

Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge

Comprehensive Conservation Plan



A Vision of Conservation

The waters of the Black River flow almost imperceptibly from Black Lake south to the Chehalis River. Meandering through a complex mosaic of wetlands, riparian forest, shrub swamp, and bogs, this area is considered the most intact low-lying river system remaining in western Washington. The Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge protects some of the most expansive and remote wetlands, sustaining a truly wild place.

Providing for a diverse community of fish and wildlife, large populations of once rare species (Oregon spotted frog, salmon, and unique bog plants and animals) now flourish in the healthy wetland habitats.

Visitors take time to explore the quiet waterway, paddling canoes through the narrow river channel to fish, observe, and photograph birds and wildlife. Opportunities to see Roosevelt elk and migratory birds in upland habitats provide visitors with a sense of stewardship for the Black River Unit.

Together, community members and partners, in concert with the Black River Unit, protect and enhance the Black River, promoting biodiversity and natural functions to benefit native fish, wildlife, and plant communities in wetland and upland habitats.

The Black River Unit continues to build strong partnerships to protect and maintain the solitude, wild character, and health of the Black River so that future generations can experience being a part of this very special place.



U.S. Fish & Wildlife Service, August 2017
Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge
Comprehensive Conservation Plan

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

Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge

Comprehensive Conservation Plan

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**U.S. Fish and Wildlife Service
Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge
Comprehensive Conservation Plan
Approval Submission**

In accordance with the National Wildlife Refuge System Administration Act, as amended, the U.S. Fish and Wildlife Service completed a Comprehensive Conservation Plan (CCP) for the Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge. The purpose of this CCP is to specify a management direction for the Unit for the next 15 years. The goals, objectives and strategies for improving Unit conditions—including the types of habitat we will provide, partnership opportunities, and management actions needed to achieve desired future conditions—are described in the CCP. The effects of the CCP on the human environment were described in the draft CCP and Environmental Assessment. This CCP is submitted for approval by the Regional Director.

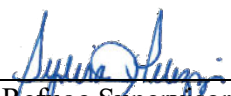
Submitted by:



Project Leader,
Nisqually National Wildlife Refuge Complex

3.09.2017

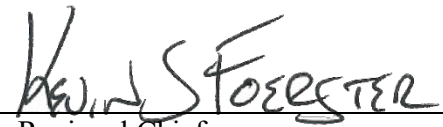
Date

Concur: 

Refuge Supervisor,
Oregon, Washington, and Idaho Refuges

3/9/17

Date

Concur: 

Regional Chief,
National Wildlife Refuge System, Region 1

3/9/17

Date

Approved: 

Regional Director,
Region 1, Portland, Oregon

3/10/17

Date

**Finding of No Significant Impact
for the
Grays Harbor National Wildlife Refuge and
Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge
Comprehensive Conservation Plans
Grays Harbor and Thurston Counties, Washington**

The U.S. Fish and Wildlife Service (Service) has completed Comprehensive Conservation Plans (CCP) and an Environmental Assessment (EA) for Grays Harbor National Wildlife Refuge (NWR or Refuge) and the Black River Unit of Billy Frank Jr. Nisqually NWR (Unit). The CCPs and EA describe our proposals for managing the Refuge and the Unit and their effects on the human environment under two alternatives, including the “no action” alternative.

The need for a CCP is derived from the overall National Wildlife Refuge System (Refuge System) mission, goals, and policies, as described in or promulgated by the National Wildlife Refuge System Administration Act (16 U.S.C. 688dd–688ee, et seq.), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). Developing the CCPs provides the Refuge and the Unit with management plans for conserving fish, wildlife, plant resources, and their related habitats, while providing opportunities for compatible, wildlife-dependent recreation. The CCPs, when fully implemented, should achieve each Refuge’s establishing purposes; help fulfill the Refuge System mission; maintain, and, where appropriate, restore the ecological integrity of the Refuge, Unit, and the Refuge System; and meet other mandates. The CCPs will guide management of the Refuge and the Unit for 15 years or until it is revised, and actions will be implemented as funding becomes available.

Features Common to All Alternatives

Features common to all alternatives include considering climate change effects in all management actions; monitoring and control of invasive species; coordinating with tribal, state, county, and other partners; protecting cultural resources; law enforcement; fire management; participating in planning and review of regional development activities; participating in landscape-scale conservation planning and design efforts; and continuing land protection within the approved Refuge boundary. Actions common to both alternatives for Grays Harbor NWR include maintaining and updating existing facilities; working with other agencies, partners, the community, and others to review the current nature center plan and to evaluate other options, including alternate funding, sites, and designs, that could lead to a viable plan for the center; restoration of 15–20 acres of salt marsh; and permitting sweetgrass harvest by Native American tribal members. At the Black River Unit, actions common to both alternatives include the removal of old buildings and working with the Washington Department of Natural Resources to develop an interagency agreement or similar instrument that promotes cooperative management of the Black River channel.

Alternatives Considered

Alternative 1 (Current Management): Under Alternative 1, Grays Harbor NWR would continue to emphasize and promote the protection of Refuge habitats. Management actions include continuing with limited control of invasive species and monitoring of migratory bird use. Environmental education would continue to be a focus of the visitor services program. Existing visitor services, including wildlife observation, wildlife photography, and interpretation, would continue with the

current facilities. No new facilities would be developed; however, planning for a new nature center would continue.

At the Black River Unit, habitat management would continue to focus on monitoring and habitat management for the federally threatened Oregon spotted frog. There would be limited invasive species management and habitat management. Land acquisition efforts would continue as a priority for the Unit as funding allows. The Unit would not be open and no visitor services would be available.

Alternative 2: Under Alternative 2, habitat programs at Grays Harbor NWR would continue as currently managed with greater emphasis and improvements on invasive species management and pursuing priority science inventory, monitoring, and research needs. The environmental education, interpretation, volunteer, and outreach programs would be enlarged and improved as staffing allows. In addition to continuing actions described under Alternative 1, the visitor services program would target facility improvements including improved parking, an expanded Sandpiper Trail, interpretive panels, and two viewing platforms.

At the Black River Unit, greater emphasis would be placed on enhancing and managing habitat, especially in wetland habitats, to benefit the Oregon spotted frog and migratory birds. Increased inventory, monitoring, and research would be used to guide management decisions to benefit fish and wildlife. These inventories would be used to evaluate whether to propose designation of a research natural area to improve protection and management of unique bog and wetland habitats. The Unit would be opened to public use, including wildlife observation, interpretation, and wildlife photography. Proposed facilities to support visitor services include a viewing platform with a short walking trail on the east side of Endicott Road and a vehicle pull-off area with interpretive signs for viewing wildlife on the west side of Endicott Road. The Service would establish a cooperative agreement with Thurston County to develop a boat launch, small parking area, and new kiosk and interpretive signs on the southeastern side of the 123rd Avenue bridge. Outreach and volunteer programs would be expanded as staffing allows.

Summary of Effects

Alternative 1 (Current Management): Under Alternative 1, the overall effects of current management on the physical environment within the Refuge and Unit would generally be negligible to minor negative in the short term due to the potential for water quality degradation and temporarily disturbed soils. However, long-term impacts to the physical environment are anticipated to be negligible to moderate positive due to ongoing habitat protection and maintenance activities. In the long term, impacts to wildlife would generally be negligible to minor or moderate positive. However, we project potential short-term negligible to minor negative impacts from temporary disturbances due to inventory, monitoring, research, and scientific assessment; invasive species control; salt marsh restoration at Grays Harbor NWR; removal of fish barriers and the mechanical, physical, biological, herbicide, or chemical methods used to manage seasonally flooded, nonnative grassland habitat at the Black River Unit.

Impacts to the social and economic environment within and surrounding the Grays Harbor NWR would be negligible to minor positive due to public use, volunteer, and outreach programs. Impacts to the social and economic environment within and surrounding the Black River Unit would be negligible or neutral due to the lack of visitor facilities and visitor services or volunteer programs.

Alternative 2: Management actions in Alternative 2 would generally result in long-term negligible to minor to moderate positive effects to the physical environment due to increased restoration of native habitats and removal of nonnative vegetation. In the short term, individual actions such as habitat management activities or construction projects may have negative effects on soils, water resources, and air quality; however, through the use of best management practices, the effects would be negligible to minor. Overall, a long-term minor to moderate beneficial effect would be expected for Refuge habitats and associated species from habitat management actions. In addition to the effects under Alternative 1, there could be short-term negative impacts from temporary disturbances associated with increased active management; inventory, monitoring, research, and scientific assessment; and public use. However, due to the limited duration, area, and intensity of these activities, the effects would be negligible to moderate.

Overall effects to the social and economic environment would be expected to be minor to moderate positive due to expanded public use, volunteer, and outreach programs. The availability and quality of wildlife-dependent recreation on the Grays Harbor NWR would have minor to moderate improvements under Alternative 2. Since wildlife observation, photography, environmental interpretation and education opportunities would be offered on the Black River Unit for the first time, the impacts to the social and economic environment would be minor to moderate positive.

Comparison of Overall Effects across Alternatives: Despite the construction of new visitor services facilities, effects to the physical environment would be most beneficial under Alternative 2, primarily due to the increased habitat restoration and enhancement activities. Regarding wildlife and habitats, Alternative 2 would have more beneficial wildlife management effects than Alternative 1. Effects to the social and economic environment would be more beneficial under Alternative 2 because of facility and programming improvements for visitors.

Public Involvement

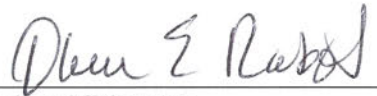
The Service incorporated a variety of public involvement techniques in developing and reviewing the CCPs and EA. This included public open houses during scoping; four planning updates; and communications with various county, state, federal, and tribal partners and interested parties. The draft CCP/EA was available for a 31-day period of public review and comment from October 26, 2016, to November 25, 2016. During that period, the Service received comments from 8 entities. The details of our public involvement are described in Appendix J. The Service prepared responses to all substantive comments, which are in Appendix N for the Grays Harbor NWR CCP and Appendix M for the Black River Unit CCP.

Selection of Management Alternative for the Final CCP

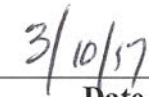
Based on our review and analysis in the CCPs and EA and the comments received during the public review of the draft CCP/EA, we selected a slightly revised Alternative 2 for implementation due to the positive benefits of improved wildlife management and visitor services on the Refuge and Unit. In response to comments, strategies regarding wildlife and habitat management were added or modified. Corrective, clarifying, and editorial changes were also made. Implementing the selected alternative will have no significant impacts on the environmental resources identified in the CCPs and EA. Refuge management under the selected alternative will protect, maintain, and enhance habitat for priority species and resources of concern and improve the public's opportunities to enjoy wildlife-dependent recreation.

Conclusions

Based on review and evaluation of the information contained in the supporting references, I have determined that implementing Alternative 2 as the Comprehensive Conservation Plan for Grays Harbor National Wildlife Refuge and the Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge is not a major Federal action that would significantly affect the quality of the human environment within the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969. The proposed action is not without precedent and is not similar to actions that would normally require preparation of an environmental impact statement. Accordingly, we are not required to prepare an environmental impact statement.



Regional Director
Pacific Region



Date

Note: This Finding of No Significant Impact and supporting references are available for public review at the Nisqually National Wildlife Refuge Complex, 100 Brown Farm Road, Olympia 98516; and U.S. Fish and Wildlife Service, National Wildlife Refuges, Branch of Planning, 911 NE 11th Avenue, Portland, OR 97232. These documents can also be found on the Internet at www.fws.gov/refuge/Grays_Harbor/what_we_do/planning.html and www.fws.gov/refuge/Billy_Frank_Jr_Nisqually/what_we_do/planning.html. Interested and affected parties are being notified of our decision.

Table of Contents

Chapter 1. Introduction and Background	1-1
1.1 Introduction.....	1-1
1.2 Significance of the Refuge Unit.....	1-1
1.3 Proposed Action.....	1-2
1.4 Purpose and Need for Action.....	1-3
1.5 Legal and Policy Guidance	1-3
1.5.1 The U.S. Fish and Wildlife Service	1-3
1.5.2 National Wildlife Refuge System.....	1-3
1.5.3 National Wildlife Refuge System Mission and Goals	1-4
1.5.4 National Wildlife Refuge System Administration Act.....	1-4
1.5.5 Other Laws and Mandates	1-5
1.6 Refuge Unit Establishment and Purposes.....	1-6
1.6.1 Legal Significance of the Refuge Purpose.....	1-6
1.6.2 Establishing Purposes	1-6
1.6.3 Unit Ownership and Land Status.....	1-7
1.7 Relationship to Other Planning Efforts.....	1-9
1.7.1 Previous Refuge Plans	1-9
1.7.2 Future Planning.....	1-9
1.7.3 Migratory Bird Conservation and Plans	1-9
1.7.4 State Plans.....	1-12
1.7.5 Other Natural Resource Plans or Guidance Documents.....	1-13
1.8 Planning Process and Issue Identification	1-14
1.8.1 Planning Process.....	1-14
1.8.2 Key Issues Addressed in the CCP	1-15
1.9 Refuge Visions and Goals.....	1-16
1.9.1 Refuge Vision	1-16
1.9.2 Refuge Goals	1-16
1.10 References.....	1-17
Chapter 2. Management Direction	2-1
2.1 Alternatives Development	2-1
2.2 Alternatives Considered but Eliminated from Detailed Study	2-1
2.3 Description of Management Direction	2-3
2.4 Goals, Objectives, and Strategies	2-11

Goal 1. Protect, maintain, and enhance aquatic habitats characteristic of the upper Black River Watershed while maintaining historical characteristics of the north Puget Trough Lowlands for the benefit of native fish, amphibians, migratory birds, and a diverse assemblage of other native species.....	2-11
Goal 2. Protect and maintain upland habitats characteristic of the upper Black River watershed.....	2-23
Goal 3. Contribute to the protection and long-term environmental health of the greater Black River watershed and ecosystem.....	2-26
Goal 4. Gather scientific information (inventories, monitoring, and research) to support adaptive management decisions.	2-28
Goal 5. Provide quality opportunities for visitors to experience a diversity of wildlife and habitats to enhance their understanding and appreciation of the Black River Unit’s natural resources and foster a connection with nature.....	2-35
Goal 6. Support and develop an active volunteer program and partnerships to assist in providing quality visitor services programs and outreach.....	2-37
2.5 References.....	2-40
Chapter 3. Physical Environment.....	3-1
3.1 Introduction.....	3-1
3.2 Climate.....	3-1
3.2.1 Climate Cycles in the Pacific Northwest.....	3-2
3.2.2 Climate Change	3-3
3.3 Hydrology	3-9
3.4 Topography.....	3-10
3.5 Geology.....	3-11
3.6 Soils	3-11
3.7 Air Quality	3-12
3.8 Water Quality and Quantity.....	3-12
3.9 Surrounding Land Use	3-15
3.10 References.....	3-16
Chapter 4. Biological Environment.....	4-1
4.1 Biological Integrity, Diversity, and Environmental Health.....	4-1
4.1.1 Historical Land Use and Conditions.....	4-1
4.2 Selection of Priority Resources of Concern.....	4-3
4.3 Habitat Types.....	4-7
4.3.1 Channel Habitat	4-7
4.3.2 Tributary Channel Habitat	4-10
4.3.3 Bog.....	4-11
4.3.4 Shrub Swamp.....	4-12

4.3.5 Riparian Forest	4-14
4.3.6 Emergent Marsh	4-16
4.3.7 Seasonally Flooded, Nonnative Grasslands Overview	4-18
4.3.8 Dry, Nonnative Grasslands.....	4-19
4.3.9 Mixed Forest.....	4-20
4.4 Major Species Groups.....	4-21
4.4.1 Fish	4-21
4.4.2 Waterfowl	4-23
4.4.3 Water Birds.....	4-23
4.4.4 Shorebirds.....	4-24
4.4.5 Raptors.....	4-24
4.4.6 Landbirds and Passerines.....	4-24
4.4.7 Mammals	4-25
4.4.8 Reptiles and Amphibians.....	4-26
4.4.9 Invertebrates	4-26
4.5 Threatened, Endangered, and Sensitive Species.....	4-27
4.6 Invasive and Nuisance Species	4-30
4.7 Biotic Responses to Climate Change.....	4-37
4.8 References.....	4-40
Chapter 5. Human Environment.....	5-1
5.1 Cultural and Historical Resources	5-1
5.1.1 Prehistoric and Ethnographic Resources	5-1
5.2 Infrastructure and Facilities	5-6
5.3 Recreation Overview	5-6
5.4 Wildlife Observation and Photography	5-6
5.5 Interpretation and Outreach	5-6
5.6 Environmental Education	5-6
5.7 Volunteers.....	5-7
5.8 Law Enforcement.....	5-7
5.9 Area Outdoor Recreational Opportunities	5-7
5.10 Recreation Trends	5-8
5.11 Special Designations.....	5-10
5.12 Socioeconomic Environment.....	5-11
5.12.1 Population and Area Economy	5-11
5.12.2 Local Community	5-12

5.13 References.....	5-13

Appendices

Appendix A. Appropriate Use Findings	
Appendix B. Compatibility Determinations	
Appendix C. Implementation	
Appendix D. Wilderness	
Appendix E. Biological Resources of Concern	
Appendix F. Statement of Compliance	
Appendix G. Integrated Pest Management	
Appendix H. Abbreviations and Glossary	
Appendix I. CCP Team Members and Contributors	
Appendix J. Public Involvement	
Appendix K. List of Black River Unit Species	
Appendix L. Maps	
Appendix M. Public Comments and Service Responses	

Tables

Table 1-1. Land Ownership Status.....	1-7
Table 1-2. Land Acquisition/Funding Authorities.....	1-8
Table 2-1. Summary of Management Direction	2-9
Table 3-1. Olympia Area: Air Temperature and Precipitation Summaries, 1948–2012 (WRCC 2015c, 2015f).....	3-2
Table 4-1. Priority Resources of Concern with Focal Species and Other Benefitting Species—Black River Unit.....	4-5
Table 5-1. Summary of Landscape Descriptions on GLO survey maps in the vicinity of Black River.	5-3
Table 5-2. Ranking of Major Activity Areas of Washington State Residents (RCO 2013).	5-9
Table 5-3. Projected Future Increase in Participation for Selected Outdoor Recreation Activities.	5-10
Table 5-4. Black River Unit: Summary of Area Economy, 2011 (Population & Employment in thousands; Per Capita Income in 2011 dollars)	5-11
Table 5-5. Employment Summary for Thurston County, 2011	5-11

Figures

Figure 3-1. Global annual average temperature and CO ₂ concentrations, 1880–2008. Source: USGCRP (2009).	3-4
Figure 3-2. Average annual temperature trends (1920–2000) in the Pacific Northwest. Increases (decreases) are indicated with red (blue) dots. The size of the dot corresponds to the magnitude of change (CIG 2012c).	3-5
Figure 3-3. Average annual precipitation trends (1920–2000) in the Pacific Northwest. Increases (decreases) are indicated with blue (red) dots. The size of the dot corresponds to the magnitude of change (CIG 2012c).	3-5
Figure 3-4. Changes in Pacific Northwest snowpack and streamflow runoff timing . (Left) Relative trend in April 1st snowpack (snow water equivalent) during 1950–2000 (CIG 2012c). (Right) Observed changes in timing of snowmelt runoff (center of mass flow) during 1948–2000 (Stewart et al. [2005:Figure 2]).	3-5
Figure 3-5. Annual mean, minimum, and maximum air temperatures for the Black River Unit, Billy Frank Jr. Nisqually NWR, during 1895–2011 and 1981–2011 (red regression lines and text). Annual temperatures are the means of the 12 monthly values (January through December). Source of monthly data: PRISM Climate Group (2012).	3-6
Figure 3-6. Annual precipitation (January through December) totals for the Black River Unit, Nisqually NWR, during 1895–2011 and 1981–2011 (red regression line and text). Source of monthly data: PRISM Climate Group (2012).	3-7
Figure 3-7. Seasonal temperatures (A) and precipitation (B) for the Upper Chehalis River HUC4 basin. Projections were for the A1B SRES Scenario. Bars and error bars represent the average and range of 10 climate models (CIG 2012b).	3-8
Figure 3-8. Combined average daily flows (baseflow + runoff) for the Upper Chehalis River HUC4 basin. Projections were for the A1B SRES scenario. Bars and error bars represent the average and range of 10 climate models. Runoff represents mean flow across the watershed (not routed through stream channels; Elsner and Hamlet 2010) (CIG 2012b).	3-9
Figure 5-1. Grays Harbor County’s population and employment over the last 10 years. In 2007, employment peaked at 33,792 and has since decreased to 30,382 in 2011, which is a 10 percent decrease. Employment changes were primarily in the construction and manufacturing sectors that experienced an increase in the first half of the decade and a subsequent decline in the latter half of the decade.	5-21

Maps

Map 1. Chehalis River Basin Overview.....	L-3
Map 2. Black River Unit Habitats.....	L-5
Map 3. Black River Unit Land Status.	L-7
Map 4. Black River Unit Management Direction.	L-9

Chapter 1

Introduction and Background



Chapter 1
Introduction and Background

Chapter 2
Management Direction

Chapter 3
Physical Environment

Chapter 4
Biological Environment

Chapter 5
Human Environment

Appendices
A-M

Chapter 1. Introduction and Background

1.1 Introduction

The Black River Unit (Unit) of Billy Frank Jr. Nisqually National Wildlife Refuge (Refuge or NWR) was established in the Chehalis River watershed in Washington State to protect fragile and unique natural habitats and their wildlife resources. The Unit is southwest of Olympia, Washington (see Map 1). The Black River is an important tributary of the Chehalis River, the second largest watershed in Washington State and the most intact lowland river system left in western Washington; the Unit boundary encompasses the northern portion of the Black River.

The Unit consists of a large, complex mosaic of wetland, riparian, and some upland habitats surrounding the low-lying river. The Unit's diverse habitats include river and tributary channels, bog, shrub swamp, riparian forest, emergent marsh, seasonally flooded nonnative grassland, dry nonnative grassland, and mixed forest (see Map 2). Bog habitat is considered locally rare.

This document is a comprehensive conservation plan (CCP) for the Black River Unit. A CCP is a management plan for the next 15 years or until it is revised; it will guide management and project development for the Unit as funding is made available. A draft CCP and Environmental Assessment (EA) was developed for both the Black River Unit and Grays Harbor NWR in 2016 (USFWS 2016a). The Unit and the Grays Harbor NWR are both part of the Nisqually National Wildlife Refuge Complex in Olympia, Washington (see Map 1).

Nisqually NWR was redesignated as Billy Frank Jr. Nisqually NWR in December 2015. A CCP for the then-named Nisqually NWR was completed in 2005 but did not include the Black River Unit. This CCP addresses management of the Black River Unit but not the remainder of Billy Frank Jr. Nisqually NWR.

The planning team for the CCP has carefully considered the critical resources, public use issues, and public input to design a plan that can best meet the resource conservation and visitor services challenges at the Black River Unit for the coming years.

1.2 Significance of the Refuge Unit

Both the upper Black River and associated wetlands are some of the last remaining lowland wide floodplain systems in the Puget Trough/Willamette Valley Ecoregion. The Unit contains spawning and rearing habitat and migration corridors for steelhead and cutthroat trout and Coho and Chinook salmon. At least 150 species of migratory birds, including waterfowl and neotropical songbirds, use the wetland and riparian habitats.

The Olympic mudminnow, a State-endemic and State species of concern, is found in the Unit. The Unit is in one of only three sub-basins in Washington to support the federally threatened and State-listed as endangered Oregon spotted frog. The complex system of wetlands within the Unit supports two major areas of frog activity and drainages into the river support other frog activity areas.

