynamic and sediment transport model and technical report were developed to evaluate tidal restoration alternatives at Nisqually NWR (ENSR 1999). This computer model was used to simulate water, sediment, and salinity characteristics under various restoration scenarios using a mean tide and mean annual river flow condition, and under 1996 river flood conditions. This modeling effort was useful in evaluating critical physical components involved in restoration, including water flow, timing, velocity, bed shear, salinity, sedimentation, and extent of tidal inundation. The model was also used to assess extreme flood conditions and alternative dike configurations.

Methods

The study area included the Nisqually River, McAllister Creek, I-5, and Puget Sound/Nisqually Reach as limits on each side. Existing data were used as much as possible on river and delta geometry, bathymetry, currents, salinity, and sediment characteristics. In addition, new data were gathered in the Nisqually River and McAllister Creek to fill information gaps, including river bathymetry, velocity time-series, salinity profiles, water surface elevations, suspended sediment concentration, and creek and pond bathymetry inside the diked area. The models used were RMA-10 for hydrodynamics and RMA-11 for sediment and salinity transport. These models can account for the effects of temperature, salinity, and suspended sediment on flow in rivers, estuaries, lakes, and reservoirs. The models were calibrated and verified using data collected during spring 1998 from the Nisqually River and McAllister Creek.

Eight alternatives were examined (with a variation in breach width on one alternative), ranging from Alternative 1, no changes in existing dike configuration (status quo), to Alternative 8, with maximum tidal restoration (approximately 80% of the diked area). Each alternative assumed the dikes were reduced down to grade in estuarine restoration areas, and the adjacent borrow ditch was filled, except for two alternatives that included breaching and bridging dikes in specific locations and retaining the dike system, with the borrow ditch left unfilled. Breaches in Alternative 3 had widths of 45 to 55 feet, creating restricted tidal flow. Breach widths were also modified in Alternatives 3 and 4 with breach widths sized to be slightly wider than the size of the existing tidal sloughs, so as to try ensure that high tidal volumes could enter and exit the restoration site. This made breaches very wide, from approximately 240 to 325 feet. These modifications were referred to as Alternatives 3W and 4b. Alternative 6, the 70% tidal restoration alternative, included a low berm to create a riparian restoration zone along the Nisqually River. All alternatives were designed to protect Nisqually NWR headquarters facilities within dikes.

Modeling Results and Discussion

The model provides important information that is useful in assessing some of the key components of estuarine restoration projects. Successful estuarine restoration typically depends on recreating a fully functional tidal system, where the tidal prism or volume is sufficient for full

tidal inundation in the restored area with each tidal cycle. Natural patterns in tidal flushing and circulation are critical to flush soils, carry nutrients and sediments to all parts of a restored site, and create the intricate system of tidal channels that feed a salt marsh. Conversely, tidal waters must be able to evacuate the site, to avoid ponding and fish entrapment. Excessive ponding will create lagoon-like or subtidal conditions, rather than a salt marsh. Isolated ponding can create artificially high salinities in water or soils due to evaporation and lack of flushing. Successful estuarine restoration also depends on the ability of sediments to reach the restored site, to accumulate soils and build the elevations necessary to grow salt marsh vegetation. Areas requiring tidal restoration are often subsided, and sedimentation is a critical component of successful restoration. Another important factor in successful estuarine restoration includes minimizing areas of high water velocity or bed shear to avoid creating highly erosive features. High bed shear could result in erosion of salt marsh, dikes, or breaches that would present potential failure sites or constant maintenance needs.

Dike Configuration and Water Movement: In alternatives where the dikes were removed to grade and the borrow ditch filled, full tidal penetration occurred with each of the alternatives. In Alternative 3, when dikes were breached with narrow openings along McAllister Creek, the peak water surface elevation in the restored area decreased by approximately 1.7 feet, and the peak was delayed by 40 minutes from what would be expected with unrestricted tidal conditions. Even wide breaches (Alternatives 3W and 4b) produced a slight delay due to the distance from the mouth of McAllister Creek. For Alternative 4b, the 50% restoration alternative in which the dikes were retained and very wide breaches added, the peak water surface elevation and timing of the tide phase were not significantly decreased. However, the wide breaches apparently reduced outflow during the receding tide, so stored water could not completely drain, leaving ponding within the restored area and in the unfilled borrow ditches. Leaving the borrow ditches unfilled (Alternatives 3, 3W, and 4b) also showed that tidal waters were partially diverted into the borrow ditches on incoming tides, affecting tidal circulation in sloughs.

Flooding: During extreme flood conditions, the Nisqually River overtops its banks upstream of the Refuge, on the south side of the I-5 bridge. The water inundates the floodplain and flows into the diked area, with approximately 70% of flood waters entering the southeast corner of the Refuge through a channel and opening under I-5 and about 30% entering through an overflow channel adjacent to McAllister Creek. All alternatives showed flooding in the diked area under 1996 flood conditions. The alternatives that restored 70% and 80% of the diked area and eliminated cross dikes along the McAllister Creek side of the Refuge reduced flood impacts to the Refuge. These alternatives allowed flood waters from the McAllister Creek overflow channel to empty unimpeded into the McAllister Creek tidal system, instead of emptying inside of diked habitat. However, diked areas in all alternatives were still flooded by flows from the overflow channel at the southeast corner of the Refuge.

Water Velocities and Bed Shear: Water velocities in tidal channels outside the dike under current conditions (status quo) were lower than restored alternatives where dikes were removed. This illustrates one of the effects of diking, where tidal channels outside the dike have a reduced tidal prism or volume because of the loss of tidal area. Alternatives that created new crossdikes that blocked tidal channels created this same backwater effect, producing a reduced volume or flow in tidal channels than would occur in a system without dikes. Alternatives with no crossdikes along McAllister Creek (70% and 80% alternatives) alleviated this effect, producing fuller tidal flow in the sloughs and channels along McAllister Creek.

Water velocities and bed shear, another measure of potential erosion, were much higher in fixed breaches, as compared to unrestricted tidal channels where dikes were removed. This illustrates the difficulty in protecting fixed breaches from eroding or widening, especially during flood conditions. In addition, velocities in the Nisqually River were confirmed to be much higher at large bends in the river, particularly during flood conditions, illustrating the highly erosive conditions that lead to dike failures, when these high velocities are forced to stay within constricted channels.

Salinity: Salinity patterns were only modeled for two tidal cycles. Longer simulations may show greater salinity penetration. Alternatives where dikes were breached and retained showed less salinity penetration in the restored area. Less salinity penetration was also observed in McAllister Creek in a 50% alternative, due to the dike constriction along McAllister Creek, which reduced tidal flow up McAllister.

Sedimentation: Sediment loads are small in the Nisqually River, McAllister Creek, and the Nisqually Reach during near annual flow conditions. Maximizing sediment deposition in restored areas is important to enhance success in a sediment-poor system like the Nisqually delta. The major source of sediments comes down the Nisqually River during flood events, when large amounts of sediment are carried in flood waters. An extended simulation period may be needed to evaluate more long-term deposition patterns; however, deposition during the 1996 flood event provides an example of potential sedimentation patterns. Dike configuration affected sediment deposition patterns. In general, alternatives where more dike was removed along the Nisqually River showed more sediment deposition along the river and in restored areas. Alternative 3, which had narrow dike breaches, showed little sediment deposition.

Conclusions

The model was very useful in evaluating various estuarine restoration scenarios, using a variety of dike configurations. Full tidal penetration occurred when dikes were removed to grade and the borrow ditch filled. Narrow breaches restricted tidal flow, reducing water surface elevations on incoming tides and delaying tidal flows. Breaches greater than the width of channel openings also allowed full tidal penetration, but stored water did not completely drain in receding tides, resulting in ponding in marshes and borrow ditches. Borrow ditches partially diverted incoming tidal flows when left unfilled, affecting circulation in restored tidal channels. Restoration scenarios retaining dikes with breaches also reduced sedimentation and altered salinity patterns. Water velocities and bed shear in channels moving through dike breaches indicated that fixed breaches may be difficult to protect from erosion.

Flooding upstream of I-5 is not expected to be adversely impacted by habitat restoration. Alternatives resulting in 70% and 80% estuarine restoration reduced flooding in the diked area, by allowing the McAllister overflow channel to empty directly into McAllister Creek. Salinity tended toward marine conditions, but some brackish areas may occur near the margins of marine water penetration. The Nisqually River is a sediment-poor system, due to dams upstream on the Nisqually River which trap much of the sediments. However, during flood events, the Nisqually River provides a major source of sediment. Dike configurations with more dike removed along the River allowed a greater amount of sediment to deposit in the restored area.

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Appendix K
Land Protection Plan

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

LAND PROTECTION PLAN

Nisqually National Wildlife Refuge
Thurston and Pierce Counties, Washington

Prepared By:

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May 2002

APPENDIX K

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Land Protection Plan

Nisqually National Wildlife Refuge

Thurston and Pierce Counties, Washington
May 2002

1.1 INTRODUCTION

The U.S. Fish and Wildlife Service (Service) has prepared this Land Protection Plan identifying the habitat protection methods that could take place for lands within Alternative D (Preferred Alternative) described in the Comprehensive Conservation Plan and Environmental Impact Statement (EIS) and for lands within the approved boundary of the Nisqually National Wildlife Refuge (Refuge). This plan also includes a priority listing of lands to be considered for acquisition within the proposed boundary and within the approved boundary.

1.2 PROJECT DESCRIPTION

Nisqually Refuge is located in Thurston and Pierce counties along southern Puget Sound (EIS, Figure 1.1-1). The Refuge was established in 1974 to protect the existing estuary from development. The approved Refuge boundary is approximately 3,936 acres. The acquisition program is ongoing and the Service has acquired approximately 2,925 acres in fee title, conservation easements, and leases to date within the approved refuge boundary. Non-refuge lands within the approved boundary total approximately 1,011 acres.

The proposed expansion would add approximately 3,479 acres for a total authorized boundary of 7,415 acres. The expansion would include 512 acres of upland habitat and 2,963 acres of floodplain, riparian, and wetland habitat. The boundary would increase habitat protection on the East Bluff north of I-5 to include a forested corridor. It would also extend the boundary south of I-5 to include floodplain, bluff, wetland, and upland forested habitats along the Nisqually River and McAllister Creek.

McAllister Creek Area: McAllister Creek originates from springs and seeps located approximately 3 miles south of Interstate 5 (I-5). It flows northerly along the base of forested bluffs, passing through the Refuge and emptying into Puget Sound. Medicine Creek originates near the Nisqually River and meanders west through developments and agricultural lands until it meets McAllister Creek.

Early in the century, the area surrounding the southern portions of McAllister Creek was likely covered with riparian forest habitat and freshwater wetlands until the majority of it was harvested, diked, and drained for use as cropland and pasture. Today, much of the McAllister Creek watershed south of I-5 continues to be maintained as pasture and cropland with dikes. The area contains freshwater wetlands in the form of potholes and upland depressions. Wetland vegetation includes sedge stands, cattails, bulrushes, willows, salmonberry, and skunk cabbage.

The headwater springs of McAllister Creek are surrounded by upland forest habitat consisting primarily of second growth Douglas-fir. The agricultural lands would provide grassland habitat and restoration opportunities for riparian forest habitat and freshwater wetlands.