Drainage from the nearby Black Hills creates Stony, Dempsey, and Waddell Creek tributaries, as well as many seeps and springs. This low-gradient, meandering river of tannin-stained, slow-moving,

nearly silt-free water flows southwesterly and the floodplain is subject to frequent surface flooding during winter and spring.

Management programs on the Unit are focused on protecting and enhancing the unique habitats for fish and wildlife, including rare or declining species, migratory birds, anadromous salmonids, amphibians, and other wildlife. Land areas within the Unit are currently closed to public access. The riverbed is State-owned aquatic land managed by the Washington State Department of Natural Resources (WDNR). The river itself is open to the public by boat only, with boat access at one location on county land.

1.3 Proposed Action

We, the U.S. Fish and Wildlife Service (Service), choose to adopt and implement Alternative 2, the Service's preferred alternative, as the CCP for the Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge. The CCP sets forth management guidance for a refuge or a unit of a refuge for a period of 15 years or until it is revised, as required by the National Wildlife Refuge System Administration Act (16 U.S.C. 688dd–688ee, et seq.) (Refuge Administration Act), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). The Refuge Administration Act requires CCPs to identify and describe:

- the purposes of the refuge(s);
- the fish, wildlife, and plant populations, their habitats, and the archaeological and cultural values found on the refuge;
- significant problems that may adversely affect wildlife populations and habitats and ways to correct or mitigate those problems;
- areas suitable for administrative sites or visitor facilities and opportunities for fish and wildlife-dependent recreation.

Refuge System planning policy (Service Manual Part 602 FW 3) states that the purposes of CCPs are to “describe the desired future conditions of a refuge and provide long-range guidance and management direction to achieve refuge purposes; help fulfill the Refuge System mission; maintain and, where appropriate, restore the ecological integrity of each refuge and the Refuge System; . . . and meet other mandates.”

The Service examined and analyzed two management alternatives for the Unit and their anticipated effects, pursuant to the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321–4347). This analysis can be found in the draft CCP/EA that was published for Grays Harbor NWR and the Black River Unit of Billy Frank Jr. Nisqually NWR. The selected alternative was modified between the draft and final versions of the CCP based on comments from the public and other agencies and organizations. The selected alternative represents the most balanced approach for achieving the Refuge's purposes, vision, and goals; contributing to the Refuge System's mission; addressing relevant issues and mandates; and managing the Unit consistently with sound principles of fish and wildlife management.

1.4 Purpose and Need for Action

The purpose of developing the CCP is to provide the Refuge Manager at Billy Frank Jr. Nisqually NWR, which manages the Black River Unit, with a 15-year management plan for the conservation of fish, wildlife, and plant resources and their related habitats, while providing opportunities for compatible wildlife-dependent recreational uses. The CCP, when fully implemented, should achieve Refuge purposes; help fulfill the Refuge System mission; maintain and, where appropriate, restore the ecological integrity of the Refuge, Unit, and the Refuge System; and meet other mandates. The CCP must be specific to the planning unit and identify the overarching wildlife, public use, or management needs for the Unit. The need for the CCP is derived from the overall Refuge System mission, goals, and policies, as described in or promulgated by the Refuge Administration Act (602 FW 3.4C1d).

1.5 Legal and Policy Guidance

1.5.1 The U.S. Fish and Wildlife Service

All national wildlife refuges are managed by the U.S. Fish and Wildlife Service, an agency within the Department of the Interior (DOI). The Service is the principal Federal agency responsible for conserving, protecting, and enhancing the Nation's fish and wildlife populations and their habitats.

The mission of the Service is “working with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.” National natural resources entrusted to the Service for conservation and protection include migratory birds, endangered and threatened species, inter-jurisdictional fish, and certain marine mammals. The Service also manages national fish hatcheries, enforces Federal wildlife laws and international treaties on importing and exporting wildlife, assists with state fish and wildlife programs, and helps other countries develop wildlife conservation programs.

1.5.2 National Wildlife Refuge System

The Black River Unit of Billy Frank Jr. Nisqually NWR is part of the National Wildlife Refuge System (Refuge System or NWRS), which is governed by a framework of legal and policy guidelines. The Refuge System is the world's largest network of public lands and waters set aside specifically for conserving wildlife and protecting ecosystems.

Refuges, and units of refuges, are guided by various Federal laws and Executive orders, Service policies, and international treaties. Fundamental are the mission and goals of the Refuge System and the designated purposes of the refuge unit as described in establishing legislation, Executive orders, or other documents establishing, authorizing, or expanding a refuge.

Key concepts and guidance of the Refuge System derive from the National Wildlife Refuge System Administration Act of 1966 as amended (16 U.S.C. 688dd–688ee) (Refuge Administration Act), the Refuge Recreation Act of 1962 (16 U.S.C. 460k–460k-4), as amended, Title 50 of the Code of Federal Regulations (CFR), and the Fish and Wildlife Service Manual (FW). The Refuge Administration Act is implemented through regulations covering the Refuge System, published in Title 50, subchapter C, of the CFR. These regulations govern general administration of units of the Refuge System.

1.5.3 National Wildlife Refuge System Mission and Goals

The mission of the Refuge System is “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans” (National Wildlife Refuge System Administration Act of 1966, as amended)(16 U.S.C. 668dd et seq.).

The goals of the Refuge System, as articulated in the mission goals and purposes policy (601 FW 1) are:

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

1.5.4 National Wildlife Refuge System Administration Act

Of all the laws governing activities on national wildlife refuges, the Refuge Administration Act exerts the greatest influence. The National Wildlife Refuge System Improvement Act (Improvement Act) amended the Refuge System Administration Act in 1997 (USFWS 1997) by including a unifying mission for all national wildlife refuges as a system, a new process for determining compatible uses on refuges, and a requirement that each refuge be managed under a comprehensive conservation plan, developed in an open, public process.

The Refuge Administration Act states that the Secretary of the Interior shall provide for the conservation of fish, wildlife, plants, and their habitats within the Refuge System as well as ensure that the biological integrity, diversity, and environmental health (BIDEH) of the Refuge System are maintained. House Report 105-106 accompanying the Improvement Act states “... the fundamental mission of our System is wildlife conservation: wildlife and wildlife conservation must come first.” BIDEH are critical components of wildlife conservation. As later made clear in the Biological Integrity, Diversity and Environmental Health Policy (601 FW 3) “the highest measure of biological integrity, diversity, and environmental health is viewed as those intact and self-sustaining habitats and wildlife populations that existed during historic conditions.”

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

Additionally, the Refuge Administration Act identifies six priority wildlife-dependent recreational uses for the Refuge System. These uses are hunting, fishing, wildlife observation and photography, and environmental education and interpretation. Under the Refuge Administration Act, the Service is to grant these six wildlife-dependent public uses special consideration in the planning for, management of, and establishment and expansion of units of the Refuge System. The overarching goal of wildlife-dependent public use programs is to enhance opportunities and access to quality wildlife-dependent visitor experiences on refuges while managing refuges to conserve fish, wildlife, plants, and their habitats. When determined compatible on a refuge-specific basis, these six uses assume priority status among all uses of the refuge. The Service is to make extra efforts to facilitate priority wildlife-dependent public use opportunities.

When preparing a CCP, refuge managers must re-evaluate all general public, recreational, and economic uses (even those occurring to further refuge habitat management goals) proposed or occurring on a refuge or unit for appropriateness and compatibility. No use may be allowed or continued unless it is determined to be appropriate and compatible. Generally, an appropriate use is one that contributes to fulfilling the refuge purposes, the Refuge System mission, or goals or objectives described in a refuge management plan. A compatible use is a use that in the sound professional judgment of the Refuge Manager will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge. Updated appropriate use and compatibility determinations for existing and proposed uses for the Unit can be found in Appendices A and B.

The Refuge Administration Act also requires that in addition to formally established guidance, the CCP must be developed with the participation of the public. Issues and concerns identified by the public help prepare alternatives considered during the development of the CCP, and together with the formal guidance, form the basis for selection of the preferred alternative. It is Service policy that CCPs are developed in an open, public process, and we are committed to securing public input throughout the CCP process. Public involvement details can be found in Appendix J.

1.5.5 Other Laws and Mandates

Many other Federal laws, Executive orders, Service policies, and international treaties govern the Service and Refuge System lands. Examples include the Migratory Bird Treaty Act of 1918 (MBTA), Refuge Recreation Act of 1962, National Historic Preservation Act of 1966 (NHPA), and the Endangered Species Act of 1973 (ESA). For additional information on laws and other mandates, a list and brief description of Federal laws pertinent to the Service can be found in the laws digest at <http://www.fws.gov/laws/Lawsdigest.html>.

In addition, we have developed or revised numerous policies and Director's orders to reflect the mandates and intent of the Refuge Administration Act. Some of these key policies include the Biological Integrity, Diversity, and Environmental Health Policy (601 FW 3); the Compatibility Policy (603 FW 2); the Comprehensive Conservation Planning Policy (602 FW 3); Mission, Goals, and Purposes (601 FW 1); Appropriate Refuge Uses (603 FW 1); Wildlife-Dependent Public Uses (605 FW 1); wilderness-related policies (610 FW 1–5) and the Director's Order for Coordination and Cooperative Work with State Fish and Wildlife Agency Representatives on Management of the National Wildlife Refuge System. These policies and others in draft or under development can be found at <http://refuges.fws.gov/policymakers/nwrpolicies.html>.

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

1.6 Refuge Unit Establishment and Purposes

1.6.1 Legal Significance of the Refuge Purpose

The purpose(s) for which a refuge or refuge unit was established or acquired is of key importance in refuge planning. Purposes must form the foundation for management decisions. The refuge purposes are the driving force in the development of vision statements, goals, objectives, and strategies in a CCP and are critical to determining the compatibility of existing and proposed refuge uses.

The purpose(s) of a refuge are specified in or derived from the law, proclamation, Executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit.

Unless the establishing law, order, or other document indicates otherwise, purposes dealing with the conservation, management, and restoration of fish, wildlife, plants, and the habitats on which they depend take precedence over other purposes in the management and administration of any unit. Where a refuge has multiple purposes related to fish, wildlife, and plant conservation, the more specific purpose will take precedence in instances of conflict.

When an additional unit is acquired under an authority different from the authority used to establish the original unit, the addition takes on the purpose(s) of the original unit, but the original unit does not take on the purpose(s) of the newer addition. When a conflict exists between the Refuge System mission and the purpose of an individual refuge, the refuge purpose may supersede the Refuge System mission.

1.6.2 Establishing Purposes

In 1980 a Service wetland inventory program identified the Black River wetland system as an important habitat in Washington State (USFWS 1980). Though little was known at the time, this intact low-lying river system retained unique wetland bogs in a mosaic of natural wetland habitats. Thurston County identified and designated this area as “natural” in the Shoreline Management Plan.

Identified in the Service’s Black River Swamp Preserve Design (Caicco 1992), a clear description of the habitats describes the unique, relatively wild character and natural features of the wetlands south of the Black Lake. The document begins the discussion of habitat protection and management opportunities for the area. In an early land acquisition effort to protect the river corridor and surrounding floodplain wetlands, The Nature Conservancy (TNC) acquired 320 acres in 1993 to manage the land as a nature preserve. The following year, the Pacific Coast Joint Venture (PCJV, now known as the Pacific Birds Habitat Joint Venture) identified portions of the Black River in need of protection in their annual Strategic Plan. Members of the public and nongovernmental organizations (NGOs), such as TNC and PCJV, advocated for the establishment of a refuge. A preliminary project proposal (USFWS 1993) was developed by the Service outlining habitat protection options and proposing an acquisition boundary. The Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge was authorized in 1996 (USFWS 1996) and the Unit was

established with the purchase of the first parcel of land in 1998 (see Table 1-1). Community outreach efforts with landowners and willing sellers in the area continue today.

The establishing purposes for the Black River Unit are the same as for the Billy Frank Jr. Nisqually NWR:

- for use as an inviolate sanctuary, or for any other management purpose, for migratory birds. 16 U.S.C. § 715d (Migratory Bird Conservation Act);
- “... for the development, advancement, management, conservation, and protection of fish and wildlife resources ...” 16 U.S.C. § 742f (a)(4) (Fish and Wildlife Act of 1956);
- “... 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).

1.6.3 Unit Ownership and Land Status

Tables 1-1, 1-2, 1-3, and Map 3 show the lands associated with the Unit. The acreage figures for fee title properties are based on realty deeds. The approved Refuge and Unit boundaries indicate boundaries approved by the national or regional U.S. Fish and Wildlife Service Director for potential acquisition of lands by the Service.

Geographic information system (GIS) acres can vary by a certain amount from realty acres, which are based on survey or deed records. Realty acres should be viewed as the most accurate source. However, a variety of analyses (habitat acres, river miles) were conducted utilizing GIS mapping during the CCP process.

Quantitative analysis in the CCP is based on GIS estimates, which may slightly over- or underestimate actual acres or lengths.

Table 1-1. Land Ownership Status

	Approved Refuge Boundary Acres ⁽¹⁾	Acres Owned in Fee ⁽²⁾	Acres in Easements, Agreement, or Lease ⁽²⁾
Black River Unit	3,873 acres	1,566	11

(1) Acres generated from GIS, rounded to the nearest acre.

(2) Acres from realty data, rounded to the nearest acre (USFWS 2015)

Land acquisition using funding from the Land and Water Conservation Fund (LWCF) is under the acquisition authority of the Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a–742j). Acquisitions using funding from the Migratory Bird Conservation Fund (MBCF) are under the acquisition authority of the Migratory Bird Conservation Act of 1929.

Unit authority and management extends across all lands owned by the Unit, except that the aquatic bed of the river within that ownership (approximated by the area that is within “bank to bank” of the river) is under the jurisdiction of WDNR (see also Section 2.3).

Table 1-2. Land Acquisition/Funding Authorities

Date	Legal Document	Direction
02/13/1998	Deed	Tracts 569, 569a, (31.6 acres) purchased with LWCF funds
09/02/1999	Easement	Tract 525R, donation of easement (.26 acres)
09/02/1999	Deed	Tract 525e, donation (25.46 acres)
12/15/1999	Easement	Tract 545R, purchased (wetlands) easement (.25 acres) with LWCF funds
12/15/1999	Deed	Tract 545, purchased (9.59 acres) with LWCF funds
03/20/2000	Deed	Tracts 525a, 525b, 525c, 525d, purchased (149.44 acres) with LWCF funds
03/20/2000	Easement	Tract 525R-1, donation of easement (3.21 acres)
06/06/2000	Deed	Tract 552, 552a, donation (73 acres)
08/31/2000	Deed	Tracts 547, 547a, 547b, purchased (41.91 acres) with LWCF funds
09/28/2000	Deed	Tracts 574, 574a, purchased (64.6 acres) with LWCF funds
11/09/2000	Deed	Tracts 575, 575a, 575b, purchased (29.1 acres) with LWCF funds
11/09/2000	Easement	Tract 575R-1, donation of easement (1.12 acres)
05/24/2001	Deed	Tract 553, purchased (23.73 acres) with LWCF funds
09/14/2001	Deed	Tract 525p, purchased (160 acres) with MBCF funds
09/24/2001	Deed	Tracts 525f, 525g, 525h, 525i, 525j, purchased (109.75 acres) with LWCF funds
10/05/2001	Deed	Tract 573, purchased (9.47 acres) with LWCF funds
06/11/2002	Deed	Tract 546, 546a, donation (19.5 acres)
06/11/2002	Easement	Tract 546R, donation of (.30 acre) easement
09/03/2002	Deed	Tract 526c, purchased (89 acres) with LWCF funds
09/05/2002	Deed	Tract 525k, purchased (20 acres) with MBCF funds
09/30/2002	Deed	Tract 551, purchased (6.22 acres) with LWCF funds
12/19/2002	Deed	Tracts 584, 584a, purchased (5.07 acres) with LWCF funds
12/19/2002	Easement	Tracts 584R, 584M, donation (4 acres)
05/16/2003	Deed	Tract 525m, purchased (13.3 acres) with MBCF funds
08/15/2003	Deed	Tract 526a, purchased (21.09 acres) with LWCF funds
09/04/2003	Deed	Tract 548, purchased (80 acres) with LWCF funds
10/22/2004	Deed	Tract 514, purchased (10 acres) with LWCF funds
10/22/2004	Easement	Tract 514R, purchased easement (.16 acres) with LWCF funds
04/13/2005	Deed	Tract 525n, 525q, purchased (328 acres) with LWCF funds
10/04/2007	Deed	Tract 513c, purchased (34.50 acres) with LWCF funds

Date	Legal Document	Direction
09/23/2009	Deed	Tract 541, purchased (19.77 acres) with LWCF funds
08/27/2010	Deed/Easement	Tract 571, 571R purchased (14.46 acres) with LWCF funds
08/18/2011	Deed	Tracts 567, 567a, 567b, 568, purchased (37.08 acres) with LWCF funds
08/18/2011	Easement	Tracts 567R, 568R, purchased easement (2.06 acres) with LWCF funds
11/03/2011	Deed	Tracts 544, 544a, purchased (19.65 acres) with LWCF funds
01/05/2012	Deed/Easement	Tracts 525r, 525R-2, purchased (65.83 acres) with LWCF funds
05/24/2012	Deed	Tract 523, purchased (38.68 acres) with LWCF funds
05/08/2015	Deed	Tracts 538c, 538d, purchased (16 acres) with LWCF funds

1.7 Relationship to Other Planning Efforts

When developing a CCP, we consider the goals and objectives of existing national, regional, state, and ecosystem plans and/or assessments. The CCP is expected to be consistent, as much as possible, with existing plans and to assist in meeting their conservation goals and objectives (602 FW 3). This section summarizes some of the key plans reviewed by members of the core team while developing the CCP.

1.7.1 Previous Refuge Plans

- Wildland Fire Management Plan for Nisqually NWR Complex (USFWS 2003)
- Flight Safety Plan for Nisqually NWR Complex (USFWS 2016b)
- Float Plan for Nisqually NWR Complex (USFWS 2016c)
- Safety Plan for Nisqually NWR Complex (Comprehensive) (USFWS 2012a)
- Draft Nisqually NWR Complex H5N1 Avian Influenza Disease Contingency Plan (USFWS 2007)

1.7.2 Future Planning

The CCP will be revised every 15 years or earlier if monitoring and evaluation determine that changes are needed to achieve the refuge purposes, vision, goals, or objectives. The CCP provides guidance in the form of goals, objectives, and strategies for refuge program areas but may lack some of the specifics needed for implementation. Step-down management plans will therefore be developed for individual program areas as needed, following completion of the CCP. Step-down plans may require additional NEPA compliance.

1.7.3 Migratory Bird Conservation and Plans

Birds of Management Concern (BMC)

BMC is a subset of all species protected by the MBTA (50 CFR 10.13) and includes those which pose special management challenges due to a variety of factors (e.g., too few, too many, conflicts

with human interests, or societal demands) (USFWS 2012b). BMC comprises both game birds below their desired condition and nongame birds.

BMC species, subspecies, or populations are divided into four categories:

- (a) birds listed as endangered or threatened under the ESA (USFWS 1973);
- (b) nongame MBTA-protected birds that have been determined to be of conservation concern (as published in *Birds of Conservation Concern 2008*; 247 including all national, regional, and Bird Conservation Region species);
- (c) birds that are considered overabundant in part or all of their range and thus potentially damaging to natural ecosystems or human interests;
- (d) high-priority migratory game birds, as determined by factors such as their population status, their socio-economic value, and our ability to manage them based on sound information.

BMCs are also:

- (a) protected by the MBTA (USFWS 1918);
- (b) regularly found in the continental U.S., Hawaiian and U.S. Pacific Islands, Puerto Rico, or the U.S. Virgin Islands;
- (c) regular breeders or winter residents in one of the above geographical areas;
- (d) hunted species that are not currently hunted for sport under provisions established by the MBTA.

The Unit provides breeding, wintering, and stopover habitat for some birds identified as BMCs with primary importance in the region and includes those species that can usually be observed using Unit habitats. Some of these species are greater white-fronted goose (Pacific population), cackling and Pacific populations of Canada goose, gadwall, American wigeon, mallard (western population), northern shoveler, northern pintail, American green-winged teal, greater and lesser scaup, surf scoter, double-crested cormorant, bald eagle, peregrine falcon, Virginia rail, red knot (roselaari), dunlin, short-billed dowitcher, Caspian tern, and rufous hummingbird. Uncommon or occasionally observed birds are dusky goose, Pacific black brant, common goldeneye, horned grebe, western grebe, pelagic cormorant, whimbrel, and marbled godwit (see Appendix E).

Focal Species of Birds

To better measure its success in achieving its bird conservation priorities and mandates, the Service's Migratory Bird Program initiated a focal species strategy for migratory birds (USFWS 2011, 2012c). The focal species strategy involves campaigns for selected species to provide explicit, strategic, and adaptive sets of conservation actions required to return the species to healthy and sustainable levels.

The goal of the focal species strategy is to measure the success in achieving bird conservation and to increase accountability. The Service remains committed to landscape-scale, integrated bird conservation for the full array of species of management concern. The focal species approach is just one component of the Migratory Bird Program and complements other work on migratory birds and their habitats.

To select focal species, the Service's Migratory Bird Program identifies species from the BMC that need investment because they (1) have high conservation need, (2) are representative of a broader

group of species sharing the same or similar conservation needs, (3) act as a potential unifier for partnerships, or (4) have a high likelihood that factors affecting status can be realistically addressed.

Birds of Conservation Concern (BCC)

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

Four BCC species regularly occur on the Unit: mourning dove, rufous hummingbird, willow flycatcher, and purple finch. Birds that occasionally are seen or are thought to use Unit habitats include bald eagle, peregrine falcon, and solitary sandpiper.

Partners in Flight (PIF)

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

The Unit is important to perching birds and landbirds. The regional PIF plans applicable to the Unit include *The Conservation Strategy for Landbirds in Lowlands and Valleys of Western Oregon and Washington* (Altman 2000) and *Conservation Strategy for Landbirds in Coniferous Forests of Western Oregon and Washington* (Altman and Alexander 2012). The lowlands and valleys plan identifies over 46 bird species and 2 priority habitats. Many forest conditions (seedlings to mature trees) identified in the coniferous forest plan are found within the Unit boundary. The 11 focal species of this plan include 4 species of warbler (orange-crowned, black-throated gray, Wilson’s, and Townsend’s), 3 species of flycatcher (olive-sided, Hammond’s, and Pacific-slope), winter wren, varied thrush, brown creeper, and pileated woodpecker.

North American Waterbird Conservation Plan (NAWCP)

An independent partnership of individuals and organizations with a shared concern for waterbird conservation developed a plan to sustain or restore the distribution, diversity, and abundance of breeding, migratory, and nonbreeding waterbirds of North and Central America and the Caribbean regions (Kushlan et al. 2002). The primary goal of the partnership was to develop and facilitate implementation of the NAWCP. Completed in 2002, the NAWCP outlines a continental-scale strategy for conserving and managing over 200 aquatic bird species. The NAWCP identifies vulnerabilities and threats to species and their habitats. Habitat and site-based conservation actions throughout the Americas and the North Pacific are promoted by the NAWCP. Conservation priorities, information needs, resources, and infrastructure are identified at regional and local levels in a step-down process through regional working groups.

The Black River Unit is an important location for waterbirds; its extensive mosaic of wetlands provides habitats for approximately eight waterbird species, including pied-billed grebe, American coot, great blue and green heron, and secretive birds such as sora, bittern, and rail.

North American Waterfowl Management Plan (NAWMP)

This plan, first formulated in 1986, provides a strategy to protect North America's remaining wetlands and to conserve waterfowl populations through protecting, restoring, and enhancing habitat. The plan was updated in 2004 with an emphasis on strengthening the biological foundation, using a landscape approach, and expanding partnerships (North American Waterfowl Management Plan Committee 2004).

A small number of individual ducks or geese from approximately 11 species identified in the NAWMP have been observed using Black River habitat.

Pacific Flyway Management Plan (PFMP)

The Pacific Flyway Council is an administrative body that forges cooperation among public wildlife agencies for the purpose of protecting and conserving migratory game birds in western North America. The council is generally composed of one member from the public wildlife agency in each state and province in the western United States, Canada, and Mexico. Biologists from state, Federal, and provincial wildlife and land-management agencies, university students and faculty, and others develop management plans for the cooperative management of migratory game bird populations in the Pacific Flyway. Biologists from the Central Flyway, Canada, Mexico, and Russia contribute to these plans.

Management plans for birds that may use the Black River Unit include cackling geese and some subspecies of Canada geese, such as lesser, Taverner's, and western geese, as well as Pacific coast band-tailed pigeons and the western management unit population of mourning doves.

1.7.4 State Plans

Washington Comprehensive Wildlife Conservation Strategy (CWCS)/Washington Wildlife Action Plan (WAP)

In response to two Federal programs—the Wildlife Conservation and Restoration Program and the State Wildlife Grant Program—the Washington Department of Fish and Wildlife (WDFW) prepared a number of important documents to help guide State resource management.

The driving force behind CWCS is the Washington Species of Greatest Conservation Need list. The list builds on current efforts to protect fish and wildlife species, including those listed on State and Federal endangered, threatened, and sensitive species lists, as well as species not yet listed but for which conservation actions or additional information is needed.

WAP is part of the CWCS (WDFW 2015). WAP includes information on the distribution and abundance of State priority wildlife and habitats, provides strategies for conserving and monitoring wildlife and habitat, and provides for coordination with Federal, State, Tribal, and local agencies, and the public. WAP emphasizes proactive measures to conserve declining species and habitats and to

maintain the status of common species, and is helpful to Unit staff in making biological and management decisions.

Washington Natural Heritage Plan (WNHP)

WNHP (WDNR 2011) is a product of the Washington Natural Heritage Program (in the Department of Natural Resources), whose mission is to conserve the full range of Washington's native plants, animals, and ecosystems through voluntary and cooperative actions. The program uses science to identify high-quality and representative examples of native Washington habitats and species and works to protect these natural treasures through voluntary and cooperative habitat conservation agreements.

Areas of critical environmental concern, wilderness areas, national monuments, and other public lands with management plans that adequately protect Washington's natural heritage include research natural areas (RNAs) as providing complete or partial protection for some ecosystems and species. For refuges and refuge units, the WNHP recommends that RNAs be established to protect natural areas of exceptional value, particularly those areas that are unique and have no similar examples protected elsewhere.

Priority Habitats and Species (PHS)

WDFW has identified those fish and wildlife resources that are a priority for managing and conserving. Priority habitats are those habitat types with unique or significant value to many fish or wildlife species. Priority species are those fish and wildlife species requiring special efforts to ensure their perpetuation because of their low numbers, sensitivity to altered habitat, tendency to form vulnerable aggregations, or because they are of commercial, recreational, or tribal importance. Descriptions of those habitats and species designated as priority were published as individual documents on habitats, birds (WDFW 2004), fish, invertebrates (WDFW 1995), amphibians and reptiles (WDFW 1997), and mammals (draft), and as a summary report (WDFW 2008), and the online Priority Habitats and Species (PHS) Lists (continually updated).

1.7.5 Other Natural Resource Plans or Guidance Documents

Chehalis River Basin Action Plan (CRBAP)

The purpose and mission of the action plan is to, "Develop a dynamic plan that will improve surface water and ground water quality in the Chehalis River Basin, including the Chehalis River, Grays Harbor, and their tributaries, by reducing nonpoint source pollution in accordance with Federal, State and local guidelines. The CRBAP will foster opportunities for organizations and individuals to work together to prevent future pollution of the waters of the Chehalis River Basin. While achieving water quality goals, we recognize the need to maintain the viability of existing industries. All goals are of equal importance." This action plan also includes information on Chehalis tributaries, including the Black River (Chehalis River Council 1992).

Chehalis Basin Watershed Management Plan (CBWMP)

The plan is adapted from the CRBAP (Chehalis River Council 1992) with additional information incorporated from the Chehalis Basin Level 1 Assessment. It outlines the status and needs to restore and conserve the waters of the Chehalis Basin (Chehalis Basin Partnership 2004).

Wetlands in Washington State, Volume 1 and Volume 2

Volume 1 is a synthesis of science, reviewing the components of freshwater wetlands and the effects of changes on the wetlands. Volume 2 provides guidance on managing and protecting wetlands. Both volumes are from Department of Ecology and they provide guidance in understanding the wetland ecology of the Black River Unit (Granger et al. 2005, Sheldon et al. 2005).

Black River Conservation Area Plan

This TNC plan pulls together information regarding the Black River Watershed, its history, uses, special habitats, threats, and needs from the headwaters to the confluence with the Chehalis River. The purpose of the Black River Conservation Area Plan (TNC 2005) is to highlight the uniqueness of the Black River in the Puget Trough, to identify the species and communities within the watershed that are representative of the ecological region, and to emphasize the need to protect, restore, and link the diverse habitats found in the Black River watershed—habitats upon which the biodiversity and ecological functioning of this Puget Trough landscape are dependent.

1.8 Planning Process and Issue Identification

1.8.1 Planning Process

The CCP planning process for Grays Harbor NWR and the Black River Unit began in 2010. A core team and an expanded team were formed to develop the CCP. The core planning team consists of the project leader, deputy project leader, visitor services manager, wildlife biologist, and conservation planner. The extended team consists of biologists from the Service, WDFW, and WDNR. The extended team assisted in the development of this CCP, particularly in providing comments and information at milestones in the planning process. A full list of the plan contributors and their roles is provided in Appendix I.

Early in the planning process, we developed a list of preliminary issues, concerns, and opportunities for the CCP. These planning issues were initially presented to the public in Planning Update 1 in May 2011 and at two local public scoping meetings on May 18 and 19, 2011. A Notice of Intent to prepare a CCP and associated NEPA document was published in the Federal Register on June 8, 2011 (76 FR 33339).

A second planning update published in November 2011 presented a summary of issues identified through the scoping process and a third planning update published in May 2013 described preliminary draft alternatives. The comments and suggestions made through this process helped further develop and refine the issues and management alternatives for the CCP, including the preferred alternative.

The draft CCP/EA was issued for public review and comment on October 26, 2016. The availability of the plan was announced through a notice in the *Federal Register* (October 26, 2016, 81 FR 74476) and via direct contact with individuals and organizations on our mailing list. The plan was made available for downloading on the Refuge website and was made available upon request in CD or printed format. Printed copies of the draft CCP/EA were available at local public libraries, and upon request. Comments were received from 8 entities during the 31-day public comment period held October 26, 2016, through November 25, 2016. All changes made as a result of public and agency

comments were documented. A summary of public involvement is included in Appendix J; public comments on the draft CCP/EA and the Service's responses to comments are included in Appendix M.

1.8.2 Key Issues Addressed in the CCP

The CCP planning team evaluated the issues and concerns raised by both staff and the public during public scoping, as well as throughout the multi-year planning process. Issues are defined as matters of controversy, dispute, or general concern over resource management activities, the environment, land uses, or public use activities. Issues are important to the planning process because they identify topics to address in the CCP, pinpoint the types of information to gather, and help define alternatives for the CCP. Although CCPs are comprehensive plans, no single plan can cover all issues. It is the Service's responsibility to focus planning and the analysis on the major issues. Major issues typically suggest different actions or alternative solutions, are within the Refuge's jurisdiction, and have a positive or negative effect on the resource. Major issues influenced the alternatives that were proposed in the draft CCP. Key issues, concerns, and opportunities analyzed in the CCP are presented below (also see Appendix J).

- *Land and Water Protection.* What actions are needed to sustain and restore priority species and habitats over the next 15 years? How can we improve habitat protection and connectivity and reduce habitat fragmentation? How can we improve water quality and quantity in the Black River system for fish and wildlife?
- *Habitat Management and Restoration.* Most habitats have been altered by human actions and are in need of management and restoration to increase value as fish and wildlife habitat. What actions will help provide important information on key species, habitat composition, and the management prescription needed for the Black River Unit? What will the effects of climate change and sea level rise have on Unit habitats and species? How can we enhance Oregon spotted frog recovery?
- *Invasive Species Control.* Invasive plant species degrade habitat quality for migratory birds, fish, amphibians, and many other forms of fish and wildlife. Nonnative animals may compete with native fish and wildlife for limited resources. How can we reduce the incidence and spread of invasive species?
- *Visitor Services and Education Opportunities.* The Black River Unit has remained largely closed because of the fragmented nature of current land ownership. How can we reduce trespassing, vandalism, and other illegal activities and improve wildlife habitat and protection? What wildlife-dependent priority public uses should be considered at the Black River Unit, where should they be allowed, and how should they be conducted? What opportunities are there for improving access to Black River, boat launching, and parking on the Unit? How can partnerships and volunteers be developed to support visitor service programs?
- *Conservation Partnership.* How can the Service develop a coordinated approach with other groups and agencies to plan and manage for the protection, restoration, and interpretation of lands and waters within the Black River corridor?

1.9 Refuge Vision and Goals

1.9.1 Refuge Vision

The waters of the Black River flow almost imperceptibly from Black Lake south to the Chehalis River. Meandering through a complex mosaic of wetlands, riparian forest, shrub swamp, and bogs, this area is considered the most intact low-lying river system remaining in western Washington. The Unit protects some of the most expansive and remote wetlands, sustaining a truly wild place.

The Unit provides a diverse community of fish and wildlife, large populations of once rare species such as the Oregon spotted frog, salmon, and unique bog, plants, and animals now flourish in the healthy wetland habitats.

Unit visitors will explore the quiet waterway, paddling canoes through the narrow river channel to fish and observe wildlife. Exploration of the native habitats offers opportunities to catch a glimpse of secretive wading birds, river otter, beaver, Roosevelt elk, and other wildlife, providing visitors with a sense of stewardship for the Unit.

Together, community members and partners, in concert with the Unit, protect and enhance the Black River, promoting biodiversity and natural ecological functions to benefit native fish, wildlife, and plant communities in wetland and upland habitats.

The Unit continues to build strong partnerships to protect and maintain the solitude, wild character, and health of the Black River so future generations can experience being a part of this very special place.

1.9.2 Refuge Goals

- 1) Protect, maintain, and enhance aquatic habitats characteristic of the upper Black River Watershed while maintaining historical characteristics of the north Puget Trough Lowlands for the benefit of native fish, amphibians, migratory birds, and a diverse assemblage of other native species.
- 2) Protect and maintain upland habitats characteristic of the upper Black River watershed.
- 3) Contribute to the protection and long-term environmental health of the greater Black River watershed and ecosystem.
- 4) Gather scientific information (inventories, monitoring, and research) to support adaptive management decisions.
- 5) Provide quality opportunities for visitors to experience a diversity of wildlife and habitats to enhance their understanding and appreciation of the Unit's natural resources and to foster a connection with nature.
- 6) Support and develop an active volunteer program and partnerships to assist in providing quality visitor services programs and outreach.

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A close-up photograph of a beaver swimming in a pond. The water is dark and reflects the surrounding autumn foliage, which includes yellow and orange leaves. The beaver's head is visible above the water, with its eyes and ears clearly shown. Its dark, wet fur is glistening. The background is a soft-focus view of the pond's surface with more leaves and ripples.

Chapter 2

Management Direction

Chapter 1
Introduction
and
Background

Chapter 2
Management
Direction

Chapter 3
Physical
Environment

Chapter 4
Biological
Environment

Chapter 5
Human
Environment

Appendices
A-M

Chapter 2. Management Direction

2.1 Alternatives Development

During development of this CCP, the Service reviewed and considered a variety of local and regional physical and biological resource conditions, as well as social, economic, and organizational aspects important for managing the Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge. All actions described for the Unit are carried out by staff and volunteers at the Billy Frank Jr. National Wildlife Refuge, which contains the Black River Unit. As is appropriate for national wildlife refuges, resource considerations were fundamental in designing alternatives. House Report 105-106 accompanying the National Wildlife Refuge System Improvement Act of 1997 states "...the fundamental mission of our System is wildlife conservation: wildlife and wildlife conservation must come first."

The CCP planning team reviewed scientific reports and studies to understand ecosystem trends and the latest scientific recommendations for species and habitats found at the Unit. The Service reached out to staff from Federal, State, and local agencies, Tribes, and elected officials to ascertain priorities and issues. Service staff met or communicated with Unit users, representatives of nonprofit groups, and community organizations to ensure that their comments and ideas were considered during CCP development. Further details of public involvement and participation are found in Appendix J.

2.2 Alternatives Considered but Eliminated from Detailed Study

During development of the alternatives, the planning team considered the actions described below for the Black River Unit. These actions were ultimately eliminated from further consideration for the reasons provided.

Waterfowl Hunting: Waterfowl hunting under state regulations occurs within the Black River channel. During the public scoping period, the Service received comments requesting opportunities to hunt waterfowl within the Black River Unit (see Appendix J).

When considering wildlife-dependent public uses on any refuge or refuge unit, we must determine if we can provide high-quality experiences that are compatible with the purposes of that refuge or unit. The term "quality" is identified as a baseline attribute for any wildlife-dependent, priority public use activity being considered. Considerations for quality waterfowl hunting on the Black River Unit included (1) hunter safety, (2) hunter ethical behavior, (3) uncrowded conditions, (4) reasonable harvest opportunities, (5) a clear understanding about which areas are open and closed to hunting, and (6) minimal conflict between hunters and other visitors. Distance and access to the site also will have to be feasible in a reasonable timeframe. In addition, local landowners live along the river shoreline in some locations, and the need to avoid conflict and maintain a safety buffer was an important factor. Rare or listed species and their associated habitats were also considered regarding potential waterfowl hunting on Unit lands.

The planning team carefully considered the feasibility of waterfowl hunting on Unit lands that met these quality parameters. Both walk-in and boat-in hunting on Unit lands along the river bank were considered but not further developed because of the difficulty in accessing the bank due to dense

vegetation, the difficulty in maintaining access to the bank, and the presence of the federally threatened Oregon spotted frog.

North of 110th Avenue, the river channel is extremely narrow, averaging 10 to 25 feet wide depending on location. Most of the narrow river channel is bounded on both sides by tall, impenetrable vegetation lining the river banks, including dense shrub scrub. These conditions make it extremely difficult-to-impossible to ensure that birds would drop in the river rather than become lost in the dense vegetation after being shot. The vegetation is too impenetrable even for dogs in most places, which would result in the loss of many downed birds. A waterfowl hunting program under these conditions would result in the waste of natural resources (50 CFR 20.25), violate the Migratory Bird Treaty Act, and not provide a quality hunting experience on Unit lands. Other considerations include safety issues and the potential for user conflicts with boaters, including kayakers and canoeists.

Waterfowl hunting in Unit lowlands and wetlands from the southern boundary of the Unit to 110th Avenue was considered and not further developed because the river corridor is within critical habitat for the federally threatened Oregon spotted frog and harbors one of the core populations within western Washington. Additionally, local landowners live along the river shoreline in some locations and this was an important consideration to avoid conflicts and maintain a safety buffer. Because of all of these considerations, it was determined that a safe and quality waterfowl hunting program is not feasible under current conditions and this activity was not selected for further analysis.

The planning team has noted the possibility of future Unit acquisitions within the Black River area, where more suitable lands which could support a waterfowl hunting program could potentially be acquired. Unit-based waterfowl hunting would be reconsidered, and a separate planning and compliance effort could follow such future acquisitions.

Fishing: Fishing under state regulations occurs within the Black River channel. During the public scoping period, the Service received comments requesting opportunities to fish from Unit lands within the Black River, including the river bank (see Appendix J).

Fishing is a wildlife-dependent public use and therefore receives special consideration in planning (see Chapter 1.5.4). When considering fishing opportunities on any refuge or refuge unit, programs are designed to provide high-quality experiences that are compatible with the purposes of that refuge or unit. In this CCP process, fishing on Unit lands within the Black River was considered but not further developed because these parameters would not be met due to the difficulty in accessing the bank because of its dense vegetation, the difficulty in maintaining access to the bank, and the presence of the federally threatened Oregon spotted frog.

Within the Unit, the bank and adjacent areas are occupied by dense stands of shrubs or are dominated by emergent wetlands making foot access to the river extremely difficult. Successfully casting from within the shrubs would be difficult. Traveling through and fishing from the shrubs or wetlands would increase the potential for wildlife disturbance. Additionally, boat landing on the river bank for fishing would involve dragging boats in and out of the water and could cause erosion and turbidity. Fishing for crayfish usually involves use of traps, which have the potential to also catch federally threatened Oregon spotted frogs or possibly Olympic mudminnows, a State-sensitive species. For these several reasons, fishing for shellfish, fishing from the banks or in the tributaries of Black River, and fishing near the boat launch site were considered but not further developed in the CCP.

Boat Launch at 110th Avenue: Boat launch sites are an important component to providing safe, feasible public access on the Black River. The planning team examined the WDNR-owned boat launch site and the surrounding Unit lands on 110th Avenue. The planning team contacted WDNR and discussed various issues regarding the upgrade of the former boat launch and parking area. WDNR no longer maintains a boat launch at this site due to infrastructure problems with flooding, costs, and the difficulty in maintaining a launch site there. Issues include extreme flood events that regularly wash out any structures or docks; the soft substrate that requires constant gravel and fill to maintain a small, existing parking and access area; safety; security due to vandalism and theft; and feasibility and costs to maintain safe facilities and access. This site was physically limited in terms of road clearance, parking space, boat launch size, and safety. Parking or public access on Unit lands adjacent to 110th Avenue is not feasible. These areas are more distant from the river and separated from the river channel by heavy brush and shallow wetlands. It was determined the site at 123rd Avenue offered the best opportunity to provide a high-quality, safe, and accessible parking and boat launch site in partnership with Thurston County (see Objective 5.2).

2.3 Description of Management Direction

As a unit of the National Wildlife Refuge System, the Black River Unit is managed to conserve native fish, wildlife, plants, and their habitats, and to provide opportunities for compatible, wildlife-dependent public uses. A brief description of the management direction follows. Table 2-1 contains additional details regarding actions associated with the CCP. A map displaying management direction for the Unit is located in Appendix L (Map 4).

Wildlife and habitat management: Under the selected alternative, Alternative 2, greater emphasis will be placed on enhancing and managing habitat, especially in wetland habitats, to benefit the Oregon spotted frog and migratory birds. Increased inventory, monitoring, and research will be used to guide management decisions to benefit fish and wildlife. These inventories will be used to evaluate whether to propose designation of a research natural area (RNA) to improve protection and management of unique bog and wetland habitats.

River channel habitat: The Service will work with WDNR to develop an interagency agreement, or similar instrument, that promotes cooperative management of the river channel between WDNR and the Service within the approved Unit boundary. Cooperative management will provide improved protection to fish and wildlife that use Unit and State-owned aquatic lands, provide improved habitat protection, allow the enforcement of Unit laws and regulations on the river channel, and define public access restrictions and management needed to provide improved wildlife protection from disturbance, while supporting high-quality, wildlife-dependent recreation opportunities. An agreement will benefit natural resources of interest to both agencies and strengthen the Service's partnership with WDNR. Cooperative management of the river channel will also contribute to achieving the Service's mission, Unit purposes, and help meet several goals by allowing the Unit to protect and better manage wildlife resources as well as meet the WDNR's objectives for the stewardship of State-owned aquatic lands.

Public use, access, outreach, and volunteer programs: The Unit will be opened to public use, including wildlife observation, interpretation, and wildlife photography. Proposed facilities to support visitor services include a viewing platform with a short walking trail on the east side of Endicott Road and a vehicle pull-off area with interpretive signs for viewing wildlife on the west side of Endicott Road. The Service will establish a cooperative agreement with Thurston County to

develop a boat launch, small parking area, and new kiosk and interpretive signs on the southeastern side of the 123rd Avenue bridge. Outreach and volunteer programs will be expanded as staffing allows.

Implementation subject to staffing and funding availability: As funding becomes available, actions described in the CCP will be implemented at the Unit over a period of 15 years. Draft project priorities and projected staffing and funding needs are included in Appendix C, although special funding initiatives, unforeseen management issues, and other budget issues will likely require adjustments to the implementation schedule in the future. The Unit will continue to work with partners to implement the CCP by sharing science, providing updates on successes and challenges, initiating discussions, encouraging participation, and hosting working groups. The CCP will be reviewed at least every 5 years and updated as necessary.

Appropriateness and compatibility: Consistent with relevant laws, regulations, and policies, prior to allowing any public use of the Unit, including commercial use, each such use will first need to be found appropriate and determined compatible (16 U.S.C. 668dd-668ee, 50 C.F.R. 25, 26, and 29; and 603 FW 1 and 2). Appropriateness and compatibility are further discussed in Appendices A and B.

Adaptive management: Based on 522 Departmental Manual (DM) 1 (Adaptive Management Implementation), Unit staff shall utilize adaptive management for conserving, protecting, and, where appropriate, restoring lands and resources. Within Title 43 of the Code of Federal Regulations (CFR) 46.30, adaptive management is defined as a system of management practices based upon clearly identified outcomes, where monitoring evaluates whether management actions are achieving desired results (objectives). Adaptive management is based on the recognition that ecosystem function is inherently complex and often results in data gaps. Adaptive management emphasizes learning while doing based upon available scientific information and best professional judgment, considering site-specific biotic and abiotic factors on refuge lands and waters. In the presence of accelerated climate change, adaptive management is an increasingly important management decision process. The Unit will employ adaptive management as a standard operating procedure. Part of measuring the success of and adaptively managing the Unit includes 5-year reviews and a 15-year revision of the CCP, which will be initiated by the Service and involve many of the same steps and engagement with partners and the public as the original CCP.

Biological integrity, diversity, and environmental health: The Administration 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 the Service to follow while achieving refuge purposes and the Refuge System mission. It provides for the consideration and protection of the broad spectrum of native fish, wildlife, and habitat resources found on the Unit. When evaluating the appropriate management direction for the Unit (e.g., in compatibility determinations), the Service will use sound professional judgment to determine the Unit’s contributions to BIDEH at multiple landscape scales. Sound professional judgment incorporates field experience, knowledge of Unit resources, an understanding of a Unit’s role within the ecosystem, applicable laws, and best available science, including consultation with others both inside and outside the Service. The policy states that “the highest measure of biological integrity, diversity, and environmental health is viewed as those intact and self-sustaining habitats and wildlife populations that existed during historic conditions.”

Climate change: As stated in DOI’s Secretarial Order 3226 and the Service’s Climate Change Strategic Plan, the Service considers and analyzes climate change in its decisions, long-range plans,

and other activities. Refuge habitats and wildlife populations are directly and indirectly sensitive to changing climatic conditions, especially temperature and precipitation, and the resultant effects on physical environments (e.g., hydrology, sea levels, ocean chemistry).

The combined changes can affect a refuge's habitats and species directly (e.g., sea level rise, timing of migratory bird arrival, changes to plant flowering phenology, changes in species' ranges and physiology), and indirectly (e.g., added vulnerability to other stressors including increasing invasive species and pathogens). Predicting biological response at the population level, however, requires complex, sophisticated data collection and modeling that must be validated with field studies over time. This highlights the importance of monitoring habitat and species to establish potential correlations and adaptation options.

Knowledge and monitoring of regional and local climate trends on Unit resources will be used to assess potential changes or enhancements to management actions and techniques and their timing, using the adaptive management approach described above.