The agricultural lands south of I-5 are currently used by migratory waterfowl for foraging and resting during localized flooding events in the fall and winter period. Common waterfowl species include American wigeon, mallards, pintails, green-winged teal, and Canada geese.

As the high tides cover the estuary, shorebirds are pushed inland and can be found using the agricultural lands along McAllister Creek. Typical shorebird species found include dunlin, dowitchers, western and least sandpipers, common snipe, and yellowlegs.

The creek historically contained seven species of salmon and trout, specifically chinook, coho, chum, and pink salmon, cutthroat and bull trout, and steelhead. Remnant runs of chinook, coho, and chum salmon, bull trout, and steelhead continue to return.

East Bluffs: The bluffs located along the eastern edge of the study area are covered with upland forest dominated by conifers. Douglas-fir is predominant, mixed with bigleaf maple, western hemlock, and red alder. The area drains directly into that portion of the Nisqually River located within the Refuge. The forest habitat located in the east bluff area provides habitat for passerines, woodpeckers, and raptors. A bald eagle nest has been reported on the bluff. The area also serves as a migration corridor for mammal species moving from one habitat to another.

Nisqually Valley and River Corridor: The Nisqually Valley and River corridor consists of agricultural lands, freshwater wetlands, and the riparian corridor contained within upland bluffs on the east rising from the river valley. The riparian corridor contains relatively undisturbed floodplain forest, backwater areas, and freshwater wetlands. Black cottonwood, red alder, bigleaf maple, Douglas-fir, and western red cedar are the dominant tree species found in the riparian corridor. The statewide significance of this area is documented in a proposal completed by The Nature Conservancy in December of 1993 which proposed the establishment of a Research Natural Area along a portion of the Nisqually River. The forested bluffs in the Nisqually River portion of the area include species such as red alder and bigleaf maple, with scattered coniferous species including Douglas-fir and western red cedar and is located on the east side of the Nisqually River.

The large and relatively undisturbed floodplain forest, backwater areas, and freshwater wetlands along the corridor provide an exceptionally productive ecosystem. Examples of species that use these types of habitats are the Pacific giant salamander, red-legged frog, tailed frog, great blue heron, harlequin duck, wood duck, belted kingfisher, American dipper, water vole, beaver, and river otter. The threatened marbled murrelet has been seen along the corridor and other inhabitants include passerines, woodpeckers, and raptors.

Ten species of salmonids occur in the Nisqually River system. Chum, coho, and chinook salmon and steelhead all have distinct and healthy stocks in the river, although these runs are decreasing. The Nisqually River chinook is listed as threatened under the Endangered Species Act. Historical populations of bull trout, currently listed as threatened in Puget Sound, may exist in the Nisqually River.

1.3 THREAT TO OR STATUS OF THE RESOURCE

The South Puget Sound area is experiencing rapid growth in residential, resort, and recreational development. Many of these developments threaten the integrity of coastal ecosystems that support existing fish and wildlife populations.

The agricultural land in the McAllister Creek drainage falls within Thurston County, Washington. Thurston County recently purchased development rights on an estimated 840 acres from several of the landowners in an attempt to preserve the agricultural emphasis of the area and to prevent development of high density residential housing. The restricted development rights do allow for the conversion of agricultural lands into plant nurseries which are becoming popular in Washington. Currently, the agricultural lands contain some habitat values for migratory birds and small mammals. Conversion of these lands into nurseries occupied with greenhouses would essentially eliminate habitat values.

Some of the area along the Nisqually River falls within the Fort Lewis Military Reservation and is an excellent example of native bottomland riparian forest habitat. Unregulated use by the public has resulted in the creation of dirt roads along some of the river corridor. This unregulated use is causing habitat degradation and threatens the integrity of the native habitat. A limited amount of military training occurs in a portion of the proposed Research Natural Area.

Thurston County, located west of the Nisqually River, requires a 200-foot setback from the bluffs because of a concern for unstable soil conditions along the bluffs. Pierce County, located east of the Nisqually River, allows for construction along the top of the bluff with no required setback. Weyerhaeuser Company currently has plans to develop approximately 400 acres along the top of the bluffs, adjacent to the eastern boundary of the Refuge. There is a concern that developments adjacent to the top of the bluffs would cause increased siltation with corresponding degradation of water quality in the Nisqually Delta, fragment habitat, and compromise the visual landscape of the bluffs from the Refuge and other parts of the delta.

1.4 PURPOSE OF THE PROPOSED EXPANSION

When Nisqually Refuge was established in 1974, the original boundary was designed to protect the Delta from specific threats of development. During the ensuing 25 years, increased development has resulted in habitat loss and degradation throughout the Puget Sound area, including the lower Nisqually watershed, contributing to declines of many fish and wildlife species. Refuge expansion would help alleviate the effects of increased habitat degradation, loss, and development pressures in adjacent parts of the lower watershed. Expanding the approved Refuge boundary would allow the Service to negotiate with willing participants within the new approved boundary to acquire lands or interests in land and water. Lands, or interests in lands acquired by the Service, would be managed as a part of the National Wildlife Refuge System (System). The System is the largest collection of lands specifically managed for fish and wildlife habitat. The needs of wildlife and their habitats come first on refuges, in contrast to other public lands managed for multiple uses.

The administration, management, and growth of the System are guided by the following goals: 1) preserve, restore, and enhance all species of fish, wildlife, and plants that are endangered or threatened with becoming endangered, 2) perpetuate migratory bird, inter-jurisdictional fish, and marine mammal populations, 3) preserve a natural diversity of fish, wildlife, and plants, 4) preserve and restore representative ecosystems of the United States, including the natural processes characteristic of those ecosystems, and 5) foster understanding and instill appreciation of fish, wildlife, and plants, and their conservation, by providing the public with safe, high-quality, and compatible wildlife-dependent public uses. Such uses includes hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

The Nisqually Refuge falls within the North Pacific Coast Ecoregion. The Service's goal for the North Pacific Coast Ecoregion is to protect, restore, and enhance the function, structure, and species composition of ecosystems for fish and wildlife conservation and 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, can 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 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 watershed restoration efforts on 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.

The expansion of the Nisqually Refuge would help achieve Ecoregion goals and objectives by 1) protecting and restoring habitat for declining populations of anadromous fish, including the federally listed chinook salmon and the federally listed bull trout, 2) enhancing and contributing to existing habitat protection efforts by the Nisqually Tribe, Fort Lewis Military Reservation, Thurston and Pierce counties, Nisqually River Council, Nisqually River Basin Land Trust, and local conservation organizations, 3) providing a diversity of native habitats that will maintain and enhance healthy populations of fish, wildlife, and plant species native to the Nisqually River delta, and 4) providing additional quality wildlife-dependent public use opportunities.

Refuge expansion would contribute to achieving Refuge goals including 1) to conserve, manage, restore, and enhance native habitats and associated plant and wildlife species representative of the Puget Sound lowlands with a special emphasis on migratory birds and salmon, 2) support recovery and protection efforts for Federal and State threatened and endangered species of concern, and their habitats, 3) provide quality environmental education opportunities focusing on fish, wildlife, and habitats of the Nisqually River delta and watershed, and 4) provide quality wildlife-dependent recreation, interpretation, and outreach opportunities to enhance public appreciation, understanding, and enjoyment of fish, wildlife, habitats, and cultural resources of the Nisqually River delta and watershed.

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.

1.5 LAND PROTECTION METHODS

1.5.1 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 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.

1.5.2 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 with Fort Lewis could involve key partners, including the Nisqually Indian Tribe. Techniques to provide improved protection of USA Trust lands would be restricted to cooperative agreements.

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 applied to land under any type of ownership.

Conservation Easements. Conservation easements transfer some, but not all property rights to the Service as specified by mutual agreement. 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.

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.

1.6 LAND PROTECTION PRIORITIES

Tables 1 and 2 list the lands within the preferred expansion boundary and within the approved Refuge boundary, respectively, by tract number, inset map, total acres, priority and possible method(s) for resource protection (ownership information is from the Pierce and Thurston County Assessor Offices and subject to change). Priorities (1, 2, 3, or 4) are assigned to each tract, 1 means high, 2 means moderate, 3 means low, and 4 means no longer of interest at this time. 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 EIS, 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.

1.7 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 (EIS, Chapter 6).

1.8 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 addition. Intensified management would increase habitat quality and improve wildlife use which would result in positive effects for wildlife observation, interpretation, and photography opportunities at the Refuge. Improvements will also enhance environmental education opportunities, particularly the opportunity to observe active habitat restoration/management activities. In addition, enhanced

waterfowl and fish habitats may encourage more waterfowl and fish to use the delta, improving waterfowl hunting and fishing opportunities (EIS, Chapter 4, section 4.6.4.1).

The Refuge environmental education program would be expanded to accommodate up to 15,000 students per year. The trail length would be shortened from the current 5½- mile loop trail to a 3½- mile round trip (non-loop) trail but of improved quality with diversified viewing opportunities. A new eastside trail would also be constructed. A trail would be established on the East Bluff if appropriate lands were acquired. Approximately 191 acres of the Refuge would be open to a quality waterfowl hunting program. Walk-in hunting opportunities would be considered south of I-5 if sufficient lands were acquired to allow for adequate wildlife sanctuary and minimal conflicts with other priority public uses. Bank fishing opportunities would be investigated along McAllister Creek south of I-5, if appropriate sites were acquired. This would provide new bank fishing access to help compensate for the loss of McAllister Creek bank fishing north of I-5 as a result of estuarine restoration, although the scheduled closure of the McAllister Creek Hatchery (July 2002) would reduce fishing opportunity, thereby lessening the effects of this loss. New fishing access at Luhr Beach and Nisqually River would be provided. Overall, the fishing opportunity at Nisqually Refuge is not expected to decrease (EIS, Chapter 4, section 4.6.4.3).

The Nisqually Indian Tribe would continue to hunt, fish, and gather. There are no anticipated adverse health or environmental effects to the Nisqually Indian Tribe from refuge expansion (EIS, Chapter 4. section 4.8.1).

Recreation economic expansion is expected to be proportionate to increased recreation and public access resulting from Refuge expansion. Increased revenue for the Refuge and region would depend on what lands were acquired. The effects of new facilities, new trails, improved habitat, and more student visits would be expected to contribute to an increasing trend in visitation, producing increased economic benefits (EIS, Chapter 4, section 4.8.4.4).

Approximately 1,100 acres of agricultural land in Thurston County and 190 acres in Pierce County could be acquired for conservation uses. Within Thurston County, approximately 840 acres are within the existing Purchase of Development Rights program. Expansion of the Refuge could result in the reduction of grazing opportunities and the conversion of some agricultural lands to wetlands and riparian habitats, but the impact to the overall agricultural economies of these counties would be minor.

The salary and operating costs for the Refuge with a fully implemented Comprehensive Conservation Plan would be approximately $1.8 million dollars, $1.2 million above current expenditure, which would be directed towards the Refuge payroll and operational costs and contribute directly to the regional economy. There would be an indirect support of approximately 55 jobs in the regional economy (EIS, Chapter 4, section 4.8.3.4). In the context of the robust economies of Thurston and Pierce counties, these increases would be minor.