The Unit will participate in and contribute to climate change assessment efforts, including those underway at a landscape scale. Participation in the North Pacific Landscape Conservation Cooperative (LCC) will provide staff at the Nisqually National Wildlife Refuge Complex, which manages the Unit, with a means to tie-in with a larger-scale assessment of the impacts of climate change. LCCs are formal, integrated, science-management partnerships between the Service, Federal agencies, states, Tribes, NGOs, universities, and other entities to address climate change and other biological stressors. LCCs provide science support, biological planning, conservation design, research, and design of inventory and monitoring programs. As guided by future empirical or projected climate impacts, relevant management objectives and strategies will be adjusted to assist in enhancing the Unit's resources' resiliency to climate change.

Reduce the Unit's carbon footprint: The Service has developed a strategic plan for responding to accelerating climate change (USFWS 2010) and an action plan that outlines specific actions needed to implement the strategic plan. The action plan calls for the Service to make its operations carbon-neutral by 2020. The Unit will work toward this goal by replacing their current vehicles with more fuel-efficient vehicles and by building appropriately sized, energy-efficient facilities, as funding becomes available. The Unit will reduce the carbon footprint of land management activities by using energy-efficient techniques, where feasible and in line with management goals. The Unit will also explore ways of offsetting any remaining carbon balances, such as carbon sequestration.

Complete land acquisition within the current approved boundaries: Based on the availability of funds, the Service will continue to negotiate with willing sellers to acquire lands within the existing approved acquisition boundaries, through fee title acquisition, easement, or other land conservation tools.

Landscape-scale conservation: The Refuge System's strategic vision document, *Conserving the Future: Wildlife Refuges and the Next Generation*, emphasizes the importance of using a "scientific, adaptive, landscape-level approach to conserving, managing, and restoring refuge lands and waters, and facilitate conservation benefits beyond our boundaries" (USFWS 2011). Following from this vision, the Service's strategic growth policy (602 FW 5) describes a landscape planning process termed landscape conservation design (LCD) where a partnership, including the Service, along with other local, State, and Federal government agencies, tribal governments, and other interested parties identify priority conservation species; develop measureable conservation targets; assess current and

projected landscape patterns, processes, and stressors; depict spatially-explicit desired future conditions; and produce a suite of management strategies for achieving those conditions on a landscape scale.

The Black River Unit will be included within the scope of future landscape planning process. Outcomes from the landscape planning processes will identify the Service's role in conservation efforts within the ecoregion and inform potential strategic growth, land protection, and management decisions for the Unit. As landscape-scale planning is a non-regulatory process, additional evaluation, planning, and compliance will need to occur prior to any implementation of strategies identified through any landscape planning process.

State, local, and interagency coordination: The Service will continue to maintain regular discussions with Washington Department of Fish and Wildlife (WDFW) and the Department of Natural Resources (WDNR), among other agencies and entities. Topics for discussion include implementing CCP projects, threatened and endangered species, landscape-scale planning, land protection planning, managing wildlife, and recreational activities and access.

Tribal coordination: The Service will coordinate and consult with Tribes on a government-to-government basis regarding issues of shared interest. The Service seeks assistance from Tribes on issues related to cultural resources, education and interpretation, natural resource programs, and the National Historic Preservation Act (NHPA).

Invasive species control: Because invasive plants and animals pose threats to all Unit wildlife and habitat, control of invasive species will be a high-priority management activity. Species that limit the Unit's abilities to provide high-quality habitat for Unit purposes and trust species will be controlled to the degree that funding and staffing permit. The magnitude of invasive species problems at the Unit is beyond the available capital resources to expect control or eradication during any single field season; therefore, it is essential to prioritize treatment of infestations. Some invasive species that are pervasive on Unit lands are the subject of long-term control efforts and will continue to be a high priority for Unit resources. The Early Detection Rapid Response model will be used to find and verify the identity of new invasive species as early after entry as possible, when eradication and control are still feasible and less costly. The Service will embark on a systematic effort to eradicate, contain, or control newly discovered invasive species and isolated infestations of a previously established, nonnative species, while the infestation is still localized. Invasive species control will be initiated prior to or concurrently with any habitat restoration efforts. Regardless of whether the invasive species is well established or newly introduced, it will be essential that the Unit prioritize pre- and post-treatment monitoring, assessment of the successes and failures of treatments, and development of new approaches when proposed methods do not achieve desired outcomes. The Integrated Pest Management Plan is included in this CCP (See Appendix G).

Integrated pest management: In accordance with DOI and Service policies 517 DM 1 and 569 FW 1, an integrated pest management (IPM) approach will be used, where practicable, to eradicate, control, or contain pest and invasive species (herein collectively referred to as pests) on Unit lands. IPM uses methods based upon effectiveness and cost, with minimal ecological impacts to nontarget species and the Unit environment. Pesticides may be used where physical, cultural, and biological methods, or combinations thereof, are impractical or incapable of providing adequate control, eradication, or containment. If a pesticide is needed on Unit lands, the most specific (selective) chemical available for the target species will be used unless considerations of persistence or other environmental or biotic hazards will preclude it. However, pesticides with substantial effects to

species or the environment may be used in order to protect human health and safety. In accordance with 517 DM 1, pesticide usage will be further restricted because only pesticides registered with the U.S. Environmental Protection Agency (EPA) in full compliance with the Federal Insecticide, Fungicide, and Rodenticide Act and as provided in regulations, orders, or permits issued by EPA may be applied on lands and waters under Unit jurisdiction. Appendix G provides detailed documentation of the IPM program and its potential implementation and evaluation.

Mosquito control: Mosquito populations on Unit lands will be allowed to fluctuate and function unimpeded unless they jeopardize wildlife or human health and safety. We recognize mosquitoes are native invertebrates inhabiting aquatic habitats, which provide a forage base for fish and wildlife, including migratory birds. To protect human and wildlife health and safety, mosquito monitoring will be allowed under a Special Use Permit (SUP) by the State or a local vector control agency as needed. Pesticide treatments (larvicides, pupicides, or adulticides) are not currently conducted but will be considered on Unit lands only if local, current population monitoring or disease surveillance data indicate Unit-based mosquitoes jeopardize wildlife or human health and safety. Mosquito treatments will only be allowed following completion of a compatibility determination, disease contingency plan, and in accordance with IPM principles applicable to all pests (unless there is a mosquito-borne, health-related emergency). Proposed pesticide uses for mosquito control will utilize appropriate and practical best management practices, where possible, given potential effects documented in Chemical Profiles (see Appendix G).

Regulatory compliance: Prior to implementation, all activities will undergo appropriate reviews and consultations, and permits and clearances will be secured, as necessary, to comply with legal and policy requirements. This includes appropriate evaluations and documentation under NEPA, evaluation and consultation required by Section 7 of ESA, and review and consultation required by Section 106 of the NHPA. Approved Section 7 consultation processes will be followed for areas potentially affecting listed species or designated critical habitat on a site-specific basis as project implementation occurs. Any new ground-disturbing projects will undergo a review under Section 106 of NHPA.

Participation in planning and review of regional development activities: The Service will actively participate in planning and studies pertaining to future industrial and urban development, transportation, recreation, contamination, and other potential concerns that may affect the Unit's resources. The Service will continue to cultivate working relationships with county, State, and Federal agencies to stay abreast of current and potential developments. The Unit will utilize outreach and education as needed to raise awareness of their resources and dependence on the local environment.

Refuge revenue sharing: Annual payments to local county governments under the Refuge Revenue Sharing Act (16 U.S.C. 715s) will continue according to the established formula and are subject to congressional appropriations. Total payments made to local counties are listed in Chapter 5 and in Appendix C: Implementation.

Volunteer opportunities: Volunteer opportunities are key components of the successful management of public lands, and are vital to Unit programs, plans, and projects, especially in times of static or declining budgets. Currently the Nisqually National Wildlife Refuge Complex, which includes the Black River Unit, makes extensive use of volunteers in invasive species control, habitat restoration, education, and visitor services programs. In the future, successful implementation of native habitat restoration, survey and monitoring activities, and environmental education and interpretation

programs will require the use of partnerships and volunteers. The volunteer program will be managed through the Refuge Complex headquarters volunteer program.

Partnerships: Partnerships on the Unit are critical components in maintaining and continuing efforts to enhance recreation opportunities or implement resource management improvements, such as restoring habitat for threatened and endangered species. These partnerships typically involve joining forces with Federal, State, and local agencies, Tribes, organizations, and businesses.

Transportation coordination: Roads, bridges, parking areas, and trail systems play a vital role in providing access to the public for compatible, wildlife-dependent recreation opportunities. The Service will look for opportunities to collaborate with the Washington Department of Transportation, Department of Public Works, and the local communities to maintain and improve safe and appropriate transportation access between gateway cities and the Unit.

Inventory and monitoring: Inventory and monitoring (I&M) policy (701 FW 2) requires refuges to prepare I&M plans. Refuge I&M plans have two sequential phases (parts):

1. A prioritized list of surveys for approval by the Refuge Supervisor.
2. Individual protocols based upon the finalized list of surveys.

An I&M step-down management plan will be developed for the Unit within 3 years of CCP completion. See also Goal 4.

Research: The Unit will continue to work with regional experts to share information and expertise on habitat management and restoration techniques. Collaboration with local universities, NGOs, State and local agencies, and others to conduct research that will advance the science of habitat management and restoration on Unit lands will be an important part of the science program. SUPs will be issued to permit research that furthers the mission of the Refuge System under the stipulations specified in the Research Compatibility Determination (see Appendix B).

Wilderness review: The Service's CCP policy requires that a wilderness review be completed for all CCPs. If it is determined that the potential for wilderness designation is found, the process moves on to the wilderness study phase. As part of the process for this CCP, the planning team completed a wilderness review found in Appendix D. This review concluded that the Unit does not meet the requirements for wilderness designation.

Step-down management plans: The CCP provides guidance in the form of goals, objectives, and strategies for several Unit program areas, but may lack some of the specifics needed for implementation. Several subsequent, or step-down, plans will be developed.

All step-down management plans require appropriate NEPA compliance, and implementation may require additional Federal, State, and county permits. Project-specific plans, with appropriate NEPA compliance, may be prepared outside of these step-down plans. The following step-down plans have been identified for the Unit:

- Inventory and Monitoring Plan;
- Wildland Fire Management Plan revision;
- Habitat Management Plan.

Refuge fire management: Fire Management Plans were finalized for the Refuge and the Unit in 2003. Until revised, fire management actions will continue to be guided by the direction set forth in the plans.

Law enforcement: The goal of law enforcement on the Unit is to protect natural resources, maintain the safety and security of the visitors and employees, and protect facilities. Law enforcement activities will include patrols, when staffing allows, to establish and maintain an effective, professional, and courteous law enforcement presence to eliminate unauthorized uses. Coordination and fostering partnerships with local law enforcement agencies will be an important part of the law enforcement program. The Service will investigate reports of violations in a timely fashion. Preventive law enforcement through education, signing, and regulation information will be used as important measures of the program.

Removal of old buildings: The Black River Unit has several old, derelict buildings in need of removal. These include old barns, outbuildings, and houses that are in various states of disrepair and need to be demolished. Many have already been removed during the past 10 years. The remaining buildings are subject to trespass, vandalism, and other criminal activities, so these areas will remain closed to public access until building removal can be accomplished. These buildings will continue to be removed as funding becomes available. See Appendix C for further details on project priorities and estimated costs of removal.

Protection of vegetation and natural processes: Woody vegetation, beaver dams, and other vegetation in the river channel provide cover and other important values for native fish, salmon, and other wildlife. Vegetation clearing for recreational purposes will not be allowed or conducted. Unit staff will continue to control invasive plants or conduct other habitat management practices needed to benefit river channel habitat as part of operating and managing the Unit.

Table 2-1. Summary of Management Direction

Theme/Issue	Alternative 2 Preferred Alternative
Aquatic Habitats	
River channel habitat	Alongside WDNR, protect 7.5 miles of river channel habitat; increase IPM program; complete a Water Resources Inventory and Assessment
Tributary channel habitat	Protect 6–16 miles of tributary channel habitat; increase IPM program and habitat enhancement
Bog habitat	Protect 56 acres of bog habitat; conduct baseline inventories and Water Resources Inventory and Assessment; conduct IPM program; introduce rare plant species as appropriate; evaluate the designation of an RNA if warranted
Shrub swamp habitat	Protect 512 acres of shrub swamp habitat; increase IPM program
Riparian forest habitat	Protect 265 acres of riparian habitat; increase IPM program
Emergent marsh habitat	Protect 34 acres of emergent marsh habitat; improve habitat for Oregon spotted frog; increase IPM program

Theme/Issue	Alternative 2 Preferred Alternative
Seasonally flooded, nonnative grassland habitat	Protect 82 acres of seasonally flooded, nonnative grassland habitat; improve habitat for Oregon spotted frog; evaluate and enhance seasonally ponded areas and improve water management capabilities as needed; increase IPM program
Upland Habitats	
Dry, nonnative grassland habitat	Protect 163 acres of nonnative grassland habitat; plant big leaf maples and/or Garry oaks where appropriate; enhance up to 15 acres (within the 163 acres) with native plants; increase IPM program
Mixed forest habitat	Protect 394 acres of mixed forest habitat; enhance 5–10 acres (within the 394 acres); increase IPM program
Watershed and Ecosystem	
Partnerships	Maintain current partnerships plus enhance and develop new partnerships and initiatives for conservation purposes
Inventories, Monitoring, and Research	
Inventory and monitoring	Develop and implement an Inventory and Monitoring Plan; continue inventory and monitoring projects as they apply to Refuge management decisions, plus initiate and support additional monitoring opportunities and projects
Research	Initiate and support research opportunities where they contribute to understanding of Unit resources and management
Visitor Services	
Welcome and orientation	Develop print and electronic media outreach materials; improve Unit visibility; install signs
Wildlife observation and photography and educational programs	Construct vehicle pull-off area with interpretive signs for viewing wildlife on the west side of Endicott Road; install small parking area, kiosk, viewing platform, short walking trail on east side of Endicott Road; identify links to Regional Trail System in coordination with Thurston County; establish a cooperative agreement with the county to develop a boat launch, small parking area, and new kiosk and interpretive signs at 123 rd Avenue bridge; partner with local organizations to incorporate Unit messages into their programs
Volunteer Program and Partnerships	
Volunteer program	Develop and promote a Unit volunteer program, including efforts to recruit and train volunteers

Theme/Issue	Alternative 2 Preferred Alternative
Partnerships program	Build community partnerships to support Unit programs

2.4 Goals, Objectives, and Strategies

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

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

In the development of this CCP, the Service prepared an Environmental Assessment (EA). The EA evaluated alternative sets of management actions derived from a variety of management goals, objectives, and implementation strategies. From those alternative sets of management actions, the Service's preferred alternative, Alternative 2, was selected as the management direction for the Unit.

The goals for the Unit to be implemented over the next 15 years under the CCP/EA are presented on the following pages. Each goal is followed by the objectives that pertain to that goal. All goals are for the lifetime of the CCP unless otherwise specified. Some objectives pertain to multiple goals and have simply been placed in the most reasonable spot. Similarly, some strategies pertain to multiple objectives. The goal order does not imply any priority in this CCP. The Implementation Plan articulates the current Unit priorities (Appendix C).

Goal 1. Protect, maintain, and enhance aquatic habitats characteristic of the upper Black River Watershed while maintaining historical characteristics of the north Puget Trough Lowlands for the benefit of native fish, amphibians, migratory birds, and a diverse assemblage of other native species.

Objective 1.1: Protect, maintain, and enhance the Black River channel habitat

Alongside WDNR, protect, maintain, and enhance up to 7.5 miles of channel habitat for native fish and wildlife, including rare and declining species such as the Oregon spotted frog and Olympic mudminnow.

Desired characteristics of this channel habitat include:

- Channel depths range from 2–15 feet in the main channel
- Plentiful water supply throughout the seasons to maintain channel habitat and sustain fish and wildlife populations**
- Annual high water events spread water out over the floodplain in winter and spring
- Abundant native submersed and emergent vegetation such as American waterweed, pondweed species, smartweed, narrow leaf bur-reed, and water starwort**
- 5–20 percent of channel edge is exposed mud without vegetation
- Muddy, silty, and sometimes unconsolidated river bottom

- Water temperatures are seasonally <64°F
- Presence of decaying, large woody debris that may support herbaceous vegetation such as small-flowered forget-me-not, smartweed, monkey flower, and water starwort
- Low to minimal populations of nonnative bullfrogs and warm-water fish populations that threaten natural food web processes**
- < 15 percent cover of nonnative, invasive plants that threaten the native plant community
- Reduce reed canarygrass**

Channel habitat is defined by the location of water flows within the confines of river or tributary banks and includes the nearby edges of the sloped bank. The current length/measurement of channel habitat includes lands and waters that are under the jurisdiction of WDNR.

***Attributes identified in current and/or proposed inventory, monitoring, and research activities*

Strategies Applied to Achieve Objective:
Work with WDNR to develop an interagency agreement or similar instrument that promotes cooperative management of the river channel between WDNR and the Service within the approved Unit boundary.
Within 8 years of completion of the CCP, complete a detailed Water Resources Inventory and Assessment (WRIA).
Coordinate and partner with appropriate agencies to sustain and enhance hydrological conditions needed to support channel habitat and ensure an appropriate water budget and delivery, including water quantity and quality.
Monitor and use appropriate IPM techniques, such as mechanical, physical, biological, and chemical methods (see Appendix G), to control invasive or undesirable plant or animal species.
Annually control nonnative, invasive, or undesirable plants such as yellow flag iris in the river channel habitat, treating ¼ mile/year.
Annually control all purple loosestrife along the edge of the river channel (see Appendix G), north and south of pipeline.
Coordinate with other agencies to determine best control methods to use in river channel and implement control of reed canarygrass.
Establish permanent refuge operations specialist position to coordinate and conduct Unit operations, habitat management, and visitor services programs.

Rationale:

The Black River is a unique lowland river and considered by some to be the most complete intact river system of its type remaining in western Washington. The Black River is an important tributary of the Chehalis River watershed, the second largest watershed in Washington State. Located within the approved Unit boundary, there are approximately 7.5 miles of free flowing river channel habitat that serves as a vital migration pathway, provides some spawning grounds, and good quality rearing habitat for juvenile salmonids, resident fish, and amphibians. However, multiple stressors (both on and off the Unit) have compromised the natural function and hydrology of the northern section of the

river influencing water temperature, water movement, water quality, sediment transport, habitat complexity, and animal passage.

A WRIA is necessary to study these stressors and to assist Unit staff by identifying various management options to improve habitat conditions, water quality, and hydrologic regimes in the river system.

Unit staff will implement an inventory and monitoring program to understand and manage impacts from invasive species on the resources. Invasive plants within the river channel and along the edges, such as reed canarygrass, are present, and some nonnative, submerged plant species are suspected. Reed canarygrass has severely altered the habitat in some places by impeding water flow and developing monotypic plant stands, thereby affecting habitat quality and wildlife use. The Unit will work with other agencies to determine the best methods to control reed canarygrass and other species in the river channel. (See Obj. 3.1 and Goal 4.) Staff will increase control measures annually on yellow flag iris by treating or removing the plant on an additional quarter-mile of river channel habitat each year. In addition, purple loosestrife will be found and treated along the river channel, including the northernmost locations for the benefit of a variety of native wildlife, including rare species such as Olympic mudminnow and Oregon spotted frog, and to enhance native plant communities.

Control and treatment for bullfrogs is needed because bullfrogs outcompete, predate upon, and displace Oregon spotted frogs (see also Section 4.6). Auditory bullfrog presence/absence surveys will take place in June. Control techniques will be used during day or night as needed using hand capture, gigging, and netting as appropriate. Captured bullfrogs will be anesthetized with 20 percent benzocaine gel on their ventral abdomen and then frozen until dead.

The Refuge Complex will seek to establish a permanent refuge operations specialist position to ensure enhanced coordination with our partners and implementation of all habitat management projects, completion of inventory, monitoring, and research programs and projects, invasive species removal, and management of the new visitor services programs.

Objective 1.2: Protect, maintain, and enhance Black River tributary channel habitat

Protect, maintain, and enhance up to 16 miles of Black River tributary channel habitat for native fish, amphibians, invertebrates, and wildlife.

Desired characteristics of tributary channel habitats include:

- Clear, running shallow streams or deeper water streams
- Cool water temperatures in riparian associated tributaries < 60°F
- Equal or higher dissolved oxygen level than in the Black River
- Firm channel bed with graduated-size cobble or soft, peat substrate
- Presence of natural woody debris
- Barrier-free passage for native fish and tadpoles
- Low to minimal populations of nonnative bullfrogs and warm-water fish populations**
- < 15 percent cover of nonnative, invasive plants that threaten the native plant community
- Reduce reed canarygrass (see Rationale in Objective 1.1)**

Tributary channel habitat is defined by the location of water flows within the confines of tributary banks and includes the nearby edges of the sloped bank. The length/measurement includes tributaries currently under ownership (fee title) of Billy Frank Jr. Nisqually National Wildlife Refuge.

***Attributes identified in current and/or proposed inventory, monitoring, and research activities*

Strategies Applied to Achieve Objective:
Monitor and use appropriate IPM techniques, such as mechanical, physical, biological, and chemical methods (see Appendix G), to control invasive or undesirable plant or animal species.
Annually control invasive plants on a minimum of 20 percent of tributary channel habitat.
Within 3 years of acquisition of new parcels, identify and remove or replace fish barriers including any culverts or other artificial structures that will deter fish passage.
Use standard enhancement techniques (riparian plantings, IPM techniques, placement of large woody debris, etc.) as appropriate to improve tributary channel conditions.
Coordinate and partner with agencies and other partners to sustain and enhance the hydrological conditions needed to maintain a healthy habitat.
Coordinate with other agencies to determine best control methods for reed canarygrass to use in tributary channel and implement control.

Rationale:

Tributaries within the Unit boundary where Unit ownership occurs include Waddell, Dempsey, and several smaller unnamed creeks. Prior to entering the Unit boundary, these creeks meander through agricultural and residential areas presenting a variety of issues and conservation challenges for maintaining a healthy watershed. Staff will seek to expand and build relationships to work with various agencies and landowners in an effort to improve the quality of this habitat influenced by off-Unit activities. The Unit will complete a WRIA prior to identifying priority enhancement opportunities that are essential for improving the health of the Black River Watershed (Objectives 1.1 and 4.3). Implementing habitat management techniques such as riparian plantings, IPM techniques, and placement of large woody debris, as appropriate, will benefit the watershed and fish and wildlife.

Unit staff will increase invasive species control measures to treat 20 percent of tributary habitat annually on species such as yellow flag iris and purple loosestrife to benefit stream function and a variety of native wildlife, including some endemic and rare species such as Olympic mudminnow and Oregon spotted frog. Research and monitoring are vital to assess overall water flow, channel function, water quality, quantity, and wildlife and fish usage. (See Obj. 4.2 and 4.3.) Reed canarygrass is present within tributary channels and along the immediate edges. Reed canarygrass has severely altered the habitat in some places by impeding water flow and developing monotypic plant stands, thereby affecting its wildlife inhabitants. The Unit will work with other agencies to determine best methods to control reed canarygrass and other species in tributary channel habitat.

Maintaining and improving the quality of the tributary channel habitat supports the ecological health of the Black River Watershed and the greater Chehalis Watershed, supporting numerous species of aquatic plants, fish, amphibians, mammals, and birds.

Objective 1.3: Protect, maintain, and enhance bog habitat

Protect, maintain, and enhance a minimum of 56 acres of unique and rare bog habitat that includes characteristic plant species and associated wildlife.