	Table 1. Land Protection Priorities for Expansion Area				
TRACT #	**OWNER NAME**	**Figure #**	**PRIORITY**	**ACRES**	**PROTECTION METHODS**
1,a,b	USA-ARMY	3,4,5	3	1083.00	Fee, Coop Agree, Easement
2f,g	WASH STATE-DEPT OF GAME	2,6	3	3.72	Coop Agree, Fee
2h	WASH-FISHERIES DEPT	4	3	8.09	Coop Agree
2i	WASH STATE-FISH HATCHERY	5	3	8.09	Coop Agree
3	THURSTON, COUNTY OF	3	3	0.24	Fee, Coop Agree, Easement
3a	THURSTON, COUNTY OF	4	3	6.06	Fee, Coop Agree, Easement
4	LACEY, CITY OF	4	3	0.18	Coop Agree
5	OLYMPIA, CITY OF	5	3	176.33	Coop Agree
6	FIRE DISTRICT #3	3	3	1.00	Fee, Coop Agree, Easement
12c,d	WEYERHAEUSER	2	1	175.24	Fee, Coop Agree, Easement
19c,d,g,h	NISQUALLY INDIAN TRIBE	2,5	3	419.72	Easement
51	HOLLISON, ROBERT AND KATHLEEN	2	1	18.74	Fee, Coop Agree, Easement
52	BENNAR, RAY AND GLENDA	2	2	1.76	Fee, Coop Agree, Easement
53	LEIGH, JOANN	2	2	1.15	Fee, Coop Agree, Easement
54	MEGEE, KATHLEEN	2	2	2.00	Fee, Coop Agree, Easement
55	MCBRIDE, ALBERT E. JR	2	2	12.27	Fee, Coop Agree, Easement
56	NISQUALLY RIVER LAND TRUST	2	1	12.99	Fee, Coop Agree, Easement
57	Unknown	2	1	unk	Fee, Coop Agree, Easement
58,a	BRIDGES, TERESA M	3	2	99.63	Fee, Coop Agree, Easement
59	WALKER, LESTER B	3	3	0.69	Fee, Coop Agree, Easement
60	SCOTT, CINDY	3	3	0.88	Fee, Coop Agree, Easement
61	ALVESTAD, CAREY D ETAL	3	3	0.81	Fee, Coop Agree, Easement
62	GOTTFRIEDSON, HENRY F/ALISON K	3	3	1.00	Fee, Coop Agree, Easement
63	MATHEWS, MAUREEN H	3	3	1.02	Fee, Coop Agree, Easement
64	DERICKSON, DOUGLAS	3	3	0.24	Fee, Coop Agree, Easement
65	TAYLOR, GARY/JANET	3	3	0.47	Fee, Coop Agree, Easement
66	FRANK, WILLIE	3	3	6.00	Fee, Coop Agree, Easement
67	BLACK, JEFFREY S/CONNIE M	3	3	0.52	Fee, Coop Agree, Easement
68	CLEMENT, KENDALL S & MARIBETH	3	3	1.00	Fee, Coop Agree, Easement
69	BRUDER, TERESA/RUSS	3	3	1.18	Fee, Coop Agree, Easement
70	ROESSNER, DEBRA D	3	3	0.92	Fee, Coop Agree, Easement
71	LOVIK, DENA L	3	3	0.61	Fee, Coop Agree, Easement
72	BOHREN, PATTI	3	3	1.36	Fee, Coop Agree, Easement
73	COLE, CLARA M	3	2	3.61	Fee, Coop Agree, Easement
74	MILLER, RHETT	3	2	0.83	Fee, Coop Agree, Easement
75	CAMPBELL, LOIS M	3	2	3.40	Fee, Coop Agree, Easement
76	MC GILLIS, JOHN W	3	3	0.50	Fee, Coop Agree, Easement
77	LOSEY, DAVID L/SHARON	3	3	1.00	Fee, Coop Agree, Easement
78	GRASSI, NELLO L	3	2	4.12	Fee, Coop Agree, Easement
79	TATE, JOHN & JUANITA D	3	2	13.79	Fee, Coop Agree, Easement
80	LYON, MICHAEL/JUDY	3	3	0.49	Fee, Coop Agree, Easement
81	BREDESEN, CHRISTOPHER L.	3	2	11.80	Fee, Coop Agree, Easement
82	DOERING, AARON M/AMY L	3	2	0.50	Fee, Coop Agree, Easement
83	PIETRZAK, PAUL R	3	2	1.03	Fee, Coop Agree, Easement
84,a	SAYONC, BETTY L	3	2	11.91	Fee, Coop Agree, Easement

	Table 1. Land Protection Priorities for Expansion Area				
TRACT #	**OWNER NAME**	**Figure #**	**PRIORITY**	**ACRES**	**PROTECTION METHODS**
85	LEAMAN, H DENNIS	3	2	2.11	Fee, Coop Agree, Easement
86	COOTS, DEAN E	3	2	2.72	Fee, Coop Agree, Easement
87	SNELL, LLOYD E & ROSE M	3	1	5.56	Fee, Coop Agree, Easement
88	NYE, TIMOTHY S JR	3	1	1.01	Fee, Coop Agree, Easement
89	SCHMAUDER, ALLEN	3	1	0.50	Fee, Coop Agree, Easement
90	COLLINS, JAMES R/JODI K	3	1	0.86	Fee, Coop Agree, Easement
91	ATTWOOD, SALLY J	3	1	1.17	Fee, Coop Agree, Easement
92	ATTWOOD, LARRY E	3	1	1.40	Fee, Coop Agree, Easement
93	KRISHNAMOORTI, SIGNA R	3	1	7.61	Fee, Coop Agree, Easement
94	WARREN, DOROTHY G	3	2	7.47	Fee, Coop Agree, Easement
95	SCOTT, CHAE AN	3	2	7.18	Fee, Coop Agree, Easement
96	HONG, CHANLIP MAN	3	2	10.03	Fee, Coop Agree, Easement
97	SAYONC, HELEN F	3	2	3.58	Fee, Coop Agree, Easement
98	HILL, DOROTHY R	3	2	2.76	Fee, Coop Agree, Easement
99	CHOJNOWSKI, DANIEL/PATRICIA	3	2	1.71	Fee, Coop Agree, Easement
100	BROWN, JAMES C	3	2	7.69	Fee, Coop Agree, Easement
101	HUNGERFORD, WILLIAM E	3	2	12.86	Fee, Coop Agree, Easement
102	MC QUEEN, BRUCE & PATRICIA	3	3	0.78	Fee, Coop Agree, Easement
103,a	DAVIS, SCOTT A	3,4	3	3.55	Fee, Coop Agree, Easement
104	DAVIS, KARIN K	3	3	2.29	Fee, Coop Agree, Easement
105	GLASTETTER, HOWARD/COLLEEN	3	3	1.52	Fee, Coop Agree, Easement
106	ALLEN, DONNA L	3	3	0.21	Fee, Coop Agree, Easement
107	FLYNN, MARGARET E	3	3	0.22	Fee, Coop Agree, Easement
108	BELT ENT INC	3	3	0.23	Fee, Coop Agree, Easement
109	BREWER, LARRY	3	3	0.18	Fee, Coop Agree, Easement
110	CHURILLA, ROBERT J/GLENDA F	3	3	0.31	Fee, Coop Agree, Easement
111	BALCOM, MABEL I	3	3	1.02	Fee, Coop Agree, Easement
112	GEORGE, HAROLD F	3	3	1.62	Fee, Coop Agree, Easement
113	WICK, ROLF F	3	3	0.54	Fee, Coop Agree, Easement
114	SHERMAN, JACK E/CARRIE L	3	3	0.91	Fee, Coop Agree, Easement
115	CLINTON, JON P	3	3	0.23	Fee, Coop Agree, Easement
116	SHEAK, MARGARET	3	3	0.53	Fee, Coop Agree, Easement
117	HUNGERFORD, WILLIAM E ETUX	3	3	0.02	Fee, Coop Agree, Easement
118	RODRIGUES, DENNIS/IRENE	3	3	0.50	Fee, Coop Agree, Easement
119	CHRISTOFFER, JEROLD F ETUX	4	2	2.00	Fee, Coop Agree, Easement
120	GOHEEN, BRYAN C/SYLVIA	4	3	0.66	Fee, Coop Agree, Easement
121	BODEN, DAVID W	4	3	0.51	Fee, Coop Agree, Easement
122	YOUNG, RICKEY M/GISELA	4	3	0.45	Fee, Coop Agree, Easement
123	CHAMBERLAIN, JESSIE M ET AL	4	3	0.54	Fee, Coop Agree, Easement
124	DEAN, MARY LOUISE	4	3	0.30	Fee, Coop Agree, Easement
125	LIPSCOMB, C JEAN	4	3	0.39	Fee, Coop Agree, Easement
126	COOPER, RUBY M	4	3	0.58	Fee, Coop Agree, Easement
127	WATSON, ELIZABETH	4	3	1.20	Fee, Coop Agree, Easement
128	SMITH, JOANN M	4	3	0.63	Fee, Coop Agree, Easement
129	LEGWOLD, ROCKY L	4	1	0.52	Fee, Coop Agree, Easement

	Table 1. Land Protection Priorities for Expansion Area				
TRACT #	**OWNER NAME**	**Figure #**	**PRIORITY**	**ACRES**	**PROTECTION METHODS**
130	ANDERSON, KENNETH A	4	3	0.37	Fee, Coop Agree, Easement
131	ANDERSON, LEE D ETAL	4	3	0.24	Fee, Coop Agree, Easement
132	SCHRUM, JOSEPH A/DEVON L	4	3	0.12	Fee, Coop Agree, Easement
133	WATTS, KELLY L/SUSAN A	4	3	0.32	Fee, Coop Agree, Easement
134	MELBY, WARD R ETAL	4	1	0.81	Fee, Coop Agree, Easement
135	PHILLIPS, DOUGLAS S	4	1	0.34	Fee, Coop Agree, Easement
136	STENKLYFT, JAMES A	4	1	0.27	Fee, Coop Agree, Easement
137	NISQUALLY SPORTSMEN CLUB	3,5	1	68.94	Fee, Coop Agree, Easement
138	ANDERSON, LAURIE	5	1	15.16	Fee, Coop Agree, Easement
139	EBERLING, MARSHALL E	5	2	0.97	Fee, Coop Agree, Easement
140	LONERGAN, GEORGE A	5	1	5.00	Fee, Coop Agree, Easement
141	WESTBERG, RAY	5	2	1.06	Fee, Coop Agree, Easement
142	CORP OF LATTER DAY SAINTS	5	1	38.34	Fee, Coop Agree, Easement
143	BLENCOE, LUCILLE M	5	1	37.94	Fee, Coop Agree, Easement
144,a	REESE, GARY FULLER	3,5	1	89.04	Fee, Coop Agree, Easement
145	BABARE, GEORGE M	5	1	107.48	Fee, Coop Agree, Easement
146	WASH DIV INV CORP	3,4	1	0.74	Fee, Coop Agree, Easement
149,a	STOKER, GERRIT	3	1	74.25	Fee, Coop Agree, Easement
150	NISQUALLY PLAZA RV PARK	3	3	1.80	Fee, Coop Agree, Easement
151,a,b	ELWESS, GENE/ANNIE	3	3	5.96	Fee, Coop Agree, Easement
152	SINGH, BAJINDER ETAL	3	3	0.51	Fee, Coop Agree, Easement
153,a	JACOBS, JAMES A	3	3	1.09	Fee, Coop Agree, Easement
154	THREATT, LORENA E	3	3	0.51	Fee, Coop Agree, Easement
155	ALL MARINE INC	3	3	0.64	Fee, Coop Agree, Easement
156	BRESSI, PAUL M	3	3	0.46	Fee, Coop Agree, Easement
157	SCHILTER, JEFF AND STEPHANIE	3	2	5.16	Fee, Coop Agree, Easement
158,a,b	SCHILTER, GOTTFRIED J	3	1	73.53	Fee, Coop Agree, Easement
159	INDUSTRIAL FORESTRY	3	1	9.36	Fee, Coop Agree, Easement
160	HAIDUCEK, TIMOTHY J/JOY E	3	2	2.75	Fee, Coop Agree, Easement
161	Unknown	3	2	0.72	Fee, Coop Agree, Easement
162	Unknown	3	2	0.46	Fee, Coop Agree, Easement
163	GABLE, ADRIAN L	3	2	0.25	Fee, Coop Agree, Easement
164	WESTLIN, BERTHA L ESTATE	3	2	1.66	Fee, Coop Agree, Easement
165,a-d	THOMSEN JESS INC	3,5	1	740.06	Fee, Coop Agree, Easement
166	TORDEN, THOMSEN, INC	3,5	1	68.36	Fee, Coop Agree, Easement
167	ROLLER, JON/GAIL	5	1	6.54	Fee, Coop Agree, Easement
168	HILL, JAMES J	3,5	1	0.50	Fee, Coop Agree, Easement
169	HILL, PAUL	3,5	1	1.00	Fee, Coop Agree, Easement
170,a,b	SCHOLS, HERMAN	3,5	1	124.02	Fee, Coop Agree, Easement
171	BROUGH, ROGER D	5	2	1.00	Fee, Coop Agree, Easement
172	KOHLENBERG, DAVID/ELIZABETH	5	1	1.78	Fee, Coop Agree, Easement
173	LONCAR, PAUL	5	1	5.50	Fee, Coop Agree, Easement
174	VO, TRI M/TRINH, DUNG K	5	1	43.94	Fee, Coop Agree, Easement
175,a	NIELSEN PACIFIC LTD	5	2	290.43	Fee, Coop Agree, Easement
176	WARD, HUGO F	5	1	40.00	Fee, Coop Agree, Easement

	Table 1. Land Protection Priorities for Expansion Area				
TRACT #	**OWNER NAME**	**Figure #**	**PRIORITY**	**ACRES**	**PROTECTION METHODS**
177	MYERS, JAMES H	5	1	40.17	Fee, Coop Agree, Easement
178	PIGMAN, DEAN A	5	1	9.80	Fee, Coop Agree, Easement
179	WILLETTE, JON F/GUILA K	5	1	7.86	Fee, Coop Agree, Easement
180	LOFTIN, FRED E	5	3	4.18	Fee, Coop Agree, Easement
181	LOFTIN, CLAIRE	5	2	3.55	Fee, Coop Agree, Easement
182,a	SMIT, JULIE L	5	3	3.80	Fee, Coop Agree, Easement
183,a	BARATZ, JULIUS/LOIS TSTEES	5	3	6.29	Fee, Coop Agree, Easement
184	BERG, JERI L	5	2	97.59	Fee, Coop Agree, Easement
185	GATZKA, JOSEPH A.	5	2	0.73	Fee, Coop Agree, Easement
186,a,b	MCALLISTER CREEK ASSN	5	2	1.06	Fee, Coop Agree, Easement
187	SUTTON, ROBERT JR./CRISTAN	5	2	0.90	Fee, Coop Agree, Easement
188	SELDOMRIDGE, CHARLES B.	5	2	1.17 ++	Fee, Coop Agree, Easement
189	OSTREICH, TROY D.	5	2	0.34	Fee, Coop Agree, Easement
190	DONALLY, ELFRIEDE H.	5	2	0.77	Fee, Coop Agree, Easement
191	MATTESON, JON MICHAEL	5	2	0.22	Fee, Coop Agree, Easement
192	EVANS, WILLIAM/KATHLEEN	5	2	0.59	Fee, Coop Agree, Easement
193,a	BRAGET TRUSTEE, AGNES	5	2	1.54	Fee, Coop Agree, Easement
194	BOEHM, FREDERICK/MICHELLE	5	2	0.39	Fee, Coop Agree, Easement
195	ZEUTENHORST, PHILLIP	5	2	0.44	Fee, Coop Agree, Easement
196	CIRRITO, CAROLYN B.	5	2	0.64	Fee, Coop Agree, Easement
197	PITTMON, JOANN/DOUGLAS	5	2	0.43	Fee, Coop Agree, Easement
198	MACY, MARSHALL/DEBORAH	5	2	0.82	Fee, Coop Agree, Easement
199	KOHLENBERG, DAVID/ELIZABETH	5	2	1.03	Fee, Coop Agree, Easement
200	SCHOLS, MARIANN J.	5	2	0.60	Fee, Coop Agree, Easement

	Table 2. Land Protection Priorities for Inholdings				
TRACT #	**OWNER NAME**	**Figure #**	**PRIORITY**	**ACRES**	**PROTECTION METHODS**
19,a,b	NISQUALLY INDIAN TRIBE	6	1	330	Coop Agree
2, a-c	WASH-GAME DEPT	6	1	625	Coop Agree
13	CROUSE, CARL N/GLORIA	6	1	1	Fee, Coop Agree, Easement
16b,c	BABARE, ROBERT	6	1	34	Fee, Coop Agree, Easement
17	MOE, GREGORY	6	1	1	Fee, Coop Agree, Easement
22	EAGLE CLIFFS SUBDIVISION	6	4	30	
25	BORLEY, CLARENCE	6	1	3	Fee, Coop Agree, Easement
27	MARTIN, JAMES A/MARY D	6	1	4	Fee, Coop Agree, Easement