Desired characteristics of bog habitat include:

- Peat soils dominated by sphagnum or have sphagnum species growing on the soil surface
- Soils are generally saturated year round, in some cases are seasonally flooded, yet are isolated from surface water flow
- Low pH and low nutrient availability
- Fed primarily by precipitation and are generally restricted to areas in which precipitation exceeds evapotranspiration
- Bog species may include sphagnum moss, Labrador tea, native cranberry, sundew, white beak-rush, cottongrass, western bog laurel, and lodgepole/shore pine, and Beller's ground beetle, Hatch's click beetle, or Queen Charlotte's copper butterfly**
- ≤ 5 percent cover of nonnative, invasive plants that threaten the native plant community**

***Attributes identified in current and/or proposed inventory, monitoring, and research activities*

Strategies Applied to Achieve Objective:
Within 5 years, partner with bog specialists to identify locations and map bog types.
Within 5 years, conduct survey to inventory plant and animal species composition, distribution, and relative abundance within the bog habitat.
Within 8 years of completion of the CCP, complete a detailed WRIA by the Service.
Coordinate and partner with appropriate agencies to evaluate hydrological conditions necessary to support this habitat.
Upon completion of inventories, surveys, and the WRIA, develop a good understanding of hydrologic processes, abiotic and biotic processes and threats, and how to manage them to sustain this sensitive and rare habitat.
Initiate appropriate habitat enhancement if a rare or declining species or habitat is found.
If valid, develop an RNA proposal package, including habitat description, map, and rationale for Regional/National approval.
Participate and partner with National Natural Areas Network information sessions by sharing research information.
Evaluate potential for translocation of rare species as appropriate, including marsh sandwort and water howellia, implement recovery actions if warranted.
Annually control invasive plants on a minimum of 30 percent of known bog habitat.

Strategies Applied to Achieve Objective:

Work with partners and researchers to develop protocols for inventory, monitoring, and research within the bog habitats (see Goal 4).

Monitor and use appropriate IPM techniques, such as mechanical, physical, biological, and chemical methods (see Appendix G), to control invasive or undesirable plant or animal species.

Rationale:

Bog habitats are unique in Washington State and are increasingly rare in the Puget Trough ecoregion. Only a fraction of western Washington's original bogs remain undisturbed. Knowledge regarding the extent and type of bog habitat found within the Unit boundary is extremely limited. A partial assessment of Unit lands has identified over five types/classifications of bog habitat which may include Federal and State-listed species and species of concern. There are a variety of unique plant species which have been specially adapted to live in bogs; some found on the Unit include western Labrador tea, sphagnum moss species, sundew, bog cranberry, bog laurel, bog orchid, and bog birch. Other species found in bogs and other habitats include shore pine, thin-leaf or gray alder, and cottongrass. A number of Federal and State-listed insect species specifically adapted to bogs may also inhabit the Unit.

Thorough inventories of the plant and animal species within the bog habitat are necessary to assess habitat quality and the potential for establishing an RNA to advance scientific research, education, and protection. Unit staff will expand partnerships to help conduct inventories, surveys, and research. Bog research will begin by 2016 to inventory and investigate the habitat condition, health, and stability (Objectives 4.1 and 4.3). A WRIA will be necessary to understand the hydrological conditions and potential threats to the bog and other aquatic habitats. This inventory and assessment will assist the Unit staff by identifying management options to monitor and improve habitat conditions.

An inventory is also necessary prior to implementing an invasive species removal program. More information is needed regarding nonnative plant species within the bog habitat. Known invasive species, including holly and reed canarygrass, in this area will be controlled on approximately 30 percent of the bog habitat annually.

By obtaining general plant and animal inventories, the Unit will gain the knowledge necessary to evaluate the special characteristics and diversity found in this bog habitat and the potential for establishing an RNA with the following characteristics: a rich and complex matrix of mixed conifer forests, bogs, shrub swamps, and spring upwellings which includes the headwaters of the Black River; is mostly undisturbed and in a natural state; contains rare and sensitive bog habitat; and rare and declining plants and animals are associated with the bog habitat (see Map 2). If designated as an RNA, the area will become part of a national network of ecosystems found in relatively pristine condition, managed primarily for their natural ecological processes, and will receive additional attention by potential partners and researchers focusing on research and education (see Objective 3.3).

The Unit may consider translocation of an endangered plant species to its historical range within bog habitat or other habitats that are appropriate. Translocation of any plant species will be part of a formal research program requiring planning and permits (see Objective 4.3). The Service policy for

BIDEH (601 FW 3) allows for the reintroduction of extirpated native flora and fauna back to their historic range.

Objective 1.4: Protect, maintain, and enhance the shrub swamp habitat

Protect, maintain, and enhance 512 acres of shrub swamp for migratory birds including marshbirds, Oregon spotted frog, Olympic mudminnow, and other native wildlife.

Desired characteristics of shrub swamp include:

- Semi-permanently to permanently flooded with water depths from <1 to 24 inches
- During late summer months, ground has less surface moisture but retains root zone saturation
- Poorly drained, fine-textured organic or muck soils
- Associated with beaver dam-building activity
- 20–50 percent canopy cover of shrubby native, deciduous trees (such as willows, ash, and Pacific crab apple; 15–30 feet high) with lichen and moss growth**
- 50–100 percent canopy cover of native deciduous shrubs (such as red-osier dogwood, ninebark, and black twinberry 5–20 feet high)**
- 10–20 percent coverage (patchy) of native, herbaceous understory plants (such as skunk cabbage, veronica, marsh speedwell, bur-weed, smartweed, and sedges)**
- 20–50 percent patches of exposed soils**
- Low to minimal levels of nonnative bullfrog populations that threaten natural food web processes**
- < 20 percent coverage of nonnative, invasive plants that threaten native plant community processes
- Reduce reed canarygrass (see Rationale in Objective 1.1)**

***Attributes identified in current and/or proposed inventory, monitoring, and research activities*

Strategies Applied to Achieve Objective:

Monitor and use appropriate IPM techniques, such as mechanical, physical, biological, and chemical methods (see Appendix G), to control invasive or undesirable plant or animal species.

Annually control invasive plants on a minimum of 5 percent of shrub swamp habitat.

Develop methods to select appropriate sample sites in shrub swamp habitat for inventory and assessment. Conduct the inventory and assessment.

Rationale:

The Unit supports 512 acres of shrub swamp habitat interspersed with other habitats, such as emergent marshes, bogs, and riparian forests, supporting a wide variety of neotropical migratory birds, wading birds, small mammals, and invertebrates. It is an essential habitat connecting other key habitat types, providing a buffer to the river channel, reducing the impacts of flooding, and providing food and cover for a diversity of resident and migratory birds including declining species and populations, endemic species such as Olympic mudminnow, rare species including the federally threatened Oregon spotted frog, Pacific clubtail dragonfly, bristly sedge, the federally endangered water howellia, as well as other wildlife.

The shrub swamp habitat dominates the northern most portion of the Unit south of Black Lake, and along the river channel and adjacent floodplain south to 123rd Avenue. Identifying presence/absence of invasive species and implementing IPM treatment methods has been extremely challenging due to the difficulty of accessing and navigating through the habitat, which has been described as an “impenetrable shrub thicket.” Reed canarygrass, yellow flag iris, purple loosestrife, possibly knotweed, and other nonnative, invasive, wetland-adapted plants most likely thrive in small, open patches. If left unchecked, they could negatively affect water flow, habitat function, and key wildlife habitats.

The Unit will expand control measures for invasive plants on a minimum of 5 percent shrub swamp annually. Newly identified, small-sized infestations will be targeted for spot treatment to prevent them from spreading. IPM-approved methods will be utilized to control invasive plants (see Appendix H).

See Objective 1.1 and Section 4.6 for the rationale for bullfrog control and treatment.

Although not noted as a strategy for this specific habitat, completing a detailed WRIA on the river system will help identify resource threats and provide details regarding management and protection options.

A complete inventory of the shrub swamp plant community is needed to understand if and how hydrological changes over time affect the bog and shrub swamp habitats (see Objective 4.1).

Objective 1.5: Protect, maintain, and enhance the riparian forest habitat

Protect, maintain, and enhance 265 acres of riparian forest for migratory birds, amphibians, small mammals, and other native wildlife.

Desired characteristics of a riparian forest include:

- Slightly higher elevation than shrub swamp habitat
- Soils are saturated part of the year
- ≥ 75 –95 percent cover from native deciduous, broadleaf trees of mixed age and species dominated by big leaf maple, western cottonwood, red alder, and Pacific willow**
- Over time, previously logged-out Sitka spruce and western hemlock may grow in with natural succession in the absence of major disturbance
- ≥ 50 percent native shrubs such as black twinberry, red osier-dogwood, snowberry, salmonberry, thimbleberry, salal, red and evergreen huckleberry, rose species, osoberry, and devil’s club**
- ≥ 40 percent herbaceous understory such as skunk cabbage, inside-out flower, twinflower, wild ginger, trillium, vanilla leaf, false lily of the valley, stinging nettle, and lilies**
- Diverse lichen and moss growth on trees and shrubs**
- Trees grow to become sufficient size to provide large woody debris to the river channel and floodplain
- Individual trees of >12 ” diameter and 20+’ long or groups of trees become snags and downed logs.
- ≤ 20 percent nonnative, invasive plants that threaten the native plant community**

***Attributes identified in current and/or proposed inventory, monitoring, and research activities*

Strategies Applied to Achieve Objective:
Monitor and use appropriate IPM techniques, such as mechanical, physical, biological, and chemical methods (see Appendix G), to control invasive or undesirable plant or animal species.
Within 5 years of acquiring lands, reestablish or enhance altered riparian habitats where appropriate by planting native trees and shrubs.
Manage a minimum of 20 percent of Unit riparian forest habitat annually to control invasive plants.
Establish maintenance staff position for habitat enhancement, invasive species control, and other management activities.

Rationale:

Since the late 1800s, the vast majority of riparian habitat in Washington has been lost or extensively modified due to agricultural clearing, logging, construction, and channel alteration activities. Intact riparian forests provide cover and serve as important travel corridors for many wildlife species. Healthy riparian forests also support native fish populations by benefitting in-stream characteristics such as water temperature, water quality, water chemistry, cover, structural diversity from woody debris, and nutrients.

The Unit currently supports 265 acres of riparian habitat for a diverse assemblage of native wildlife, such as resident and migratory birds, cavity-nesting waterfowl, possibly great blue heron colonies, and red-legged frogs. Riparian forest habitat is naturally located within floodplain areas and serves as a natural floodwater storage area during high water events.

Maintenance and enhancement of this habitat will contribute to function and health by improving the connectivity for wildlife that is dependent on riparian forests. Management will include evaluating, planting, and using established forestry management techniques to enhance a mix of early-, mid-, and late-successional riparian forest habitat. This habitat is vulnerable to invasive plant degradation and IPM-approved control methods will be utilized to control this and other invasive plants (see Appendix G).

Establishment of a maintenance staff position is essential for conducting proposed habitat enhancement projects, nonnative invasive plant and animal control, and other daily management projects and activities in the Refuge Complex. This position will support Unit partnerships, visitor services facilities and programs, and habitat enhancement and maintenance projects to benefit wildlife both on and off Unit lands.

Objective 1.6: Protect, maintain, and enhance emergent marsh habitat

Protect, maintain, and enhance 34 acres of emergent marsh for amphibians such as Oregon spotted frog, migratory and marsh birds, and other wildlife.

Desired characteristics of this freshwater emergent marsh include:

- Semi to permanently flooded lands with standing water between <2 to 25 inches deep.
Deep water conditions occur between October and June
- Provides a pathway for amphibians and fish to deeper water sites

- Located along the river and tributary edges, swales, oxbows, and land depressions that connect to other wetlands and deeper waters
- Topography includes a mosaic of shallow depressions
- Poorly drained soils (peat, muck, or mineral)
- 15–35 percent soil exposure (no vegetation)
- <20 percent moderately high-growing (>4+ feet high) native plants such as cattail, hard or soft stem bulrush, or slough sedge**
- 30–70 percent cover of low-growing, native, emergent, hydrophilic vegetation and seed-bearing plants such as water plantain, bur-reed, sedges, rushes, and creeping grasses**
- Decaying large woody debris in the marsh brought in by high-water events
- Zero to minimal invasive bullfrogs to prey on Oregon spotted frog tadpoles, juveniles, or adults, other amphibians, or other native species**
- < 20 percent coverage of nonnative, invasive plants that threaten the native plant community processes
- Reduce or manage reed canarygrass (see Rationale in Objective 1.1)**

***Attributes identified in current and/or proposed inventory, monitoring, and research activities*

Strategies Applied to Achieve Objective:
Develop an array of appropriate IPM techniques, such as mechanical, physical, biological, and chemical methods, including mechanical mowing, haying, selective hand-cutting and thatch removal, herbicides, herbivore grazing, prescribed fire, water control methods, or barrier cloth placement, that are minimally detrimental to rare or declining species populations such as Oregon spotted frog or water howellia (see Appendix G).
Continue partnerships with other agencies to develop and implement reed canarygrass management in non-diked emergent marshes and enhance native and nonnative grassland habitats.
Annually manage a minimum of 20 percent of emergent marsh habitat to control invasive plants and enhance habitat, especially for Oregon spotted frog.
Move stranded Oregon spotted frog eggs into nearby water as appropriate.

Rationale:

The Refuge supports approximately 34 acres of emergent marsh habitat found in patches along the edge of the river and tributary channels. This important habitat is vital for providing Oregon spotted frog breeding and egg-laying locations. Thurston County's Oregon spotted frog population is the second largest in Washington State.

Emergent marsh habitat has perhaps the most reed canarygrass. IPM control measures on an additional 20 percent of the habitat will be expanded specifically to benefit the rare and declining Oregon spotted frog. Unit staff will continue to work with partners and seek new partnerships to develop and implement new techniques for controlling reed canarygrass (see Appendix H). Staff will work with Natural Resources Conservation Service on Workforce Recruitment Program lands to reduce the negative impacts reed canarygrass causes to Oregon spotted frog and to improve habitat for Oregon spotted frog use.

Unit staff will continue to monitor and manage all known Oregon spotted frog use sites and expand inventory areas to identify oviposition and overwintering sites (see Goal 4). Promoting the survival of the Oregon spotted frog, the few stranded egg masses laid each year will continue to be relocated to safer habitat as necessary. Enhanced inventories and surveys will be needed to identify the presence of the federally listed plant, water howellia, which is suspected to occur on the Unit.

See Objective 1.1 and Section 4.6 for the rationale for bullfrog control and treatment.

Objective 1.7: Manage and enhance seasonally flooded, nonnative grassland habitat

Manage 82 acres of seasonally flooded, nonnative grasslands for amphibians such as Oregon spotted frog, migratory and marsh birds, and other wildlife.

Characteristics of these wet, nonnative grasslands include:

- Dominated by combination of pasture grasses and reed canarygrass
- Former farm-, crop-, or pasturelands
- 0–25 percent remnant emergent marsh or shrub swamp species
- Located along the river and tributary edges, swales, oxbows, and land depressions that connect to other wetlands and deeper waters
- Annual high surface water conditions between November and May ranging from 5 inches to 4 feet of standing water depth, depending upon land elevation
- Surface water levels drop throughout the summer resulting in dry, moist, or saturated soils in early fall
- A portion of this habitat may be minimally appropriate for amphibian (including Oregon spotted frog) breeding and egg-laying conditions in late winter or early spring**
- Connection to deeper water sites in early summer for frog or tadpole movement
- Water conditions that may support rearing juvenile Oregon spotted frog in late spring and early summer**
- Algal growth on the monoculture reed canarygrass vegetation provides some juvenile amphibian foraging opportunities
- Zero to minimal levels of nonnative bull frog populations**
- Managed reed canarygrass

***Attributes identified in current and/or proposed inventory, monitoring, and research activities*

Strategies Applied to Achieve Objective:

Develop and implement an array of effective techniques (including IPM strategies) to contain, control, manage, or retard reed canarygrass in difficult-to-access conditions on up to 25 acres. Manage this habitat using a variety of tools such as mechanical, physical, biological, herbicide, or chemical methods, which include mowing, haying, selective hand-cutting and thatch removal, disking or tilling, fertilizing, herbicides, herbivore grazing, prescribed fire, water control methods, barrier cloth placement, and/or planting more appropriate plant species.

Continue partnerships with other agencies to develop and implement reed canarygrass management in non-diked emergent marshes and seasonally flooded habitats.

Use IPM methods to manage reed canarygrass growth and create low grass, moist soil conditions.

Strategies Applied to Achieve Objective:

Manage reed canarygrass on all known Oregon spotted frog breeding sites as needed to enhance egg-laying, larval, and juvenile frog development.

Move stranded Oregon spotted frog eggs into nearby water as appropriate.

Evaluate and enhance seasonally ponded areas and improve water management capabilities as needed through installation of water control structures, ditch or culvert removal, and improvements to water level management capabilities.

Rationale:

Historically, this seasonally flooded, nonnative grassland habitat was likely healthy emergent marsh habitat. However, over time, nonnative grasses used for agricultural purposes have dominated and changed the former emergent marsh habitats. The Unit manages approximately 82 acres of seasonally flooded, nonnative grassland habitat that supports a variety of species including Oregon spotted frog, migratory and marsh birds, and other wildlife.

The Unit focus will be to implement and increase Oregon spotted frog management activities by improving breeding sites, enhancement of egg-laying areas, and expansion of juvenile frog-rearing habitat.

Seasonally ponded areas will be evaluated and water management capabilities may be improved through the installation of water control structures and/or ditch or culvert removal in order to achieve appropriate water conditions for Oregon spotted frogs. Per WDFW (2013), the hydrological needs for Oregon spotted frogs are summarized thusly:

Watson et al. (2000) found that different life stages of Oregon spotted frogs had different hydrological needs that varied by season. For development of eggs and larvae, relatively stable water levels were needed during the breeding season. For survival of transformed frogs, deeper water pools were critical during the summer dry season. Adequate water levels over emergent vegetation were important for survival of all age classes during the wet season and coldest time of the year. A topographic gradient with overall gradual relief was vital for providing this mix of aquatic conditions and aquatic connectivity between areas used. Watson et al. (2003) stressed that the most important features for microhabitat use were water depth, flow characteristics (still water was used over flowing water) and a high degree of water surface exposure (i.e., 50–75% water) or conversely, a low to moderate degree of emergent vegetation (i.e., 25–50%). The predominant use of shallow water habitat by Oregon spotted frogs was illustrated by Watson et al. (1998, 2003), who found Oregon spotted frogs ($n = 295$ radio-telemetry locations) selected water depths of 10–30 cm (~4–11.7 in.) with less emergent vegetation and more submergent vegetation than adjacent habitats.

Nonnative grasses, such as reed canarygrass and other pasture grasses, have increased the habitat management challenges and made restoration efforts nearly impossible in some areas. To manage nonnative grasses and provide the best Oregon spotted frog breeding habitat requires an intensive management program that includes herbivore grazing and mowing of the nonnative grasslands.

Unit staff will seek partnerships to develop effective IPM techniques to control and manage nonnative grasses such as reed canarygrass where feasible.

Staff will continue to monitor Oregon spotted frog populations and evaluate habitat improvement projects (see Objective 4.1–4).

Goal 2. Protect and maintain upland habitats characteristic of the upper Black River watershed.

Objective 2.1: Protect, maintain, and enhance dry, nonnative grassland habitat

Protect, maintain, and enhance 163 acres of dry, nonnative grassland for species that depend upon open, short, forbacious, upland grassland conditions such as migratory birds and other wildlife.

Characteristics of nonnative grasslands include:

- Well-drained soils in upland areas, may have been former croplands, pasturelands, or forests
- ≥ 30 -acre patches of low-growing vegetation
- Mosaic of vegetation heights between 6 and 36 inches
- Mix of desirable, palatable grasses such as native Roemer's fescue, red fescue, California oatgrass, and nonnative grasses such as velvet and timothy**
- Mix of native and nonnative forbs to benefit pollinators such as early blue violet, large leaf lupine, pearly everlasting, northwest cinquefoil, yarrow, aster, blue-eyed Mary, goldenrod, clovers, and alfalfa**
- Contain a single or occasional patch of large growing, cavity-producing trees such as big leaf maple or Garry oak
- Native shrubs form a border around the grasslands and provide transitional habitat for nesting cover and roosting habitat for birds and provide dispersal habitat for small mammals
- Minimal human disturbance to wildlife populations, especially during spring nesting season and winter use by elk and migratory birds
- ≤ 5 percent cover of nonpalatable/invasive plants such as burdock, broom, teasel, thistle, or blackberries**

***Attributes identified in current and/or proposed inventory, monitoring, and research activities*

Strategies Applied to Achieve Objective:
Monitor and use appropriate IPM techniques, such as mechanical, physical, biological, and chemical methods (see Appendix G), to control invasive or undesirable plant or animal species.
Maintain 148 acres of dry, nonnative grasslands in appropriate early successional stage, as open savannah-like habitats to benefit open, short-grassland- adapted species. Techniques may include mechanical mowing, haying, fertilizing, herbicides, herbivore grazing, prescribed fire, barrier cloth placement, invasive plant control, seeding, and/or planting native plants.
Achieve greater composition of native grasses and forbs by enhancing 15 acres. Techniques may include mechanical mowing, haying, fertilizing, herbicides, herbivore grazing, prescribed fire, barrier cloth placement, invasive plant control, seeding.
Identify potential enhancement sites for native grasses and forbs.

Strategies Applied to Achieve Objective:

Plant 3–5 big leaf maples and/or Garry oaks where appropriate on approximately 50-acre blocks to provide habitat for cavity-nesting birds and enhance grassland habitat diversity to benefit appropriate species. Protect solitary or interspersed big leaf maple or Garry oak trees within nonnative grasslands by placing tree collars, fencing saplings, and similar habitat enhancement measures.

Hire permanent maintenance worker to conduct habitat management and enhancement in uplands and wetlands, invasive control work, and maintain posting and signing needed to protect Black River Unit habitats.

Rationale:

Historically, this habitat may have been grasslands maintained by Native American burning practices or possibly late successional forest habitat before the habitat was converted for agricultural purposes in the late 1800s. It is not classified as prairie because it lacks the appropriate soil types normally associated with prairie habitats in the Black River watershed. However, because so little native prairie remains in Thurston County, these grasslands, with some enhancement, can help support species that prefer larger, open spaces of short grass, flowering herbaceous plants, and an occasional large cavity-producing tree that provides perches and nesting cavities. Ideally a transition area of shrubs will provide an area of cover for animals utilizing both grasslands and woodlands.

The Unit supports 163 acres of dry, nonnative grassland habitat, which consists of a mixture of mostly nonnative grasses, nonnative forbs, and shrubs that function to support a wide variety of birds and animals.

The Unit will conduct active management on 148 acres of this nonnative grassland habitat by mowing, haying, and controlling invasive plants to maintain an early successional stage of open, savannah-like habitat. Grassland-oriented species, including resident and migratory birds such as western meadowlark, American kestrel, and owl; foraging herbivorous waterfowl such as goose and American wigeon; pollinators such as butterfly, moth, and hummingbird; and wintering ungulates such as black-tailed deer, will benefit from early successional stage habitat.

The Unit will identify and enhance a minimum of 15 acres with native grass and native forb species to benefit native pollinators, other native insects, birds, and other native animals. Enhancement techniques to achieve the desired plant compositions may include mechanical mowing, haying, fertilizing, herbicides, herbivore grazing, prescribed fire, barrier cloth placement, invasive plant control, seeding, and/or planting native plants. IPM techniques will be utilized to control and monitor undesirable and nonpalatable plant species (see Appendix G).

Unit staff will establish and protect a few big leaf maples and/or Garry oaks on approximately 50-acre blocks to provide habitat for passerine and raptor perching, cavity-nesting birds such as owls, and bat roosting to enhance both habitat and wildlife diversity.

Objective 2.2: Protect, maintain, and enhance upland mixed forest habitat

Protect, maintain, and enhance 394 acres of mixed forest for migratory birds, mammals, and other native wildlife.