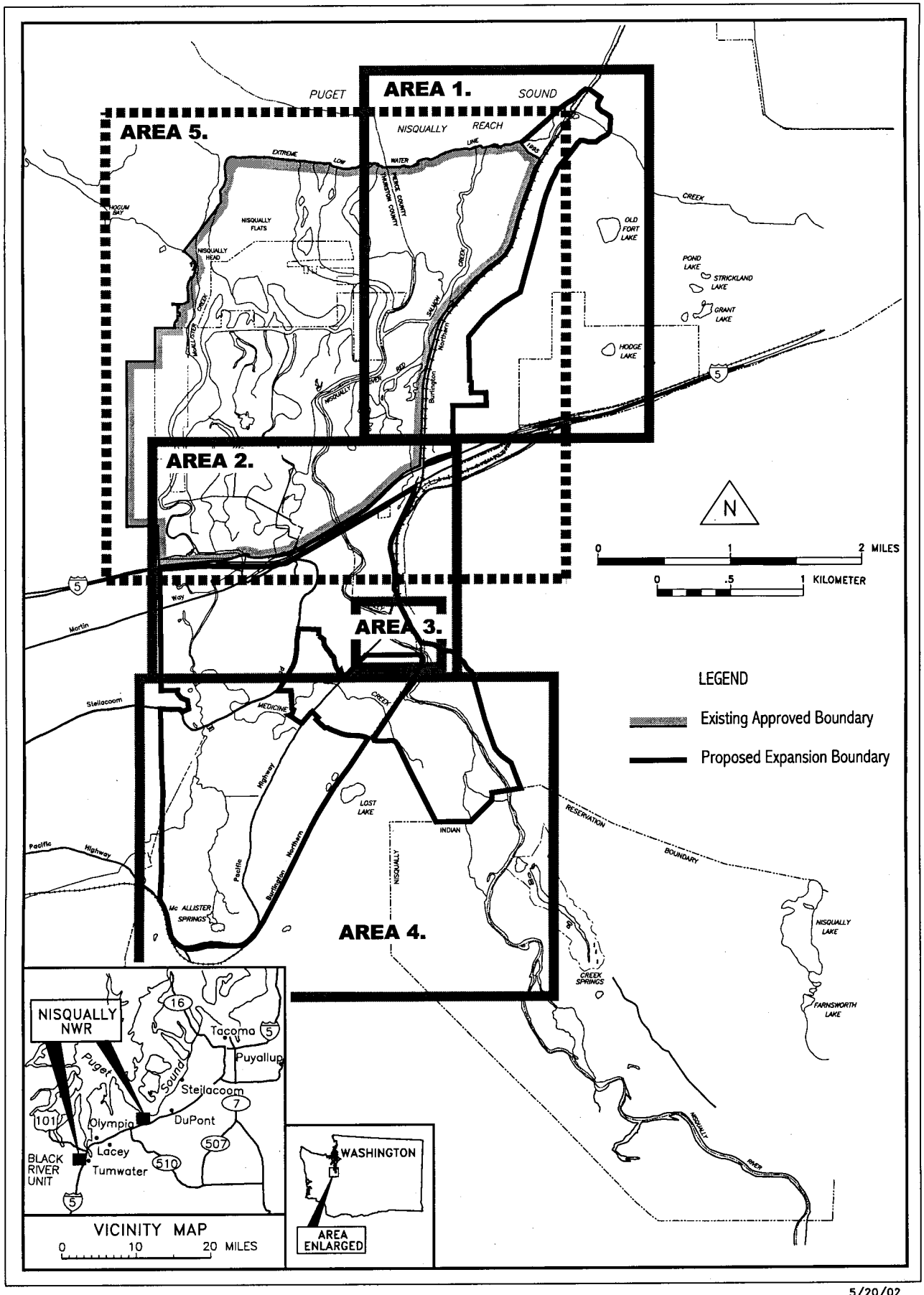


FIGURE 1. NISQUALLY NATIONAL WILDLIFE REFUGE TRACT MAP INDEX

5/20/02

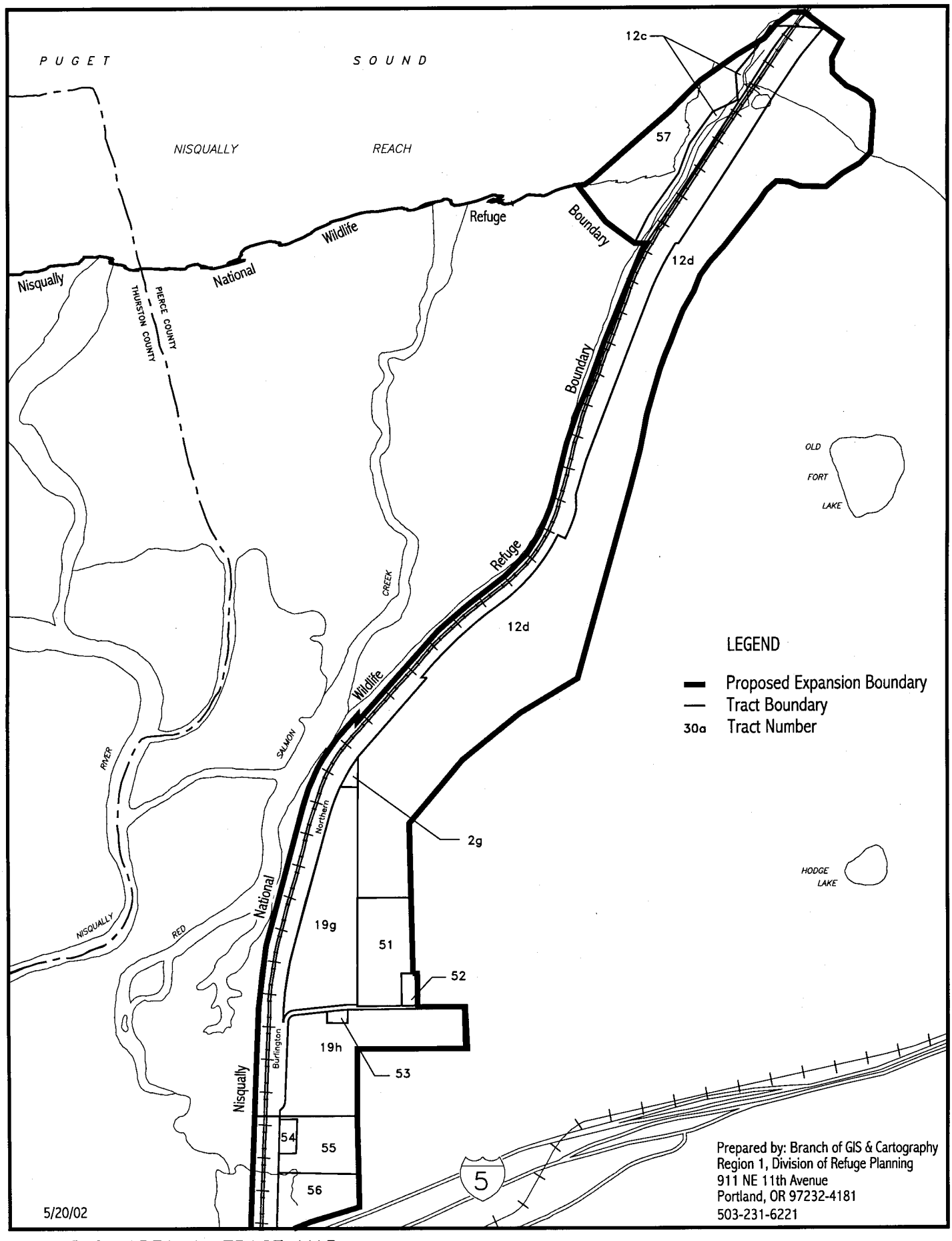
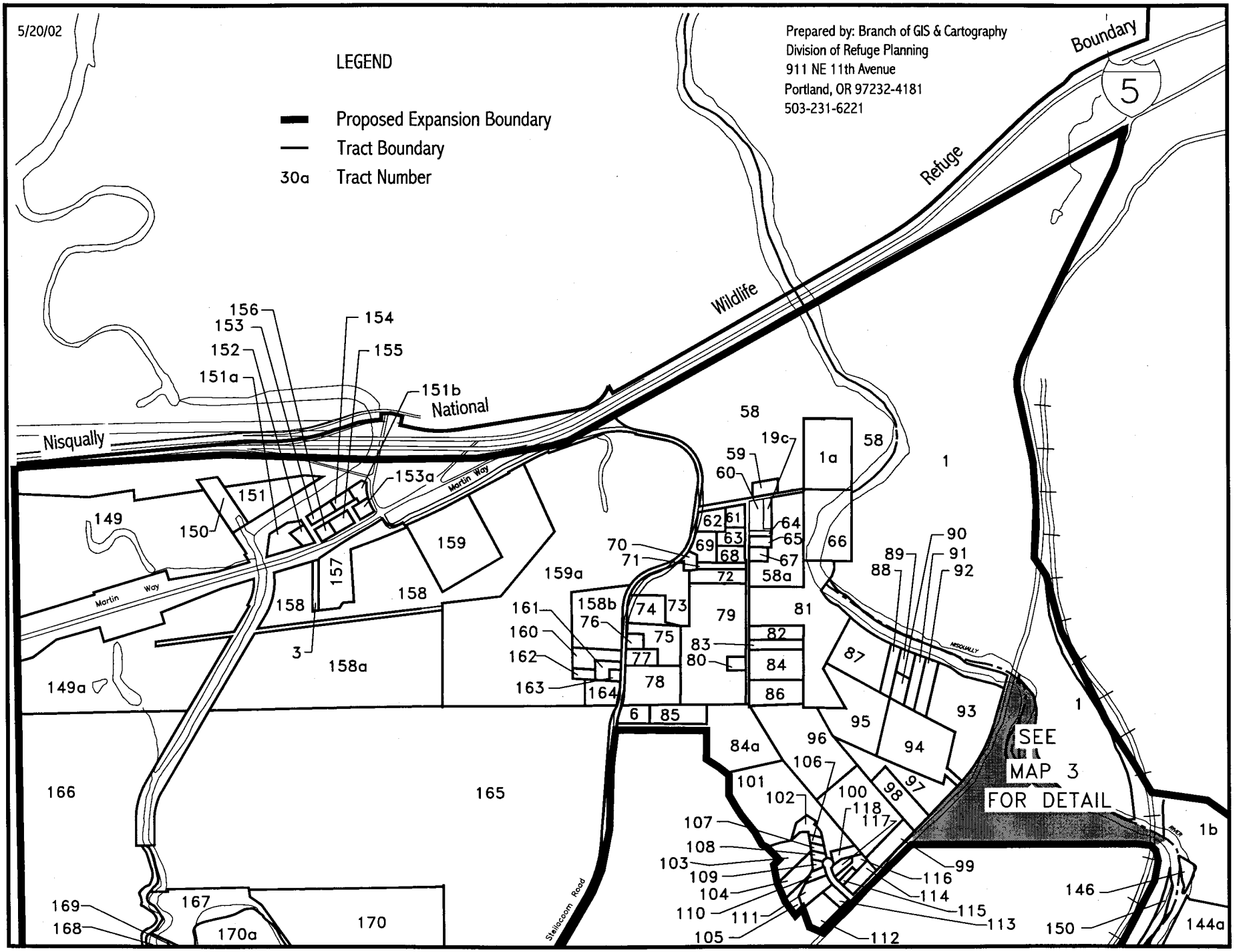


FIGURE 2. AREA 1. TRACT MAP

FIGURE 3. AREA 2. TRACT MAP



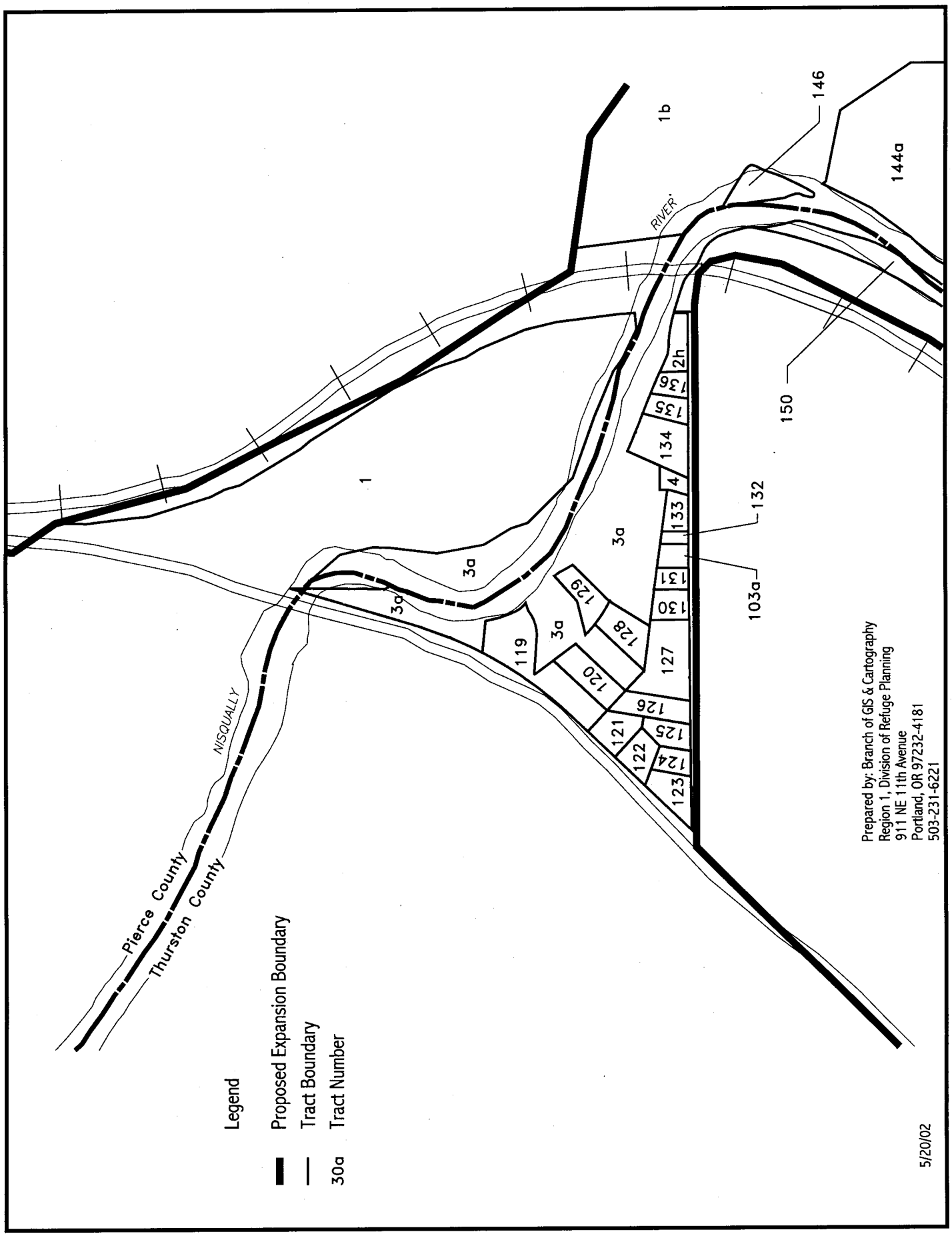
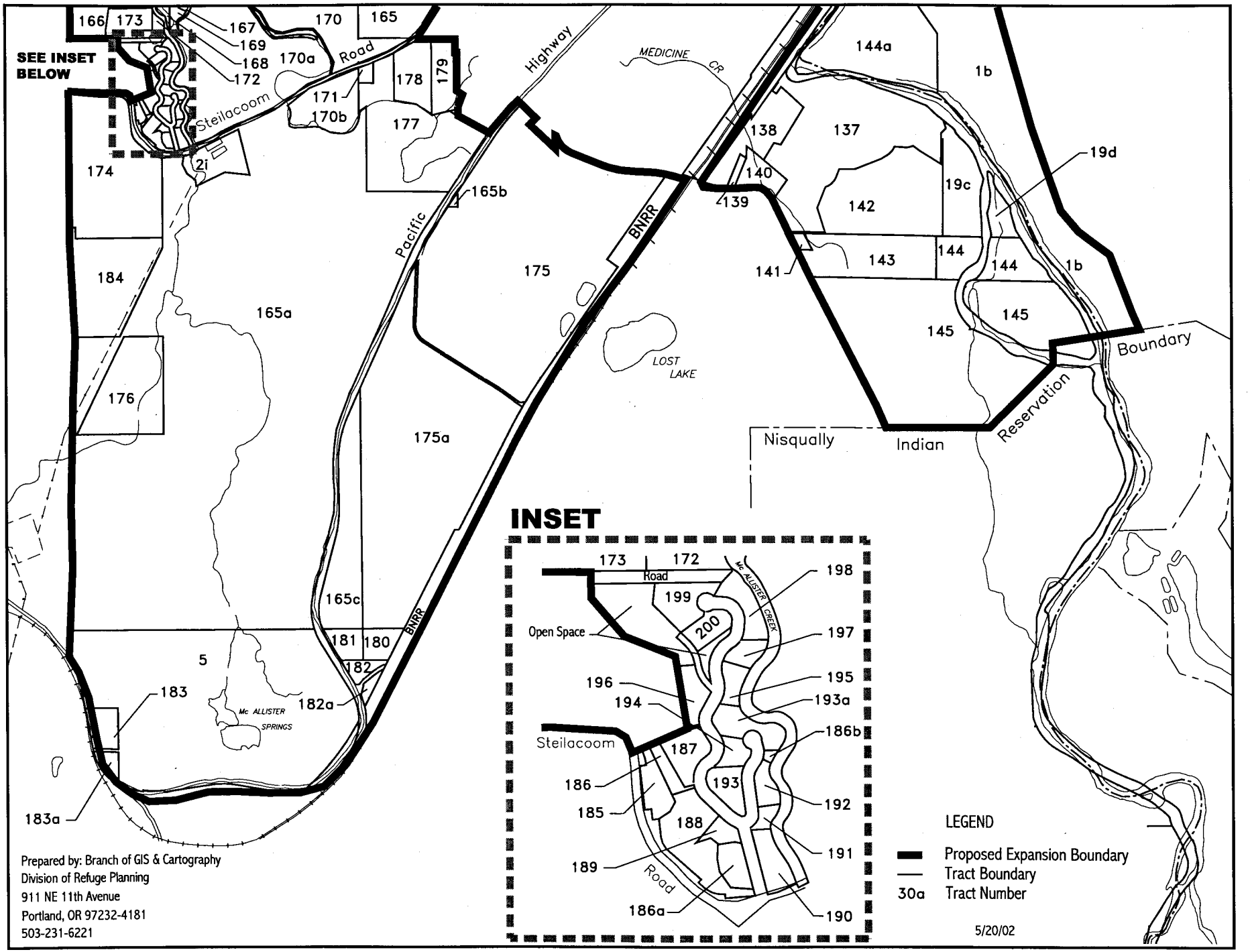


FIGURE 4. AREA 3. TRACT MAP

FIGURE 5. AREA 4. TRACT MAP



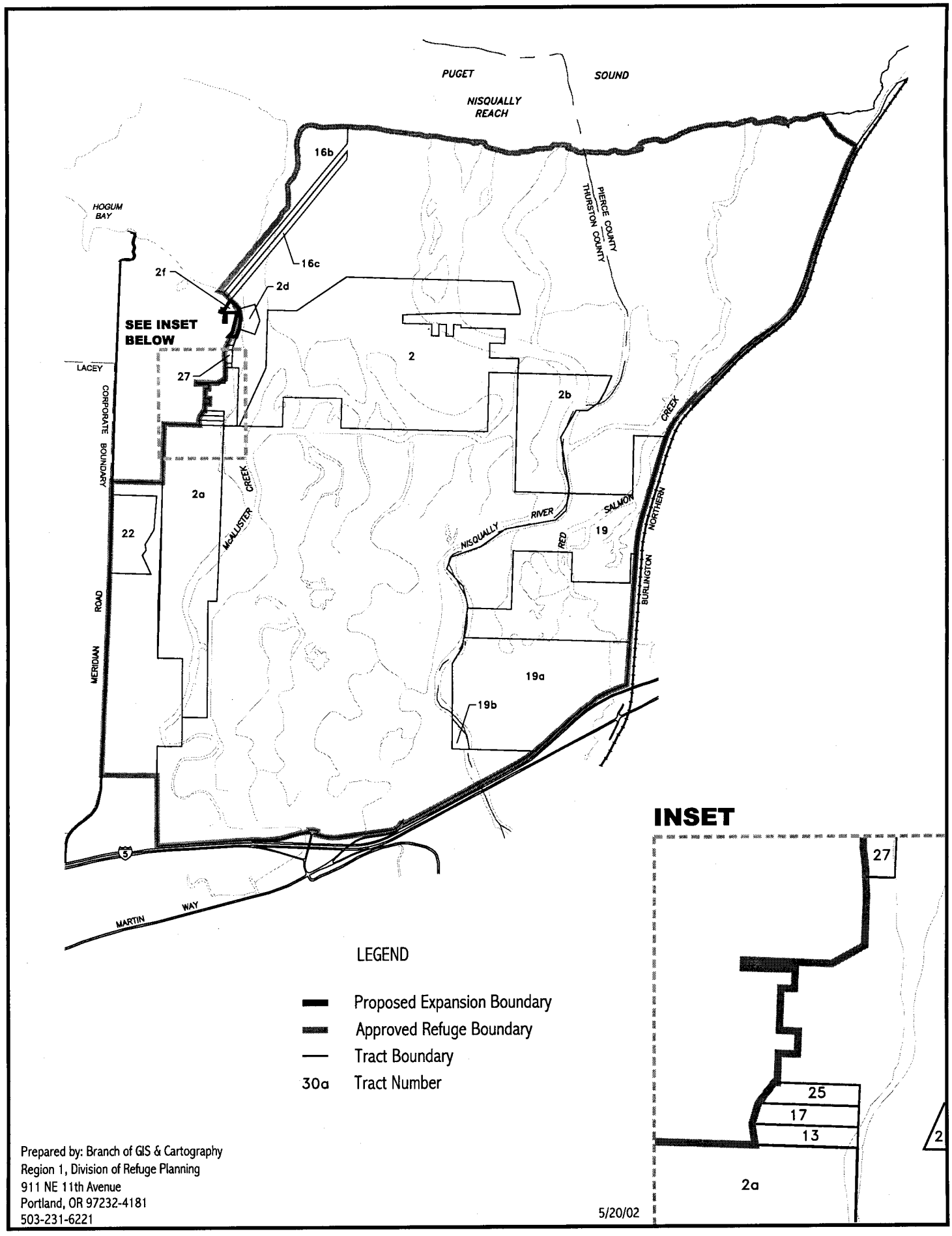


FIGURE 6. AREA 5. TRACT MAP

Appendix L
Wilderness Review

Appendix L: Wilderness Review

A wilderness review is the process used by the Service to determine whether or not to recommend lands or waters in the National Wildlife Refuge System to Congress for designation as wilderness. The Service is required to conduct a wilderness review for each refuge as part of the CCP process. Land or waters that meet the minimum criteria for wilderness are identified in a CCP and further evaluated to determine whether they merit recommendation for inclusion in the Wilderness System.

According to Section 13 of the Service's Director's Order No. 125 (12 July 2000), in order for a refuge to be considered for wilderness designation, all or part of the refuge must:

- Be affected primarily by the forces of nature, with the human imprint substantially unnoticeable;
- Have outstanding opportunities for solitude or primitive and unconfined type of recreation;
- Have at least 5,000 contiguous acres (2000 ha) or be sufficient in size to make practical its preservation and use in an unimpaired condition, or be capable of restoration to wilderness character through appropriate management, at the time of review; and
- Be a roadless island.

Nisqually National Wildlife Refuge (Refuge) is not recommended for inclusion in the Wilderness System because it does not meet the above criteria. The Refuge comprises only 3,936 acres; has considerable evidence of past human use; does not have outstanding opportunities for solitude; and is not roadless.

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Appendix M
Summary of Public Comment and the Service's Responses

[For a copy of this appendix, see the Final CCP/EIS document]

Appendix N
Record of Decision (ROD)

Nisqually National Wildlife Refuge

Thurston and Pierce Counties, Washington

Record of Decision

for the

Final Comprehensive Conservation Plan and Environmental Impact Statement

U.S. Fish and Wildlife Service

November 2004

Record of Decision

For the
Final Comprehensive Conservation Plan and Environmental Impact Statement

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

Nisqually National Wildlife Refuge

Thurston and Pierce Counties, Washington

This Record of Decision (ROD) presents the decision regarding the selection of a Comprehensive Conservation Plan for Nisqually National Wildlife Refuge. It includes a brief summary of the alternatives considered, public involvement in the decision making process, and the reasons for selecting Alternative D for implementation. The Nisqually National Wildlife Refuge Comprehensive Conservation Plan will provide management guidance for conservation of refuge resources and public use activities during the next 15 years.

Alternatives Considered

The U.S. Fish and Wildlife Service (Service) evaluated the following four alternatives contained in the Final Comprehensive Conservation Plan and Environmental Impact Statement (CCP/EIS) for the management of Nisqually National Wildlife Refuge (Nisqually NWR, Refuge).

Alternative A: This alternative, the No Action Alternative, assumes no change from current management and is considered the base from which to compare the other alternatives. There would be no changes to the Refuge boundary and no major changes in habitat management or public use programs.

Alternative B: This alternative would provide for moderate expansion of the Refuge boundary (2,407-acre addition). It places new management emphasis on the restoration of estuarine habitat and improved freshwater wetland management. The current environmental education program would be improved and expanded to the largest degree of all action alternatives. There would be fewer changes to the trail system than in other action alternatives, and the Refuge would remain closed to waterfowl hunting, with the closure posted and enforced.

Alternative C: This alternative would provide for the same expansion of the Refuge boundary as in Alternative B; however, it places a stronger emphasis on the restoration of estuarine habitat, while improving freshwater wetland and riparian habitats. The environmental education program would be improved and expanded, although serving fewer students than in Alternative B. Moderate changes would occur to the trail system. The largest portion of Refuge land would be opened to waterfowl hunting of any alternative. Refuge and State lands would be consolidated into a waterfowl hunting area totaling 1,170 acres. Hunting would be limited to 3 days per week, if an agreement can be reached with Washington Department of Fish and Wildlife (WDFW).

Alternative D, (Preferred Alternative): This alternative provides the largest potential Refuge boundary expansion (3,479-acre addition). It will also maximize estuarine restoration, while improving freshwater wetland and riparian habitats on the Refuge. The environmental education program will be improved and expanded, although not to the level described in Alternative B. The trail system will greatly change under this alternative. A smaller portion of Refuge lands will be opened to waterfowl hunting, 7 days per week, with no changes to hunting on WDFW lands. Additional details regarding the Preferred Alternative are as follows:

Refuge Expansion – The Approved Refuge boundary will be expanded by 3,479 acres for a total authorized boundary of 7,415 acres. Land protection will occur through agreement, easement, or acquisition from willing sellers including 512 acres of forested corridor north of I-5, along the East Bluff; 1,952 acres of freshwater wetland, riparian, and forested habitat in the Nisqually River Valley; and 1,011 acres of the Nisqually River corridor south of I-5. Efforts will be made to strengthen partnerships within the watershed to improve habitat protection.

Habitat Restoration – A large portion of the Nisqually estuary will be restored, by removing sections of the Brown Farm Dike to restore 699 acres of former estuarine habitat and allow the Nisqually River and McAllister Creek to flow more naturally. As a result of estuarine restoration, freshwater wetlands will be reduced from 1,000 acres to 263 acres within currently owned Refuge lands. The establishment of 5 new interior management units and more intensive management will improve wetland habitat quality of the 263 acres. An additional 38 acres of riparian/surge plain habitat will be restored along the Nisqually River.