Desired characteristics of a good quality mixed forest include:

- Well-drained soils that are moist much of the year and dry for approximately 3–4 months
- As stands mature, Douglas-fir, grand fir, western hemlock, western red cedar, and big leaf maple dominate the canopy as early successional red alder becomes less dominant**
- Selected individual trees or groups of trees of >12" diameter and 20' long become snags and logs and enhance diversity
- Mid-story and understory development depend upon forest maturity, moisture, and light availability and may include yew, salal, salmonberry, osoberry, tall Oregon grape, beaked hazel, vine maple, red, evergreen, and black huckleberry, trailing blackberry, twinflower, inside-out flower, wild ginger, sorrel, Pacific bleeding heart, starflower, trillium, columbine, and bunchberry**
- < 10 percent cover of invasive plants in the mid- and understory layers

***Attributes identified in current and/or proposed inventory, monitoring, and research activities*

Strategies Applied to Achieve Objective:
Monitor and use appropriate IPM techniques, such as mechanical, physical, biological, and chemical methods (see Appendix G), to control invasive or undesirable plant or animal species.
Annually control or manage invasive species in a minimum of 20 percent of mixed forest habitat.
Evaluate and manage 5-10 acres of forests through various forest management practices (variable density stand thinning, etc.) to convert young stands into structurally diverse mature forests that include diverse mid- and understory development.

Rationale:

Mixed forest habitats are abundant throughout the southwest Washington region. This upland mixed forest habitat type is made up of a variety of deciduous and coniferous trees found in a mosaic of successional stages important for wildlife diversity. Most upland areas on the Unit are young forest stands recovering from logging and currently include a predominance of young Douglas-fir. No old-growth forest is located on Unit lands, and forests over 80 years are rare in this watershed. This younger age-class lacks the density of snags that are found in older forests.

The Unit will encourage upland mixed forests to mature over time into old-growth forests that might eventually support rare species such as the marbled murrelet and Northern spotted owl. Linkage between conifer forests of Capital State Forest, Unit upland mixed forests, riparian forests, and swamps provide habitat corridors for wildlife to move as seasons dictate or food requirements change. Forest enhancement and linkage will benefit many species of wildlife associated with this habitat type including many species of landbirds, both resident and migratory, many myotis bat species, as well as silver-haired and hoary bats, many small rodent species, including mountain beaver, Douglas and flying squirrels, Townsend's chipmunk, and larger mammals such as elk, black-tailed deer, black bear, and mountain lion.

Forest management will include a thorough evaluation of the Unit forests and overall forest health with the aid of partners such as USDA Forest Service, Pacific Northwest Research Station. Forest management practices (variable density stand thinning, etc.) will be implemented on a minimum of

5–10 acres to transition young stands into structurally diverse forests that include multi-species mid- and understory development.

To maintain the health and diversity of the habitat, Unit staff will manage invasive species, such as reed canarygrass, Scotch broom, and nonnative blackberry, on a minimum of 20 percent of mixed forest habitat (see Appendix H).

Goal 3. Contribute to the protection and long-term environmental health of the greater Black River watershed and ecosystem.

Objective 3.1: Develop and strengthen partnerships

The Unit will initiate, develop, and continue to strengthen existing partnerships with interested groups for the benefit of the long-term environmental health of native wildlife and their habitats.

Partnership actions include:

- Working with and involving local communities, Tribes, universities, landowners, NGOs, agencies, and other interested parties
- Identifying the Service’s role in conservation efforts with the focus on partnerships that provide support for natural resources
- Utilizing existing and supporting new eco-regional plans and priorities
- Working with and assisting others in the recovery of threatened and endangered species**
- Working with others and assisting with management objectives, resource protection, and research**
- Working with others to control and manage nonnative plants and enhance habitats**
- Considering and participating in climate change initiatives and research**

***Attributes identified in current and/or proposed inventory, monitoring, and research activities*

Strategies Applied to Achieve Objective:
Continue to work with partners such as the Thurston County Noxious Weed Control Board (TCNWCB) to continue coordinated control efforts and monitoring of invasive plant and animal species.
Continue to participate and coordinate with the Washington and Oregon Spotted Frog Working Group partners to plan and implement recovery strategies both on- and off-Unit (see Objectives 1.1, 1.2, 1.4, 1.6, 1.7, 4.3).
Maintain and improve partnerships with natural resource agencies, Tribes, NGOs, and private companies involved in land management and restoration at Black River.
Work with State, county, Tribes, and other partners to develop a plan (based on a completed WRIA) to ensure an appropriate water budget and delivery conditions (water quality and quantity) are sustained in the Black River and tributaries (see Objectives 1.1, 1.2, 1.3, 1.6, 1.7).
Endorse and partner (where feasible) with public and private organizations, Tribes, and adjacent landowners to maintain and enhance connectivity of native plant communities and habitat quality on lands adjacent to the Unit and other protected lands in the watershed.

Strategies Applied to Achieve Objective:
Partner with the TCNWCB and others to provide education and outreach opportunities, including with local landowners, on invasive plant control and the impacts of invasive plants to the habitat and methods of reducing and controlling infestations.
Partner to educate and encourage private landowners to maintain healthy habitats for fish, amphibians, and native wildlife.
Coordinate with partners to develop and/or evaluate suitability of techniques to control populations and reproduction of invasive frogs and invertebrates.
Partner with interested agencies to determine an array of effective techniques (including IPM strategies) available to contain, control, or manage reed canarygrass in difficult wetland conditions.
Work with partners to locate, protect, and conserve land within the watershed, especially priority habitats such as bogs and emergent marsh and rare and declining species.
Endorse and partner (where feasible) with public and private agencies and adjacent landowners to maintain and enhance connectivity of native habitats, habitat quality, and native plant communities within the watershed.

Rationale:

The approved Unit boundary includes only the northern portion of the Black River, and further acquisition is ongoing. The limited size of current ownership limits the Unit's ability to provide landscape-level benefits, such as greater watershed protection and buffers for sensitive habitats and species.

Achieving landscape-level habitat protection will require partnerships beyond the Unit boundary. Unit staff will work to develop new partnerships to provide the necessary habitat monitoring, protection, resources, and educational information to help maintain the Black River ecosystem in a healthy, sustainable condition. Conservation projects occurring near the Unit also strengthen habitat and wildlife protection inside the Unit boundaries. By developing and strengthening partnerships, conservation of the Black River watershed will be more effective by combining efforts and leveraging financial and technical resources from other entities (other governmental organizations, NGOs, Tribes, and private landowners). Whenever possible the Unit will seek to engage private landowners in voluntary conservation projects to enhance the health of wildlife habitat and protect water quality. Through an active role in local, State, Tribal, and Federal partnerships, Unit staff will work to improve and protect water quality and the ecological integrity of the Black River Watershed.

Partnerships include the Chehalis Tribe, Capitol Land Trust, Port Blakely, Center for Natural Land Management, TCNWCB, Thurston County, Thurston Conservation District, Washington Department of Ecology, WDFW, WDNR, and the Service's Washington Fish and Wildlife Office. Conservation efforts will continue to focus on protecting and enhancing habitats locally by participating in various groups such as the Washington Oregon Spotted Frog Working Group, Chehalis River Cooperative Weed Management Working Group, and others to implement working-group strategies and goals shared by the Unit.

Goal 4. Gather scientific information (inventories, monitoring, and research) to support adaptive management decisions.

Objective 4.1: Inventory

Conduct scientific inventories to provide information regarding the status of Unit resources and better guide resource management decisions. These scientific inventories and surveys will contribute to the development of Unit resource objectives. They will also facilitate habitat restoration through selection of appropriate habitat management strategies based upon site-specific conditions.

These inventory activities will have the following attributes:

- Inventory habitats, species, or species groups according to the Unit's approved I&M Plan and associated protocols
- Scale, accuracy, and completeness of inventories that will be appropriate for development and implementation of Unit habitat and wildlife management actions
- Data collection techniques that will reduce animal mortality, disturbance, and habitat destruction
- Proper cleaning of investigator equipment and clothing and use of quarantine methods, where necessary, to minimize the potential spread or introduction of invasive species and disease

Strategies Applied to Achieve Objective:
Develop a Unit I&M Plan within 3 years of CCP completion that provides the management rationale, timing, and costs for conducting Refuge surveys; lists the prioritized surveys; identifies the surveys selected for implementation; and documents the protocols that describe the survey objectives and methods.
Implement the Black River Unit I&M Plan within 5 years on currently owned tracts and within 2 years of acquiring any new tracts; create a plan for appropriate habitat enhancement.
Characterize all known Oregon spotted frog oviposition sites, including habitat, elevation, and hydrology, to provide a comparison for future monitoring.
Inventory new areas and identify new oviposition locations for Oregon spotted frog (see Objective 1.2).
As tributary and river channel habitat is acquired, assess each for key biotic and abiotic characteristics and potential enhancement needs (see Objectives 1.1 and 1.2).
Partner with appropriate science experts to find, classify, and map all bog sites on the Unit. (Objectives 1.3 and 3.3)
Conduct inventory of terrestrial and wetland plants in existing and any newly acquired tracts to determine nonnative plant species presence, relative abundance, and determine the need for nonnative species control.
Conduct submerged plant inventory to determine presence or absence of invasive species growing in the river and tributary channels.
Conduct presence or absence inventories on nonnative animal populations and evaluate distribution and relative abundance in key habitats.

Strategies Applied to Achieve Objective:
Within 5 years of CCP completion, begin inventories for bullfrog concentrations and their egg-laying locations. Survey first at known Oregon spotted frog oviposition habitats.
Conduct inventories to gather data (presence/absence, habitat use, relative abundance) on wildlife species such as small mammals (e.g., rodents, bats), amphibians, reptiles, invertebrates, and pollinators.
Develop data management plan that describes topics such as data entry, verification, and editing; analysis; metadata generation; data sharing; and data security and archiving for all Unit-supported inventory activities.

Rationale:

An inventory is defined as a survey that estimates the presence, abundance, or distribution of species, habitats, ecological communities, or abiotic features at a particular time (701 FW 2). Inventories may also establish a beginning time-step (baseline) or reference information for subsequent monitoring. For example, a well-designed inventory may be repeated at a later time to assess the status and trends in the same location, which will then be considered monitoring. Inventories will provide fundamental information about biotic (e.g., vegetation data) as well as abiotic processes and conditions (e.g., water quality, water flow) that are necessary to ensure that implementation of on-the-ground resource management achieves the resource management objectives identified under Goals 1–3.

Specifically for the Black River Unit, a Unit I&M Plan needs to be developed to document the surveys required to determine species status, assess habitat condition, detect changes in diverse fish, wildlife, and plant communities and physical resources including water, air, and soils and ecological processes. The I&M Plan will include information on the specific metrics required for supporting management decision-making and may include presence/absence, species composition, seasonal habitat use, spatial distribution, and/or population estimates. Field work to inventory biological status of current and newly acquired lands will take place on each of the habitats, especially in the bog habitat.

Funds are currently prioritized to perform the most pressing projects on the Nisqually National Wildlife Refuge Complex, leaving few resources and staff available to conduct Black River-specific baseline assessments. Partnering with other field biologists from natural resource agencies, NGOs, private lands, and using qualified volunteers will be instrumental in accomplishing these inventories.

Black River Unit Objective 4.2: Monitoring

Conduct high-priority monitoring activities that evaluate changes in the status of fish, wildlife, and their habitats. The information gathered facilitates adaptive management actions for resource management and public use activities. Monitoring projects can take place annually or periodically depending on species, habitat, or management needs.

Monitoring of wildlife and habitat contributes to the enhancement, protection, use, preservation, and management of wildlife populations and their habitats on and off Unit lands. Information gained can be used to evaluate achievement of resource management objectives identified under Goals 1–3.

These monitoring and survey activities have the following attributes:

- Projects will adhere to scientifically defensible protocols for data collection, where available and applicable
- Data collection techniques should have minimal animal mortality, disturbance, habitat destruction
- Minimum number of samples (e.g., water, soils, vegetative litter, plants, macroinvertebrates, vertebrates) to meet statistical analysis requirements will be collected for identification and/or experimentation in order to minimize long-term or cumulative impacts
- Proper cleaning of investigator equipment and clothing and use of quarantine methods, where necessary, will minimize the potential spread or introduction of invasive species and disease

Strategies Applied to Achieve Objective:
Within 3 years of CCP completion, develop a Unit I&M plan that provides the management rationale, timing, and costs for conducting Refuge surveys; lists the prioritized surveys; identifies the surveys selected for implementation; and documents the protocols that describe the survey objectives and methods.
Monitor and assess condition and availability of appropriate habitats for rare, declining, federally or State-listed, and priority species or species groups.
Annually conduct Oregon spotted frog egg surveys to assess population status and habitat use (see Objective 1.6).
Annually assess Oregon spotted frog oviposition site locations for habitat enhancement opportunities.
Monitor to determine if Oregon spotted frog eggs develop successfully when laid on reed canarygrass leaf mats in deep water.
Annually monitor the effects of habitat enhancement project success in Oregon spotted frog oviposition habitat using frog-egg-mass numbers and location (see Objective 1.6).
Monitor the effectiveness of any bullfrog control methods to benefit Oregon spotted frog, other amphibians, small fish, birds, and invertebrates.
Partner with other agencies or groups to periodically monitor the river and tributary channel(s) within Unit boundaries for water quality, quantity, flow rate, turbidity, dissolved oxygen, pH, nutrients, connectivity, and other parameters to benefit all native species and nearby wetland habitats.
Within 5 years, specifically establish a long-term bog habitat monitoring program to look at habitat condition, threats, and changes over time. Include monitoring of plant and animal species composition and density, ground pH, nutrient levels, soils, hydrology, and incorporate the I&M Plan (see Objective 1.3).
Periodically monitor for potential biological integrity threats that may develop in habitats NOT targeted for enhancement to benefit species that use those habitats.
Periodically monitor actively managed or enhanced habitats to assess response by key avian, mammalian, and other wildlife species to support adaptive management.

Strategies Applied to Achieve Objective:
Annually survey at least 0.5 miles of the river or tributaries for nonnative submersed plants in the channels (see Objectives 1.1 and 1.2).
Survey, GPS, and map the invasive, nonnative reed canarygrass along the river channel and monitor changes over time (see Objective 1.1).
Survey, GPS, and map locations of yellow flag iris, purple loosestrife, reed canarygrass, and other specific nonnative or invasive plant species threatening Unit wetlands. If plants are found, implement IPM control strategies (see Appendix G).
Continue to partner with agencies to monitor effectiveness of various management techniques used to control, contain, or manage reed canarygrass to learn most efficient, useful, effective, and long-term methods for the benefit of Oregon spotted frog and other wildlife.
Periodically monitor nonnative animal control effort efficacy, if implemented, in specific wetland habitats and monitor wildlife response (presence/absence) to nonnative animal removal over time.
Annually monitor all enhanced habitats for invasive plant regrowth and needed treatment.
Monitor results of Landscape Conservation Cooperative and other large-scale and long-term monitoring and research efforts to assess resilience of refuge habitats to changing climate trends.
Work with partners to monitor environmental factors that are climate change-related stressors (e.g., changes to hydrology, water temperature).
Develop data management plan that describes topics such as data entry, verification, and editing; analysis; metadata generation; data sharing; and data security and archiving for all Unit-supported monitoring activities.
Establish a biological technician position to focus on wildlife and habitat surveys and monitoring of trends and changes in plant and wildlife populations.

Rationale:

Monitoring consists of repeated survey efforts intended to document changes over time (e.g., months to years) and space in select attributes of wildlife, plants, habitats, ecological communities, or abiotic resources. Two types of monitoring in the Service policy (701 FW 2) are:

- (1) Baseline monitoring. Monitoring that is not tied to specific predictions of how a natural resource will respond to management or environmental stressors, but instead is designed to document change over time of a natural resource. Examples include monitoring wildlife population trends, disease incidence, and climate change.
- (2) Monitoring to inform management. Monitoring to assess whether a natural resource is approaching or exceeding a known threshold, or if a resource is responding to a management action or system stressor in a specified manner. This type of monitoring involves defining the threshold values or expected response, then surveying to measure the response or a closely related indicator. Comparing monitoring results with these expected values may show a need

for initiating, intensifying, or altering management actions. Results from this type of monitoring are used in an adaptive management context to improve management or evaluate progress toward achieving management objectives, as derived from the Refuge System mission and Refuge purposes.

Periodic monitoring for rare and sensitive species, as well as key avian, mammalian, and/or other wildlife species will provide information on their status and habitat quality. Species response to habitat enhancements will need to be understood to adapt management techniques. As noted in Objective 4.1 and Chapter 4, the bog habitat and potential RNA may include a complex mosaic of habitats and species that are very sensitive to abiotic changes and require close monitoring.

Working with partners to monitor Oregon spotted frog on Unit lands has been ongoing and with increased monitoring, will provide critical information on the frog populations, habitat usage, and habitat quality. Additionally, long-term monitoring of bullfrog presence/absence is important for continued Oregon spotted frog survivorship. Monitoring habitat manipulation efforts and results, especially to control reed canarygrass, will assist managers in learning and adapting techniques to further enhance habitats. Monitoring fish and wildlife response to habitat manipulations will help guide managers to support sound management decisions and provide higher quality habitat.

Most wetland habitats in the Black River Unit are difficult and time consuming to physically access, and walking or paddling are challenging. Extensive field work is needed to survey and monitor habitats, fish and wildlife, rare and sensitive species, and specific responses of animals to management techniques. The current, single biologist for the three refuges in the Nisqually National Wildlife Refuge Complex will not be able to conduct all of the needed Black River Unit monitoring activities, even with partner and volunteer assistance. Because of the workload, a new biological technician position is needed to help conduct habitat inventory and monitoring projects in the field, enter data, work with partners, and assist researchers.

The Unit will monitor wildlife corridor analyses, research potential shifts in species distributions and/or timing of migration, vulnerability assessments, and other efforts, including those underway at a landscape scale, such as the North Pacific LCC. LCCs are formal science-management partnerships between the Service, other Federal agencies, States, Tribes, NGOs, universities, and other entities to address climate change and other biological stressors in an integrated fashion. LCCs provide science support, biological planning, conservation design, research, and design of inventory and monitoring programs. As needed, objectives and strategies will be adjusted to assist in enhancing Unit resources' resiliency to climate change, and to potentially manage for new assemblages of species in the future.

Objective 4.3: Research

Conduct high-priority scientific research projects that provide the best science for habitat and wildlife management on- and off-Unit. These research projects may identify cause-and-effect relationships, produce new knowledge, and last 1–3 years. Scientific findings gained through these projects will expand knowledge regarding life-history needs of species and species groups as well as identify or refine habitat and wildlife management actions.

Research will also reduce uncertainty regarding wildlife and habitat responses to Unit management actions in order to achieve desired outcomes reflected in resource management objectives and facilitate adaptive management.

These research projects will have the following attributes:

- Adhere to scientifically defensible protocols for data collection, where available and applicable, in order to develop the best science for resource management
- Data collection techniques will likely have minimal animal mortality, disturbance, and habitat destruction
- Collect the minimum number of samples (e.g., water, soils, vegetative litter, plants, macroinvertebrates, vertebrates) to meet statistical analysis requirements for identification and/or experimentation in order to minimize long-term or cumulative impacts
- Utilize proper cleaning of investigator equipment and clothing as well as quarantine methods, where necessary, to minimize the potential spread or introduction of invasive species and disease
- Often result in peer-reviewed articles in scientific journals and publications or symposiums

Strategies Applied to Achieve Objective:
Within 5 years, set up research to investigate the status and long-term condition of known bog habitat, including general plant and related animal species composition, hydrological conditions and needs, and relative health and stability of this rare plant community.
Continue to participate in studies to develop an array of effective methods to contain, control, manage, or retard rank reed canarygrass in wet and wetland conditions and implement as methods are developed.
Investigate effective IPM control techniques specifically for reed canarygrass that is invading river and tributary channels and apply to 0.25 miles annually as effective, feasible techniques are developed.
Within 7 years of CCP completion, develop effective techniques to reduce known populations of nonnative bullfrogs using IPM methods and implement and monitor where needed in key locations based on survey results.
Develop research projects with the help of qualified researchers to explore factors affecting priority wildlife species and their habitats with the intent to increase our understanding and ability to manage these resources.
Seek funding and support partnerships to conduct a hydrological modeling study of the entire Black River system to identify impairments, management needs, and identify feasible measures to improve water quality and flows for natural resource management and improvements in the watershed.
Coordinate with partners to develop and/or evaluate suitability of techniques to control populations and reproduction of invasive frogs and/or invertebrates without negatively affecting salmonids, Olympia mudminnow, Oregon spotted frog, or rare or declining species in the Black River ecosystem.
Examine ephemeral Oregon spotted frog habitats and connectivity to permanent water locations during the dry seasons, and determine the value and/or threats of artificially connecting isolated marshes.
Conduct research to examine survivorship of Oregon spotted frog eggs, larvae, tadpole and juvenile

Strategies Applied to Achieve Objective:
frogs, habitat use, and investigate predation and other threats.
Support partnerships to investigate Oregon spotted frog ecology and nonbreeding habitat use and needs to provide information to support habitat management and land protection decisions.
Determine the threats and challenges to Oregon spotted frog that could be reduced through adaptive management.
Develop data management plan that describes topics such as data entry, verification, and editing; analysis; metadata generation; data sharing; and data security and archiving for all Unit-supported research activities.

Rationale:

Research projects on Unit lands can address a wide range of natural and cultural resources. Examples of research projects include habitat use and life-history requirements for specific species/species groups, practical methods for habitat management and enhancement, extent and severity of environmental degradation, including water loss or contamination, techniques to control or eradicate pest species, effects of climate change on environmental conditions and associated habitat/wildlife response, or modeling of wildlife populations. Projects may be species-specific, Unit-specific, or evaluate the relative contribution of the Unit to larger landscape (ecoregion, region, flyway, national, international) issues and trends. Like monitoring, results of research projects will expand the best available scientific information and potentially reduce uncertainties to promote transparent decision-making processes for resource management on Unit lands. In combination with results of surveys, research will promote adaptive management on Unit lands.

Specific research needs in the Black River Unit include developing and implementing more effective yet practical methods to control reed canarygrass without having the ability to control water levels. Special attention and study is needed to learn cost efficient, practical methods to control or reduce reed canarygrass density in all wetland habitats but especially in the river and tributary channels, while minimizing impacts to aquatic residents. One of the challenges of developing reed canarygrass management techniques for use in the river is the difficulty in accessing sites.

Ensuring that enough high-quality water flows through the river and tributaries and provides an adequate hydrologic regime for the mosaic of associated wetlands is of utmost importance to the Unit purpose and function. A WRIA of the Black River system is needed to identify impairments, management needs, and feasible measures to improve water quality and flows for natural resource management and improvements in the watershed. This information is vital to effectively managing the Unit.

The Unit will monitor wildlife corridor analyses, research on potential shifts in species distributions and/or timing of migration, vulnerability assessments, and other efforts, including those underway at a landscape scale, such as the North Pacific LCC.

Goal 5. Provide quality opportunities for visitors to experience a diversity of wildlife and habitats to enhance their understanding and appreciation of the Black River Unit's natural resources and foster a connection with nature.

Objective: 5.1 Welcome and Orientation

Provide visitors with welcoming and orienting features, facilities, and experiences. These will be characterized as follows:

- Refuge sign
- Information kiosk
- Orientation signs
- Signs directing visitors to a parking area
- Use of electronic and print media to reach and orient visitors

Strategies Applied to Achieve Objective:
Install a Unit sign at the vehicle pull-off area on the west side of Endicott Road when it is developed.
Work with WDFW to provide Watchable Wildlife signs.
Develop a brochure for the Unit.
Provide electronic and print media with accurate information that is positively worded and available at the Unit kiosk and other local venues such as the Chamber of Commerce.

Rationale:

Customer service and first impressions are important to visitors to feel welcome and safe at national wildlife refuges. Visitors to the Black River Unit do not necessarily know they are on a unit of a national wildlife refuge and need welcome and orientation features that are easily found and well maintained. Materials should provide accurate, timely, and appropriate information on Unit facilities, programs, and experiences. These strategies will increase Unit visibility and promote visitor compliance with Unit regulations.

Objective: 5.2 Provide high-quality wildlife observation and nature photography, interpretation, and environmental education opportunities

Provide compatible wildlife observation and photography, interpretation and environmental education opportunities with the following characteristics:

- Facilities are safe, fully accessible, and available to a broad spectrum of the public
- Opportunities exist to view and photograph a diversity of wildlife in their natural habitat and setting
- Access is provided to several habitat types, but mainly the river habitat
- Viewing opportunities are tied to interpretive and educational opportunities
- Observation opportunities promote public understanding of the Unit's resources and its role in managing and protecting those resources
- Observation occurs in places with the least amount of disturbance to wildlife
- Observers have minimal conflict with other visitors or operation of the Unit

Strategies Applied to Achieve Objective:
Design and install a vehicle pull-off area with interpretive signs on west side of Endicott Road for wildlife viewing. The area could accommodate several parked cars and a pull-through for cars and buses to stop briefly for wildlife and habitat viewing.
Provide interpretive and regulatory signage at the vehicle pull-off area.
Install a small viewing deck at the vehicle pull-off area for wildlife viewing.
Design and install a small parking area on the east side of Endicott Road.
Install a short trail to a viewing deck with views of the Black River and associated habitats at the parking area on the east side of Endicott Road. Interpretive panels will enhance the visitors experience and knowledge of the area's natural resources.
Develop an interagency agreement or similar instrument with WDNR to allow cooperative management of public uses of the Black River channel.
Upon establishment of the planned Thurston County Gate-Bellmore Trail, which will run along the eastern edge of the Unit, explore potential spur trails into the Unit to provide wildlife-viewing opportunities.
Explore opportunity for a cooperative agreement with Thurston County to facilitate improvements on the county right of way at 123rd Avenue including a boat launch, small parking area, and new kiosk and interpretive signs on the southeastern side of bridge.
Look for opportunities to partner with business, agencies, and organizations that are providing environmental education to local students.

Rationale:

Compatible wildlife observation, photography, interpretation, and environmental programs receive priority consideration in planning and management on national wildlife refuges, secondary to the needs of fish and wildlife. Wildlife observation is the primary visitor activity at the Black River Unit. Wildlife observation and photography programs are designed to provide a diversity of high-quality viewing opportunities for visitors while minimizing disturbance to wildlife and habitats. These activities increase public understanding and appreciation for America's natural resources and incorporate a message of stewardship and conservation.

The Unit allows bird watching, wildlife observation, and recreational opportunities in habitats unique to the local area. The native habitats at the Unit, such as the river corridor and the associated uplands and wetlands, are most easily experienced by boat. Currently, the only place available for public boat launching is an undeveloped Thurston County right-of-way at 123rd Avenue. By making improvements to this county land and adding a small parking area in the Unit-owned uplands adjacent to the ROW, visitors will have an improved place to launch boats.

A small vehicle pull-off area and interpretive information are proposed to bring vehicles off Endicott Road to view wildlife and increase visitor safety. Trail connections with Thurston County will enhance both the County's trail system and provide an avenue for Unit visitors to experience the

habitats closely associated with the river. The Unit will be open to the public from sunrise to sunset. Areas not specifically open will be closed to protect wildlife and habitat from disturbance.

Goal 6. Support and develop an active volunteer program and partnerships to assist in providing quality visitor services programs and outreach.

Objective: 6.1 Develop and promote a Unit volunteer program

Develop, support, and maintain a volunteer program associated with the Unit with the following attributes:

- Provide effective training and program management
- Support and complement the Service mission and current initiatives
- Increase visibility and foster conservation
- Support a variety of Unit programs/activities and increase their effectiveness
- Encourage community involvement and strengthen relationships

Strategies Applied to Achieve Objective:
Identify areas where volunteers could work in support of Unit programs and management objectives.
Publicize volunteer opportunities to recruit new volunteers from the local community.
Look for ways to partner with other organizations to provide volunteers.
Maintain an up-to-date “Volunteer Training Manual.”
Provide a training course for volunteers on the Service, Billy Frank Jr. Nisqually National Wildlife Refuge and the Black River Unit history, management, and natural resources; the specifics of the Unit volunteer program and volunteer opportunities; and the specifics of volunteer duties.
Recruit and train volunteers who will work with a variety of Unit programs.
Recruit and train volunteers from the Nisqually National Wildlife Refuge Complex to help with a variety of Unit activities.
Provide volunteers with annual recognition.

Rationale:

Volunteers provide an important and needed service on national wildlife refuges. Successful volunteer programs are recognized as a key component of the successful management of public lands and are vital to implementation of refuge programs, plans, and projects, especially in times of declining budgets.

Unit volunteers will be recruited from the local area as well as from the Nisqually National Wildlife Refuge Complex volunteer program. New volunteers will participate in the volunteer training course provided at Nisqually National Wildlife Refuge Complex and be given the necessary information to

perform the required tasks. Volunteer projects could include (1) weed warriors who help to identify and control invasive plants, (2) wildlife surveys and monitoring, and (3) education and outreach.

Volunteers will play an important role as the Unit continues to acquire lands, increase habitat enhancement and management programs, and assist with visitor services programs to the public. In addition to providing assistance with programs and helping the Unit meet its mission, volunteers are outreach ambassadors in the community. They spread the word message about the Unit throughout the community where they live.

Objective: 6.2 Support and encourage partnerships to support visitor services programs

Support and encourage partnerships with the following attributes:

- Partners support the mission of the Unit and Refuge System
- Working together with Unit staff, partners will be advocates for the Unit in helping secure resources and funding for programs and facilities
- Partners will provide needed volunteer support to Unit programs
- Partners may be a part of a network of Friends Groups across the county supporting and advocating for the National Wildlife Refuge System

Strategies Applied to Achieve Objective:

Identify local community groups, businesses, and organizations that could help support the Unit's visitor services program and facilities development.

Work with local partners to develop public programs.

Explore ways to work with the Chehalis Basin Partnership and other partners to provide education and outreach to local communities.

Rationale:

National wildlife refuges have developed extensive and sophisticated partnerships and Friends Groups in order to carry out the mission of the Refuge System. Partners provide support in a variety of ways at the local, regional, and national levels. Partnerships and Friends Groups provide a way for citizens to be involved in and work to enhance and improve the resources that refuges are mandated to protect.

As the Unit continues to acquire land, improve and enlarge habitat management programs, and open areas and activities to the public, the need for partner support of the visitor services programs will grow. Partners could provide financial or technical support as well as on-the-ground program support. These invaluable contributions by partners will play an important role in the success and growth of the Unit's visitor services programs.

Support at the local level will be important for the development of visitor facilities and programs. Working with a variety of partners will enable the Unit to reach new audiences and to stay active and visible in the local community.

2.5 References

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Chapter 3

Physical Environment

Chapter 1
Introduction
and
Background

Chapter 2
Management
Direction

Chapter 3
Physical
Environment

Chapter 4
Biological
Environment

Chapter 5
Human
Environment

Appendices
A-M

Chapter 3. Physical Environment

3.1 Introduction

The Black River Unit is located 7 miles southwest of Olympia in Thurston County (Map 1). The Unit boundary begins at the south end of Black Lake at river mile 25. It extends south on either side of the river approximately 7.5 miles to river mile 17.5, just south of 123rd Avenue. The Unit's acquisition boundary is 3,873 acres, and 1,566 acres have been acquired. Much of the Unit lies within the Black Lake, Dempsey Creek, and Black River sub-basin drainages of the Chehalis River. In spite of rapidly growing development nearby, the Unit has retained an isolated and wild character.

3.2 Climate

Oceanic influence from the Pacific Ocean to the west and Puget Sound to the north buffers temperature extremes in the Black River drainage, while the Cascade Mountains to the east protect this watershed from continental air masses. This results in a mild, modified maritime climate with long growing seasons. Prevailing airflow from the ocean greatly modifies the colder winter temperatures and the heat of summer in the area.

Weather parameters representative of the Unit are measured daily at the Olympia Airport, approximately 7 air miles northeast of the Unit. The average annual air temperature between 1948 and 2012 in areas surrounding Olympia was 49.9 °F (WRCC 2015c). Monthly average air temperatures between 1948 and 2012 are identified in Table 3-1. Daily maximum temperatures in nearby Olympia are usually between 70 and 80 °F during summer, while average daily minimum temperatures in winter are near freezing. The July mean high temperature is 77.14 °F and the January mean low temperature is 31.77 °F (WRCC 2015d, 2015e). Area temperatures over 90 °F occur only about 6 days a year and temperatures over 100 °F rarely occur during summer months. Freezing temperatures occur about 83 days/nights a year in the valleys and the average frost-free period is 150 to 210 days. Higher points in the nearby Black Hills have moderately severe winters.

Thurston County has well-defined seasons, and seasonal changes are gradual. The average annual precipitation for the Olympia area from 1953 to 2012 was 50.82 inches and occurred mostly as rain during the winter months (WRCC 2015f). Average annual rainfall of 110 inches along the western county border decreases to 38 inches in the southeastern portion of the county. Olympia averages 52.3 inches per year, but the nearby Black Hills, which drain into Black River, receive considerably higher amounts (CRC 1992). Precipitation is heaviest during late fall (28 percent of yearly average) and winter (46 percent of yearly average) causing many lowlands, including the Black River area, to flood. Approximately 20 percent of the rain falls in spring, and only 6 percent in summer, thus summers are fairly dry, averaging only 3 inches of rain. The area can expect an average of 73 clear days, 72 partly cloudy days, and 220 cloudy days a year.

Table 3-1. Olympia Area: Air Temperature and Precipitation Summaries, 1948–2012 (WRCC 2015c, 2015f)

Month	Average Temperature (Fahrenheit)	Total Precipitation (Inches)
January	38.2	8.02
February	40.7	5.63
March	43.5	5.24
April	47.7	3.33
May	53.6	2.10
June	58.7	1.57
July	63.3	0.72
August	63.3	1.12
September	58.5	2.02
October	50.1	4.70
November	43.0	8.24
December	38.7	8.12
Annual	49.9	50.82

3.2.1 Climate Cycles in the Pacific Northwest

Two climate cycles have major influences on the climate and hydrologic cycles in the Pacific Northwest: the shorter-term El Niño/La Niña/Southern Oscillation (ENSO) events, and the longer-term Pacific Decadal Oscillation (PDO) epochs (CIG 2012a). In El Niño years, average sea surface temperatures in the central and eastern equatorial Pacific Ocean are warmer than average, with weakened easterly trade winds in the tropical Pacific. La Niña years are characterized by the opposite—cooler than average sea surface temperatures and stronger than average easterly trade winds. These changes in wind and ocean circulation have global impacts on weather events. ENSO influence on Pacific Northwest climate is strongest from October to March. During an El Niño event, the winters tend to be warmer and drier than average. La Niña winters tend to be cooler and wetter than average. Each ENSO phase typically lasts 6–18 months, with phases reoccurring every 2–7 years (CIG 2012a).

Like ENSO, PDO is characterized by changes in sea surface temperature, sea level atmospheric pressure, and wind patterns (CIG 2012a). PDO is described as having two phases: warm and cool. During a warm phase, sea surface temperatures near the equator and along the western coast of North America are warmer, while in the central north Pacific they are cooler. During a cool phase, the

patterns are opposite. Within the Pacific Northwest, warm phase PDO winters tend to be warmer and drier than average whereas cool phase PDO winters tend to be cooler and wetter than average. A single warm or cool PDO phase may last 20–30 years.

The potential for temperature and precipitation extremes increases when ENSO and PDO are in the same phases and thereby reinforce each other. When ENSO and PDO are in opposite phases, their opposing effects on temperature and precipitation can cancel each other out, but not in all cases and not always in the same direction (CIG 2012a).

3.2.2 Climate Change

As guided by DOI Secretarial Order 3226 (Secretary of the Interior 2009) and the Service’s Climate Change Strategic Plan (USFWS 2010), the Service considers and analyzes climate change in its decisions, long-range plans, and other activities.

The terms “climate” and “climate change” are defined by the Intergovernmental Panel on Climate Change (IPCC). “Climate” refers to the mean and variability of different types of weather conditions (e.g., temperature, precipitation, wind) over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007a). The term “climate change” thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007a).

Climate-related concerns are generally focused on potential anthropogenic changes to the atmosphere that have altered Earth’s “greenhouse effect” (NOAA 2012a). The greenhouse effect is a natural phenomenon that assists in regulating and warming Earth’s temperature. Greenhouse gases (GHGs) in the atmosphere—primarily carbon dioxide (CO₂), water vapor, methane, and nitrous oxide — absorb and emit infrared radiation from sunlight, ultimately trapping heat at the Earth’s surface. Concentrations of GHGs, especially CO₂, are strongly correlated with global temperatures.

Trends and projections related to climate change are discussed in this section, and potential effects to the Refuge and the Unit are considered in Chapter 6.

Historical Trends in GHGs, Air Temperature, Precipitation, Snowpack, and Streamflow

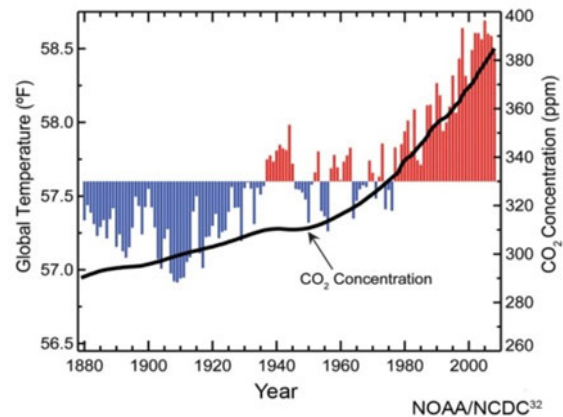
Empirical evidence indicates that Earth’s global climate has been changing rapidly during the 20th and early 21st centuries, with substantial evidence that the magnitude of climate alterations has been amplified by human activities, such as deforestation and the burning of fossil fuels (IPCC 2007, NAS 2008, USGCRP 2009). Well-documented climate variations have occurred throughout Earth’s history (NOAA 2012b), but the current warming trend differs from geologically earlier climate shifts in two ways. First, recent climate changes appear to be driven primarily by human activities that have generated greater concentrations of atmospheric GHGs. Second, atmospheric CO₂ (and other GHGs) concentrations are at their greatest levels than at any time during the last 800,000 years and are increasing at unprecedented rates (Lüthi et al. 2008). Prior to the start of the Industrial Revolution around 1750, the amount of CO₂ in the atmosphere was about 280 parts per million (ppm). Current global levels are ~392 ppm and are increasing at a rate of ~2 ppm/yr (Department of Energy 2012, NOAA 2012c).

Empirical climate measurements support an accelerating change in global CO₂ concentrations and temperatures since the 1950s (Figure 3-1). Increased frequencies in extreme regional precipitation and wind events also have occurred (IPCC 2007b, Solomon et al. 2007, USGCRP 2009). These recent changes “very likely” have resulted from human-generated increases in GHGs, especially CO₂ emissions from burning fossil fuels (IPCC 2007c, Solomon et al. 2007). Huber and Knutti (2011) concluded that ~75 percent of global temperature increases since 1950 were caused by human activities.

In the Pacific Northwest, increased GHGs and warmer temperatures have resulted in a number of physical and chemical impacts. These include changes in snowpack, streamflow timing and volume, flooding, landslides, sea levels, ocean temperatures and acidity, and disturbance regimes such as wildfire, insects, and disease outbreaks (USGCRP 2009:135–138). Climate shifts also may exacerbate the frequency, magnitude, and intensity of extreme weather events, such as winter storms (Dominguez et al. 2012) and ocean wave heights (Ruggiero et al. 2010); both have been reported for the Pacific Northwest since the 1970s and are projected to intensify during the 21st century.

Climate observations have indicated many changes to Pacific Northwest temperature, precipitation, snowpack, and streamflow during the 20th century (CIG 2012c). On average, the region warmed about 1.5 °F; warming was greatest west of the Cascades during winter and spring (Figure 3-2). Trends in precipitation suggest moderate increases west of the Cascades (Figure 3-3); the largest relative increases occurred in eastern Washington and southern British Columbia, mainly during spring.

Changes in air temperature, especially during winter months, have affected the quantity of mountain snowpack throughout the Pacific Northwest, as well as the timing of spring snowmelt. For the Washington Cascades, Mote et al. (2008) reported that spring snowpack declined 15–35 percent from the mid-20th century to 2006 (also see Figure 3-4); similarly, Casola et al. (2009) reported 8–16 percent declines during 1977–2006. The volume and timing of streamflows throughout the region have also changed; Stewart et al. (2005) reported that spring snowmelt timing was 5–20 days earlier at many Pacific Northwest sites compared with 1948 measurements (Figure 3-4). However, the streams within the coastal Washington region (including the Chehalis River) are primarily rain-dominated, and so are less influenced by snowpack and snowmelt (Mantua et al. 2010). In this area, changes in precipitation would have a greater effect on streamflow and flood timing (Hamlet et al. 2007).



Global annual average temperature (as measured over both land and oceans). Red bars indicate temperatures above and blue bars indicate temperatures below the average temperature for the period 1901–2000. The black line shows atmospheric carbon dioxide (CO₂) concentration in parts per million (ppm). While there is a clear long-term global warming trend, each individual year does not show a temperature increase relative to the previous year, and some years show greater changes than others.³³ These year-to-year fluctuations in temperature are due to natural processes, such as the effects of El Niños, La Niñas, and the eruption of large volcanoes.

Figure 3-1. Global annual average temperature and CO₂ concentrations, 1880–2008. Source: USGCRP (2009).

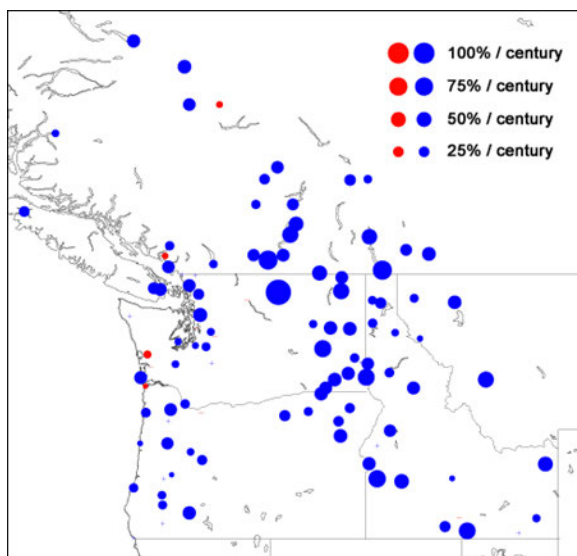


Figure 3-2. Average annual temperature trends (1920–2000) in the Pacific Northwest. Increases (decreases) are indicated with red (blue) dots. The size of the dot corresponds to the magnitude of change (CIG 2012c).

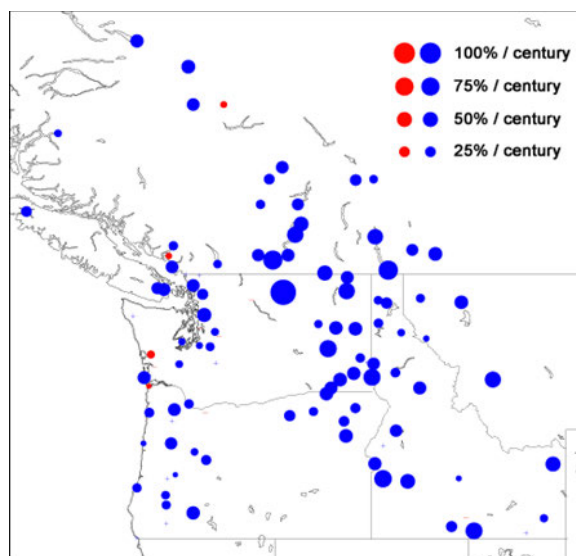
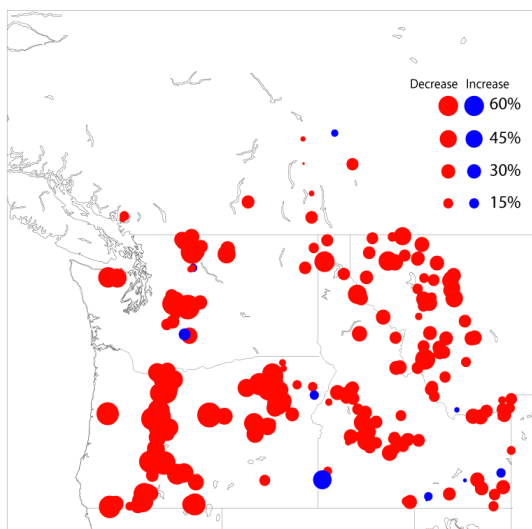


Figure 3-3. Average annual precipitation trends (1920–2000) in the Pacific Northwest. Increases (decreases) are indicated with blue (red) dots. The size of the dot corresponds to the magnitude of change (CIG 2012c).



Source: Climate Impacts Group, University of Washington

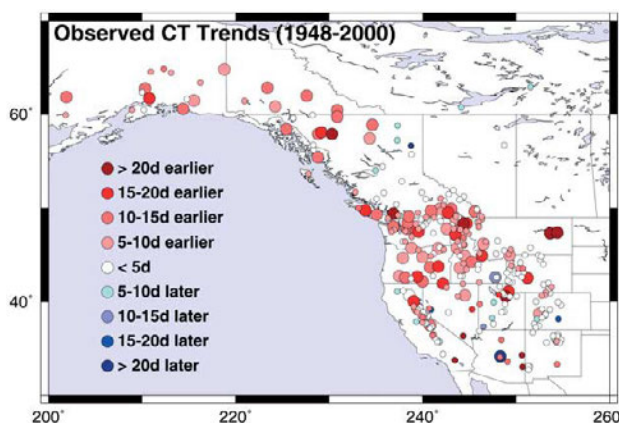


Figure 3-4. Changes in Pacific Northwest snowpack and streamflow runoff timing . (Left) Relative trend in April 1st snowpack (snow water equivalent) during 1950–2000 (CIG 2012c). (Right) Observed changes in timing of snowmelt runoff (center of mass flow) during 1948–2000 (Stewart et al. [2005:Figure 2]).

Air temperatures tended to increase at the Black River Unit during 1895–2011 (Figure 3-5). Based on best-fitting linear regressions, overall maximum, mean, and minimum temperatures have increased 0.70, 1.28, and 1.97 °F, respectively, during that 110-year period; the strongest trend was for minimum temperatures. However, the regressions accounted for only 2–26 percent of the variation in temperatures, suggesting that other dynamical factors affect our ability to detect any long-term trends in air temperature at the Black River Unit. During the most recent 30-year period (1981–2011) there were minor, increasing trends for mean and minimum temperatures, and a minor, decreasing trend for maximum temperatures (Figure 3-5), although these linear trends again accounted for <25 percent of the annual temperature variations.

Annual precipitation at the Black River Unit tended to increase during 1895–2011 (Figure 3-6), although the regression analysis suggested that total annual precipitation increased only 0.93 in/yr (1.8 percent) during that 110-yr period. But as with air temperatures, the linear regression model fit the annual data poorly ($R^2 = 0.00$). The 1981–2011 precipitation trend suggested a minor decrease in annual precipitation, but the regression fit was poor ($R^2 = 0.01$) (Figure 3-6).