Environmental Education - The environmental education program will be expanded and improved to serve 15,000 students annually. There will be increased field trip support, teacher training, and site-specific materials and curriculum developed. Efforts will be made to develop a cooperative management agreement for the Luhr Beach area including the Nisqually Reach Nature Center as part of the environmental education program.

Wildlife Observation, Hiking, and Trail Configuration - The existing 5.5-mile dike trail loop will be reduced to a 3.5-mile round-trip trail, including a boardwalk extension into the estuary. A new 2.5-mile loop trail will be developed on tribal and Refuge lands east of the Nisqually River along with a visitor contact station and parking area.

Waterfowl Hunting - The Refuge will open 191 acres to boat-access waterfowl hunting. Hunting will be permitted 7 days per week during the hunting season with a 25 shells per day limit. The Refuge hunt area will form a single block with the State hunt area north of the Brown Farm Dike. The Research Natural Area (RNA) will be reduced in size by 29 acres to allow for hunting and to square off the Refuge hunt area with adjacent State hunting areas.

Fishing - Boat fishing opportunities will be similar to current conditions except the RNA fishing closure will be enforced and tidal restoration areas will be closed to fishing. Due to removal of the dike, bank fishing will no longer be available along McAllister Creek. New land access

fishing opportunities will be explored including the possibility of bank fishing access on the east side of the Nisqually River and an accessible fishing site at the Nisqually River Overlook.

Boating - A speed limit of 5 mph will be established in all Refuge waters. The RNA will be closed to boating from October 1 through March 31 each year to provide sanctuary for migratory birds and other wildlife. A cooperative management agreement for the Luhr Beach boat ramp area will be sought to enhance Refuge outreach efforts and provide Refuge boating regulations information.

Full implementation of this alternative will require additional staff and funding. Step down planning and compliance will also have to be carried out to meet compliance requirements.

Environmentally Preferable Alternative

The alternative which causes the least damage to the biological and physical environment and best protects, preserves, and enhances natural resources is Alternative D, the Preferred Alternative. Alternative D includes the largest amount of Refuge expansion (3,479 acres), which will provide the greatest land protection potential of all the alternatives. This alternative also includes the largest amount (699 acres) of high priority estuarine habitat restoration than any other alternative. Benefits to Federally listed chinook salmon as well as other estuarine associated species will be greatest under this alternative.

Public Involvement and Comments Received

Public comment has been requested, considered, and incorporated throughout the planning process in numerous ways. Public outreach has included open houses, public meetings, technical workshops, planning update mailings, and Federal Register notices. Four previous notices were published in the Federal Register concerning this CCP/EIS (62 FR 52764, October 9, 1997; 65 FR 6390, February 9, 2000; 67 FR 78009, December 20, 2002; and 69 FR 53084, August 31, 2004). Numerous national, state, and local organizations; agencies; neighboring landowners; and interested citizens were involved in the review process. Comments and concerns received early in the planning process were used to identify issues and draft preliminary alternatives. During the Draft CCP/EIS comment period that occurred from December 20, 2002 to February 21, 2003, the Service received a total of 1,717 comments (email, letters, faxes, postcards, comment sheets, visits, or telephone calls). All substantive issues raised in the comments on the Draft CCP/EIS have been addressed through revisions incorporated into the Final CCP/EIS text or responses contained in Appendix M of the Final CCP/EIS. With a few exceptions, most guidelines and actions in Alternative D of the Final CCP/EIS remain consistent with those presented in the Draft CCP/EIS.

Responses to Comments Received On the Final CCP/EIS

The Service issued a Final CCP/EIS on August 31, 2004. We received comment letters from two Federal agencies in addition to a few notes and phone calls that were generally in support of the preferred alternative. The comments received on the Final CCP/EIS did not raise new issues or result in changes to the analysis or to the preferred alternative in the Final CCP/EIS.

The Department of Army, Fort Lewis submitted a letter indicating they do not support the transfer of military lands to the Nisqually Refuge because these areas are required to support military activities including training exercises; and military, public and tribal recreational use, etc. Communications between the U.S. Fish and Wildlife Service and Fort Lewis have occurred throughout the planning process. Both agencies have agreed to continue participation in appropriate meetings to facilitate ongoing activities and uses of federally owned properties located adjacent to the Nisqually River.

National Marine Fisheries Service submitted a letter supporting the preferred alternative in the Final CCP/EIS. Specifically, they stated support for refuge expansion and estuarine restoration in the preferred alternative, as these actions are likely to have a significant benefit to listed salmon species and their future conservation.

Decision

The Service has selected Alternative D, the Preferred Alternative, as specified in the Final CCP/EIS as the Comprehensive Conservation Plan for Nisqually National Wildlife Refuge. Alternative D is the most effective alternative at addressing the key issues and conflicts identified during the planning process and will best achieve the purposes and goals of the Refuge, as well as the goals of the National Wildlife Refuge System. Implementation of the CCP will occur over the next 15 years. This decision includes adoption of stipulations and mitigation measures referenced in the Measures to Minimize Environmental Harm section below.

Factors Considered in Making the Decision

In reaching this decision the Service reviewed and considered: the impacts identified in Chapter 4 of the Draft and Final CCP/EIS; results of the various studies and surveys conducted in conjunction with the Draft and Final CCP/EIS; relevant issues, concerns, and opportunities presented by agencies, organizations, and individuals throughout the planning process including comments on the Draft and Final CCP/EIS; and other relevant factors, including the purposes for which the Refuge was established, and statutory and regulatory guidance. For the following reasons Alternative D was selected for implementation:

Alternative D provides the greatest amount of Refuge expansion and the highest potential to improve protection of the Nisqually delta and the lower watershed. The areas identified within the expanded boundary will provide crucial fish and wildlife habitat for a variety of migratory

birds and salmonids. This expanded boundary has the potential to be more effective in protecting habitat quality, connectivity, water quality, and areas important for wildlife that move throughout the Nisqually delta and lower watershed. This alternative best responds to the increasing development, habitat fragmentation, and other human pressures in the surrounding areas.

Alternative D provides the greatest amount of estuarine restoration and restores a large part of the historic Nisqually estuary. Estuarine habitat is severely depleted within Puget Sound and the Pacific Northwest. Restoration of this amount of estuarine habitat will result in a 46% increase in intertidal emergent (saltmarsh) habitat in southern Puget Sound. Estuarine restoration in the Nisqually estuary has been identified as the highest recovery priority for threatened chinook salmon in the Nisqually watershed. This action will be an important contribution to recovering chinook salmon and will benefit a variety of migratory birds, including waterfowl, shorebirds, seabirds, and wading birds.

Alternative D will contribute the most to riparian habitat protection and restoration along the Nisqually River and McAllister Creek, primarily through Refuge expansion and riparian habitat restoration, including the restoration of 38 acres of key riparian habitat within the estuarine restoration site. Riparian habitat is a depleted habitat that is extremely important for a variety of landbirds, including many passerines, and directly benefits salmon and many migratory birds.

Alternative D will improve the management of 263 acres of freshwater wetland habitat through the creation of five manageable units and more intensive water and habitat management measures. Acquisition of areas that could be restored to freshwater wetland habitat will be a high priority within the Refuge expansion area.

Alternative D provides an achievable balance of 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 areas for fish, wildlife, and habitat. Implementation of the waterfowl hunting program in Alternative D will eliminate unauthorized hunting and consolidate State and Refuge hunting areas. Access to various habitats will still be provided and additional trails will be developed over time on existing and acquired Refuge lands, and adjacent tribal lands. Alternative D will greatly enhance the quality of the environmental education program and triple the number of students currently served by the program. In addition, other public use facilities will be expanded and improved.

Alternative D provides an improved degree of wildlife and habitat protection from human-caused disturbance and minimizes conflicts among the various user groups. Adequate sanctuary for fish and wildlife will be ensured through boat speed restrictions; seasonal closures in the Research Natural Area and enforcement of RNA closures to consumptive uses; clearly defined and enforced hunting area boundaries; a daily limit of 100 students; trail configuration that minimizes habitat fragmentation; and enforcement of area closures to selected public uses. In addition, all public uses will be monitored to help assess disturbance effects on wildlife and habitat.

Alternative D incorporates several components addressing a variety of needs including fish and wildlife sanctuary; habitat restoration and protection; Refuge expansion; and the "big six" high priority public uses; however it is the unique combination of these components in Alternative D that contributes the most to achieving Refuge mission, purposes, and goals. Alternative D better prepares the Refuge to respond to rapidly changing conditions within a rapidly growing urban environment. It strengthens the monitoring of fish, wildlife, habitat, and public uses. It is the best alternative to ensure that the Refuge can make the greatest contribution to fish, wildlife, and habitat needs within the Nisqually River watershed and the greater Puget Sound region.

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 impacts that could result from implementation of Alternative D have been identified and incorporated into Chapter 2, Appendix G (Compatibility Determinations), and Appendix I (Goals, Objectives and Strategies) of the Final CCP/EIS. The stipulations identified in the Compatibility Determinations in Appendix G ensure that public and other uses are compatible with the purposes for which the Refuge was established. These compatibility determination stipulations and other mitigation measures identified for Alternative D in Chapter 2 and Appendix I are adopted by the Service in this Record of Decision and will be followed or enforced by Refuge staff and volunteers.

Findings Required by Other Laws and Executive Orders.

The proposed action complies with all Federal laws and Executive Orders (E.O.) related to the Comprehensive Conservation planning process at Nisqually NWR. A Compliance Statement has been prepared which explains how the proposed action complies with the requirements of the National Wildlife Refuge System Improvement Act (Public Law 105-57, Improvement Act); the National Environmental Policy Act (42 U.S.C. §4321 et seq.); the Coastal Zone Management Act; Section 7 of the Endangered Species Act; Section 106 of the National Historic Preservation Act; Comprehensive Environmental Response, Compensation and Liability Act (1980) CERCLA; The Uniform Relocation Assistance and Real Property Acquisition Policies Act; the Wilderness Act; E.O. 12898, Environmental Justice; E.O. 11988, Floodplain Management; E.O. 11990, Protection of Wetlands; E.O. 12372, Intergovernmental Review; E.O. 13186, Protection of Migratory Birds; and E.O. 13175, Consultation and Coordination with Indian Tribal Governments.

For Further Information

For further information contact the Refuge Manager, Nisqually National Wildlife Refuge Complex, 100 Brown Farm Road, Olympia, Washington 98516, Phone (360) 753-9467. Copies of the Final CCP/EIS and subsequent Comprehensive Conservation Plan may be viewed at Nisqually National Wildlife Refuge and at the following libraries in Washington State:

Timberland Community Library in Olympia; Tacoma Public Library; University of Washington's Suzallo Library in Seattle; William J. Reed Library in Shelton; and the Evergreen State College Library in Olympia. The Final CCP/EIS and this ROD will be available for viewing and downloading online at http://pacific.fws.gov/planning.

Regional Director, Region 1

11/1/04
Date

STATEMENT OF COMPLIANCE
for Implementation of the
Nisqually National Wildlife Refuge, Thurston and Pierce Counties, Washington
Comprehensive Conservation Plan

The following executive orders and legislative acts have been reviewed as they apply to implementation of the Nisqually National Wildlife Refuge (NWR) Comprehensive Conservation Plan (CCP).

- **National Environmental Policy Act (1969).** The planning process has been conducted in accordance with National Environmental Policy Act Implementing Procedures, Department of Interior and Fish and Wildlife Service procedures, and has been performed in coordination with the affected public. The requirements of the National Environmental Policy Act (42 U.S.C. §4321 et seq.) and its implementing regulations in 40 CFR Parts 1500-1508 have been satisfied in the procedures used to reach this decision. These procedures included: the development of a range of alternatives for the Nisqually NWR CCP; analysis of the likely effects of each alternative; and public involvement throughout the planning process.

  An environmental impact statement was prepared for the project that integrated the CCP management objectives and alternatives into the NEPA document and process. During the Draft CCP/EIS comment period that occurred from December 20, 2002, to February 21, 2003, the Service received a total of 1,717 comments (email, letters, faxes, postcards, comment sheets, visits, or telephone calls). All substantive issues raised in the comments on the Draft CCP/EIS have been addressed through revisions incorporated into the text of the Final CCP/EIS or the responses contained in Appendix M of the Final CCP/EIS. A Final EIS was issued August 31, 2004.

- **National Historic Preservation Act (1966).** The management of archaeological and cultural resources of Nisqually NWR will comply with the regulations of Section 106 of the National Historic Preservation Act. Implementation of the CCP will remove portions of the Brown Farm Dike which is eligible for listing in the National Register of Historic Places. Portions of the dike will remain and mitigation for modification or removal of other portions of the dike will entail, at a minimum, a Historic American Buildings Survey and Historic American Engineering Record documentation to National Park Service standards. No other historic properties listed in or eligible for listing in the National Register of Historic Places are known to be affected by the proposed action based on the criteria of an effect or adverse effect as an undertaking defined in 36 CFR 800.9 and Service Manual 614 FW 2; however, determining whether a particular action has a potential to affect cultural resources is an ongoing process that occurs as step-down and site-specific project plans are developed. The Service will comply with the National Historic Preservation Act if any management actions have the potential to affect any historic properties that may be present.

- **Executive Order 11988. Floodplain Management.** Under this order Federal agencies "shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by flood plains." The CCP is consistent with Executive Order 11988 because CCP implementation would protect floodplains from adverse impacts as a result of modification or destruction. Removal of portions of the Brown Farm Dike located in the floodway is consistent with this Executive Order. The CCP also supports Thurston County efforts to reduce development within the Nisqually River floodplain by designating frequently flooded areas (including homes) within the 100-year floodplain for conservation.

- **Executive Order 11990. Protection of Wetlands.** The CCP is consistent with Executive Order 11990 because CCP implementation would potentially conserve and protect up to 400 acres of freshwater wetlands and approximately 1,000 acres of riparian wetlands. Almost 700 acres of estuarine habitat will also be restored with significant benefits to Puget Sound.

- **Executive Order 12372. Intergovernmental Review.** Coordination and consultation with affected Tribal, local and State governments, other Federal agencies, and the landowners have been completed through personal contact by Service Planners, Refuge Managers, and Refuge Supervisors.

- **Executive Order 13175. Consultation and Coordination with Indian Tribal Governments.** As required under Secretary of the Interior Order 3206 American Indian Tribal Rights, Federal-Tribal Responsibilities, and the Endangered Species Act, the Refuge Manager consulted and coordinated with the Nisqually Indian Tribe regarding the proposed action. The Service met with the Tribe 14 times during the course of the planning process, and they were given the opportunity to comment on an internal review draft of the CCP/EIS.

- **Executive Order 12898. Federal Actions to Address Environmental Justice in Minority and Low-Income Populations.** All Federal actions must address and identify, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations, low-income populations, and Indian Tribes in the United States. The CCP was evaluated and no adverse human health or environmental effects were identified for minority or low-income populations, Indian Tribes, or anyone else.

- **Endangered Species Act (1972).** CCP implementation is expected to result in significant benefits to listed species especially salmon (see NOAA letter on FEIS). The Service and NOAA Fisheries have deferred biological evaluations required by Section 7 of the Endangered Species Act until step-down and/or site-specific project plans are being developed. They decided that biological evaluations for Federally listed and proposed species, and critical habitat will be more appropriate at that time because more details

will be available. NOAA Fisheries also wrote a formal letter of concurrence with Alternative D, the Preferred Alternative.

- **National Wildlife Administration Act of 1966, as amended by The National Wildlife Refuge System Improvement Act of 1997 (16 U.S.C. 668dd-668ee).** The National Wildlife Refuge System Improvement Act (Public Law 105-57, Improvement Act) requires the Service to develop and implement a comprehensive conservation plan for each refuge. The Final CCP/EIS identifies and describes: Refuge purposes; fish, wildlife, and plant populations and related habitats; archaeological and cultural values of the Refuge; areas suitable for administrative or visitor facilities; significant problems that may affect populations and habitats of fish, wildlife, and plants, and actions necessary to correct or mitigate such problems; and opportunities for fish- and wildlife-dependent recreation as required by the Improvement Act.

  Compatibility determinations have been prepared for the following uses: recreational boating; recreational fishing; waterfowl hunting; environmental education; wildlife observation, photography, and interpretation; research; and agriculture – haying. All of these uses were found to be compatible with Refuge purposes and the System mission with stipulations specified in each of the compatibility determinations.

- **Executive Order 13186. Responsibilities of Federal Agencies to Protect Migratory Birds.** Requires the four major bird conservation plans: U.S. Shorebird Conservation Plan, N. A. Waterbird Conservation Plan, N. A. Waterfowl Management Plan, and Partners in Flight, be considered and incorporated into federal land use planning documents. The Service consulted these four plans, related regional plans, and staff from Region 1's Migratory Bird Division during the planning process. Implementation of the Nisqually NWR CCP will contribute to several important goals identified in these plans.

- **Comprehensive Environmental Response, Compensation and Liability Act (1980) (CERCLA) and Secretarial Order 3127.** All acquisitions of real property, whether discretionary or nondiscretionary, will require a Level 1 pre-acquisition environmental site assessment. Results of an initial reconnaissance survey are documented on pages 3-5 and 3-6 of the FEIS. The East Bluff expansion contains a small section of the former DuPont Works. Extensive cleanup actions are taking place by DuPont Companies and Weyerhaueser. The Washington State Department of Ecology is overseeing this project. Lands south of I-5 include military training areas, the Holroyd gravel pit, the Nisqually Exit 114 gas stations, the McAllister Creek State Fish Hatchery, and farming related buildings and structures. These developments may have underground or above ground fuel storage tanks that have potential for leaking or past spills. All sites will be investigated in a Level 1 survey prior to acquisition.

- **Coastal Zone Management Act, Section 307.** Section 307(c)(1) of the Coastal Zone Management Act of 1972 as amended, requires each Federal agency conducting or supporting activities directly affecting the coastal zone, to conduct or support those

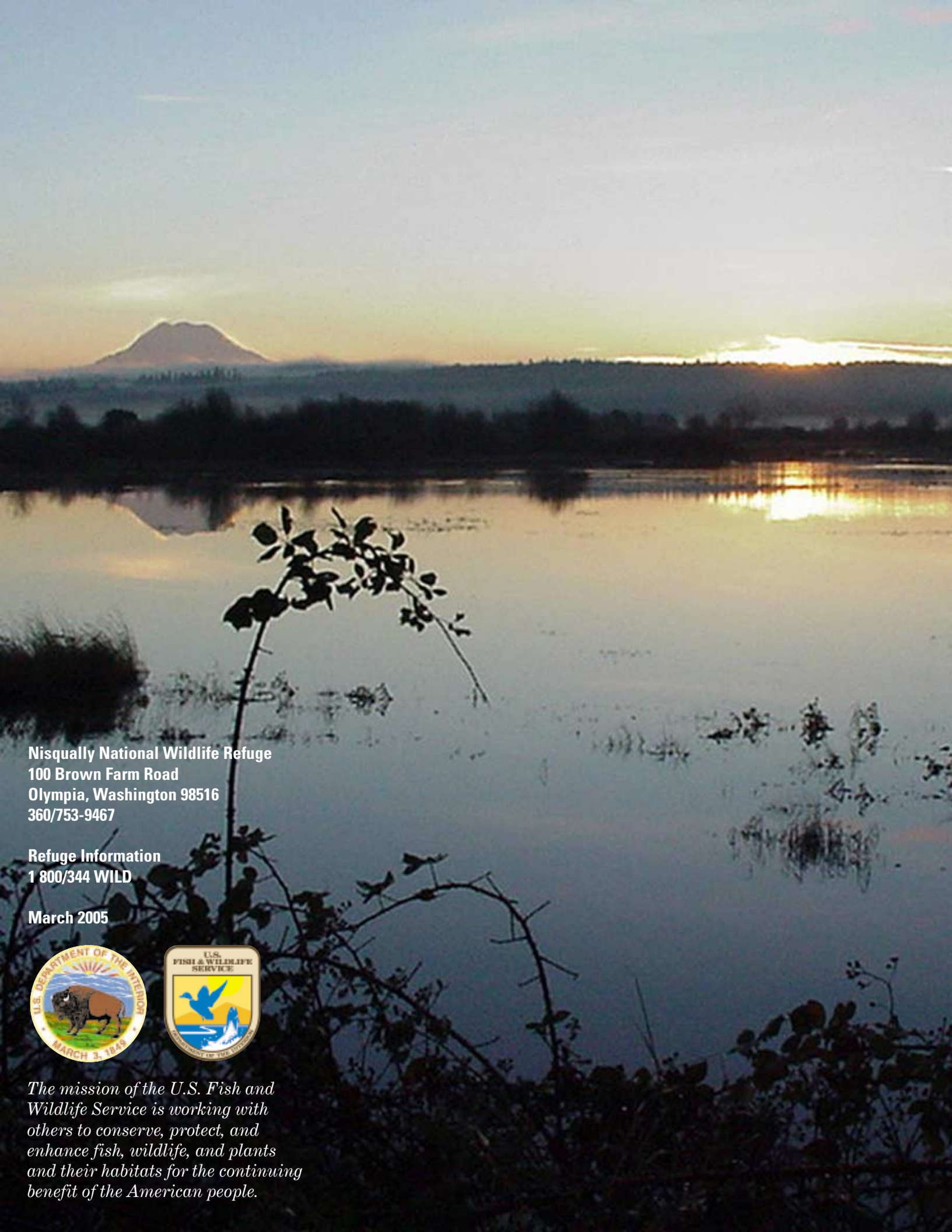
activities in a manner which is, to the maximum extent practicable, consistent with approved state coastal management programs. The Service determined that the Draft CCP/EIS was consistent with the requirements of the Coastal Zone Management Act and a Consistency Determination concurring with this conclusion was issued by the Washington Department of Ecology, dated August 1, 2003.

- **Uniform Relocation Assistance and Real Property Acquisition Policies Act (1970), as amended.** The Service will conduct all realty actions in conformance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act.

- **Wilderness Act (1964).** The Service has evaluated the suitability of the Refuge for wilderness designation and has found that it does not meet wilderness criteria. Nisqually NWR is not recommended for inclusion in the Wilderness System.

Ben Harrison — 10-21-04

Acting Chief, Division of Refuge Planning — Date



Nisqually National Wildlife Refuge
100 Brown Farm Road
Olympia, Washington 98516
360/753-9467

Refuge Information
1 800/344 WILD

March 2005

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