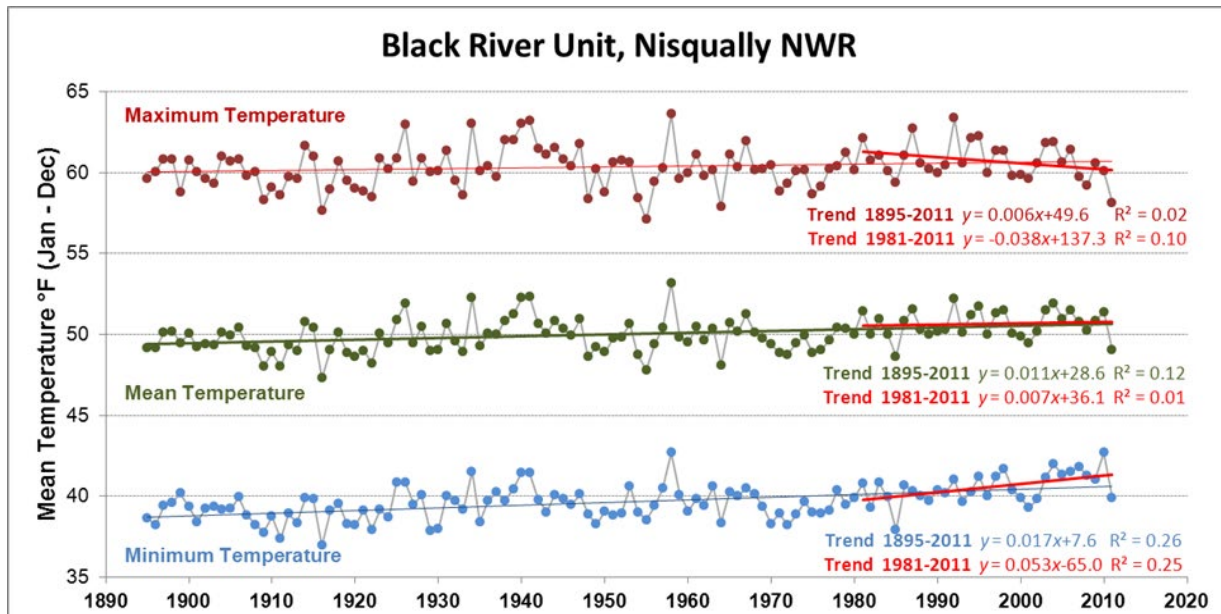


Figure 3-5. Annual mean, minimum, and maximum air temperatures for the Black River Unit, Billy Frank Jr. Nisqually NWR, during 1895–2011 and 1981–2011 (red regression lines and text). Annual temperatures are the means of the 12 monthly values (January through December). Source of monthly data: PRISM Climate Group (2012).

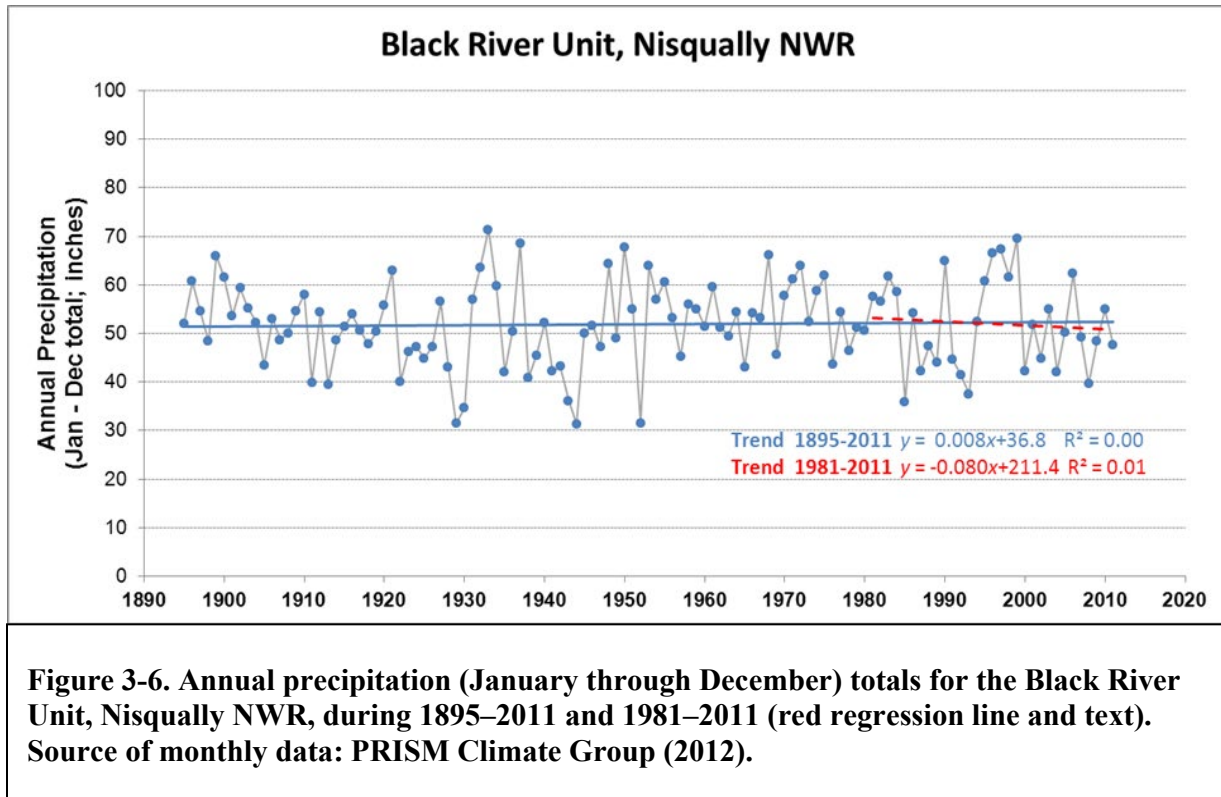


Figure 3-6. Annual precipitation (January through December) totals for the Black River Unit, Nisqually NWR, during 1895–2011 and 1981–2011 (red regression line and text). Source of monthly data: PRISM Climate Group (2012).

Future Climate Projections

Average global surface air temperature is projected to increase 3.2–7.2 °F by 2100 (~0.36 °F/decade), depending on the emissions scenario used (IPCC 2000), i.e., depending on the ultimate concentrations of GHG emissions released into the atmosphere. Interim projections for the six IPCC “marker scenarios” (B1, A1T, B2, A1B, A2, and A1FI) suggest temperature increases of 1.1–1.2 °F by 2030, 2.3–3.1 °F by 2065, and 3.2–5.6 °F by 2100 (IPCC 2007c, and see CIG 2012c:Table 2).

Precipitation projections are less certain, with overall annual precipitation generally expected to remain within the range of natural variability (Solomon et al. 2007); exceptions are for increased precipitation at high latitudes and decreased precipitation in the subtropics. Projected precipitation changes over the next century are small compared to the interannual and decadal variability observed during the 20th century (Meehl et al. 2007).

Regional temperature projections are similar to the global projections. Based on a statistical downscaling of 20 global climate models, Mote and Salathé (2010) projected an overall 0.5 °F/decade rate of temperature increase through the 2080s. This corresponds to increases of ~2 °F by the 2020s, ~3.2 °F by the 2040s, and ~5.3 °F by the 2080s. All of these increases are greater than the historical 1.5 °F overall increase observed for the Pacific Northwest during the entire 20th century.

Regional precipitation projections suggest only small increases in annual precipitation (~4 percent by the 2080s; Mote and Salathé 2010), although there are large differences among the various model projections. As with the global projections, there is a wide range of natural variability in Pacific Northwest precipitation amounts and timing, making the relatively small climate-change-related changes difficult to distinguish except over long time scales. However, a majority of regional climate

models project decreased summer (July–August) precipitation of 6–13 percent, and increased winter (December–February) precipitation of 2–8 percent (Mote and Salathé 2010, Salathé et al. 2010).

Regional snowpack is projected to decrease at accelerated rates compared to those during the 20th century, with shifts to earlier spring snowmelt occurring for snow-dominated and transient basins. Elsner et al. (2010) projected 29 percent, 44 percent, and 65 percent declines in Washington State April 1 snow-water-equivalent by the 2020s, 2040s, and 2080s, respectively (A1B SRES scenario). However, for the rain-dominated basins of coastal Washington, changes in the timing of spring runoff likely will be minimal, although the risk for lower low-flows and greater stream temperatures will increase (Mantua et al. 2010).

For the Black River area, climate and hydrologic projections were generated for 8-digit HUC4 basins by the Climate Impacts Group’s Columbia Basin Climate Change Scenarios Project (Hamlet et al. 2010) and Regional Climate and Hydrologic Change efforts (Littell et al. 2011). We downloaded data via Climate Impacts Group (2012b).

Figure 3-7 presents seasonal summaries of average monthly temperature and total precipitation for the Upper Chehalis River basin (HUC4 17100103), which includes the Black River watershed. Average projections from 10 climate models for time periods ending in the 2020s, 2040s, and 2080s are compared with the empirically based 1915–2006 estimates. Local projections are similar in magnitude to the regional projections. Average temperatures are projected to increase in all seasons; precipitation projections indicate increases during fall and winter and decreases during summer.

Projections for streamflow and runoff across the Upper Chehalis River basin (Figure 3-8) closely match those for precipitation, with increasing winter flows and decreasing summer flows through the 2080s.

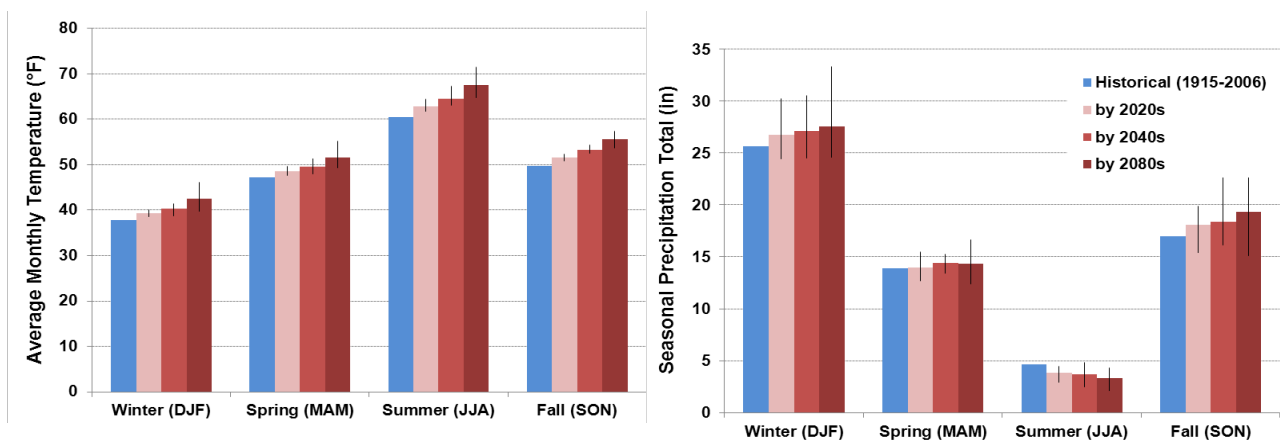


Figure 3-7. Seasonal temperatures (A) and precipitation (B) for the Upper Chehalis River HUC4 basin. Projections were for the A1B SRES Scenario. Bars and error bars represent the average and range of 10 climate models (CIG 2012b).

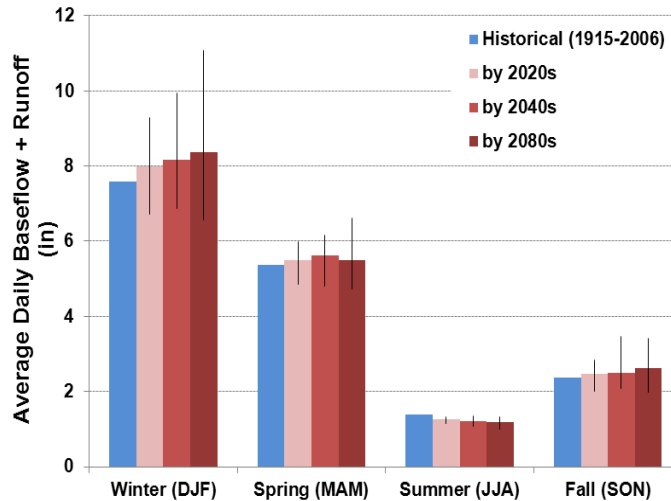


Figure 3-8. Combined average daily flows (baseflow + runoff) for the Upper Chehalis River HUC4 basin. Projections were for the A1B SRES scenario. Bars and error bars represent the average and range of 10 climate models. Runoff represents mean flow across the watershed (not routed through stream channels; Elsner and Hamlet 2010) (CIG 2012b).

3.3 Hydrology

The Black River, a tributary of the Chehalis River, flows southwesterly through the western and southwestern portion of Thurston County. Originating in wetlands at the south end of Black Lake (river mile 25), the Black River begins as an extremely low-gradient river system. The slow descent for most of the river length allows an accumulation of mud, sand, and decomposing organic material that provides for abundant aquatic and semi-aquatic plant and animal life. Beaver dams throughout the northern portion of the river help to create and maintain shallow water swamps and wetlands on the Unit. The Black River features some of the largest natural freshwater wetlands in western Washington (Pickett 1994a, Foster Wheeler 2003, Caldwell et al. 2004, Napier et al. 2008, Easterly and Salstrom 2008, CRC 1992).

Within the Unit acquisition boundary, the river channel varies from 15 feet to 120 feet in width and runs approximately 7 miles in length. Dempsey Creek, Salmon Creek, and Blooms Ditch drain into the river within the current Unit boundary with Waddell Creek bordering the former Weiks Dairy Unit and entering the river just south of the Unit boundary. There are numerous named and unnamed creeks and streams within the Unit acquisition boundary totaling approximately 23 miles (see Map 3). The acquisition boundary ends north of the town of Littlerock at approximately river mile 17.

There are two major topographic regions which affect the hydrology of the Black River Unit: the western uplands and the eastern lowlands. The Black Hills, a low, mountainous region that includes the Capitol State Forest, forms most of the western watershed. The two largest tributaries of the western watershed are Waddell Creek (10.4 miles long) and Mima Creek (7.15 miles long). There are also smaller tributaries, including Mill, Stony, Baker, Noski, Darlin, and Dempsey creeks, and several smaller unnamed creeks. The eastern lowland region includes forested rolling hills and

grasslands. The eastern region of the Black River drainage also includes several lakes and numerous wetlands. Salmon, Blooms Ditch, Beaver, and Allen's Creeks drain from the east into the northern and middle aspects of the River.

The Black River was historically the primary outlet draining Black Lake, but the hydrology of the system has been radically altered through the years. Anecdotal information indicates the river channel may have been dredged or straightened in some areas in the 1800s. Additional changes to the river system began in the early 1900s when water was diverted from the lake to improve drainage north of Black Lake, including digging the Black Lake Ditch in 1922. The ditch continues to divert a large amount of water flow northward to Puget Sound through Percival Creek, instead of south into the Black River. A pipeline was installed in 1965 across the northern portion of the Black River, which appears to have created a low berm across the wetlands. Hydrological studies indicate some impacts on the direction of water flow, although drainage through the Black Lake Ditch is the greatest factor influencing the direction of flow (Foster Wheeler 2003). Many changes throughout the years have affected the natural hydrologic regime of the river system including the issuance of water rights and water withdrawals.

Flooding and Surface Water

The Black River valley is known for its wide, flat lands that rapidly flood with winter and spring season rains. Most flooding along the main stem of the river is inundation flooding with low velocity floodwater because the wetland complex buffers the flow. The main streams draining east of the river are Salmon, Blooms Ditch, Allen, and Beaver Creeks. These are slow-flowing systems that tend to cause inundation flooding with little to no velocity. The east side of the drainage is susceptible to high groundwater flooding when periods of extended rain exist (Thurston County 2012). Within the Unit boundary only Salmon Creek and Blooms Ditch drain into the river from the eastern side. From the west side of the drainage, Dempsey Creek flows into the river, is flashy, rising quickly and spreading out, and then draining rapidly.

The two roads that cross the Black River and associated wetlands within the approved boundary of the Unit act as dikes and increase water levels in wetlands directly upstream. The road dike and bridge situation prevents the channel from naturally changing course at these locations and alters flow through the restricted channel opening. The roadway approaching the 110th Avenue Bridge over the Black River is usually one of the first local roads to close and last to reopen due to surface flooding associated with typical winter rains. The 123rd Avenue roadway itself is sometimes flooded west of the bridge during these periods. All habitats on either side of the river are replenished with sediment and nutrients during periods of surface flooding.

3.4 Topography

The Unit is located within the Puget Sound Trough Ecoregion with the Coastal Range Mountains to the west and the Cascade Range to the east. The Coastal Range Mountains border the western portion of Thurston County, with rolling hills and valleys lying towards the east and south. Foothills of the Cascade Mountain Range and Mount Rainier begin to rise in the southeastern portion of the County. Surrounding elevations in the immediate Black River area range from sea level at Olympia to 2,657 feet in the Black Hills west of the Unit. The Black River valley floor is approximately 200 feet above sea level.

3.5 Geology

The Black River is located within and below the maximum southern extent of Pleistocene continental glaciations west of the Cascade Mountains. The north end of the Black River drainage, including Black Lake and the upper reaches of the river, were under ice during the last glacial maxima. During early glacial retreat, meltwater was blocked by ice from flowing northward, and glacial meltwater from much of the entire lobe was channeled southward through a shifting series of outwash channels, including the Black River channel, to the Chehalis drainage, and then out to the Pacific Ocean. Routes of the outwash channels were controlled by the slowly retreating glaciers, the underlying outcrops of Eocene sandstone and basalt in the area, and the overlying topography of moraines and glacial till. Fine-textured sediment deposited during this process blanketed portions of the landscape. Sand was also deposited by overbank deposition during flood surges caused by hydraulic damming associated with the sandstone and basalt bedrock in the channel-ways (Easterly and Salstrom 2008).

The combination of huge volumes of meltwater and blockages by earth and ice caused the water to pond and form a series of temporary lakes, including Lake Russell (Bretz 1913, cited by Easterly and Salstrom 2008), which extended over the southern inlets of what became Puget Sound. Lake Russell had a spillway over a low divide from Budd Inlet to the head of the valley of the Black River. The volume of water that was carried south over the spillway was considerable and became a large erosional force all the way to the mouth of the Chehalis River (WCC 1933). Within flood channels, the flow of meltwater sorted outwash sediments, leaving gravel. The outwash events created, eroded, and reshaped terraces in the massive amount of sediment in the outwash channels. The resulting Black River occupies a channel that is oversized and has a very low gradient (average of 9 inches/mile). Associated with this channel are a series of terraces that are likewise low-gradient, some including perched wetlands on outwash terraces above the Black River channel. Overbank deposition of sand from the outwash events is primarily perched on or above remnant terraces on the edges of the immediate area, as at Olympia Airport and south of Maytown (west of Tilly Road). Mima mounds on both sides of the river appear to be related to/associated with some “middle” terraces of the outwash channels. The oversized drainage basin creates a broad wetland zone along much of the river, especially in the upper reaches. The low-gradient side-slopes produce an overall relatively stable landform, and landslides are rare along the main stem of the river (Smith and Wenger 2001, Easterly and Salstrom 2008).

3.6 Soils

Soils in the Black River drainage range from slightly to strongly acidic at the surface, but become more neutral with depth. Glacial deposits range from porous sands and gravel to till which consists of clay and silt mixed with coarser materials. These deposits are composed chiefly of granite and quartzite. Some soil types were derived from bedrock, valley deposits, lake sediments, and alluvial deposits, while others are highly or purely organic. In the lowlands of this drainage, organic soils are common. They consist of decaying wetland vegetation in various stages of decomposition.

The soil types are diverse and interspersed in an irregular pattern. Using NRCS web soil surveys, over 31 different soil units were identified within the approved acquisition boundary, including 20 hydric and 11 nonhydric units. The floodplain soils are nearly level, very deep, and well drained. They formed in alluvium derived from mixed sources. (USDA 2012, USDA 1990).

Riggs (1958) conducted a detailed soil profile study for peat between the upper reaches of the river to 123rd Avenue. Generally, the quantity of peat decreases from 35 feet deep in the north to 10 feet deep in the south, the river flows over the deepest part of the peat deposit, and fibrous and woody peat form the major part of the deposit. Approximately 1,465 acres of various kinds of peat, including 15 acres of sphagnum, were reported. Sphagnum peat was described as raw and wet, implying little decomposition, and its presence correlates to the presence of bog vegetation. Diatomite shows past diatoms and phosphate presence (Riggs 1958). The soil types, maturity, and depth directly correlate to plant communities found within the Unit boundaries.

3.7 Air Quality

Air quality refers to the cleanliness of the atmosphere. Clean air is vital to human health and is a resource protected by Federal, State, and local regulations because it is a natural resource without boundaries. Pollutants in the air can negatively affect plants, animals, and humans. Air quality is affected by climate, topography, and meteorological conditions.

The Environmental Protection Agency (EPA) has the lead responsibility for air quality in the United States; through the 1990 Clean Air Act, the agency sets limits on the amount of pollutants that can be discharged into the air. According to the EPA, more than 170 million tons of pollution are emitted annually into the air within the United States. The Washington Department of Ecology (WDOE) is responsible for protecting the air quality within the State.

Air quality at the Unit is susceptible to gravel mining dust, woodstoves, vehicle exhaust, tractors, motorboats (e.g., gasoline-powered engines/equipment), and outdoor burning. Habitat and public use improvement projects, including monitoring activities, may include the use of heavy equipment and the operation of trucks, tractors, or motorboats to access portions of the Unit for management purposes.

3.8 Water Quality and Quantity

Water quality and pollution is a problem in the Black River and its tributaries (Yake and Bernhardt 1989, Pickett 1991). Nonpoint source pollution is a problem in the Black River basin. Stormwater runoff at commercial, light industrial areas, and construction sites can produce potential pollutants, especially in the rapidly growing upper basin. Streets, roads, and highways, including Interstate 5, could discharge pollutants in stormwater or potentially spill into Black River tributaries. Water pollution from adjacent residential septic systems, recreational uses, and agricultural runoff continues to be a problem to be resolved by Federal, State, and local governments. Regional growth in the Black River basin will likely put pressure on the groundwater resource, from both withdrawals and pollutant inputs (Pickett 1994a). The current trend towards increasing numbers of residential developments being serviced by individual septic systems overtaxes the area's capability to naturally treat residential wastes, resulting in ground- and surface-water pollution.

Prior to 1989 the Black River had not been studied extensively. The Black River system was poorly understood but appeared to be sensitive to environmental impacts and under pressure from several different land uses and projected regional population growth. In 1989, a large fish-kill in the mid- to lower portions of the river indicated poor quality water in the river, which stimulated more in-depth studies. Most studies took place in the 1990s and focused on the middle and lower sections of the

river, but some of these established a few sampling points in the northern reaches of the river which are relevant to Unit management.

In 1994, two studies of the Black River were undertaken: one on dissolved oxygen and phosphorus, and one on fecal contamination and nonpoint source pollution. The areas of the river that were sampled (near 110th Avenue, 123rd Avenue, and River Road bridges (upper river)) (Pickett 1994a, 1994b) generally had acceptable temperatures, especially in winter, but late summer temperatures were above the standard of 64 °F (18 °C). The upper river pH levels were generally acceptable, but organic sediments reduce pH near the bottom of the river, while photosynthesis in the submersed vegetation increases pH levels near the water surface. Pickett (1994a, 1994b) suggests the low pH levels near the riverbed appear to be a natural condition and not a violation of water quality standards.

Dissolved oxygen (DO) levels in Waddell Creek, measured during a significant flow period, were acceptable. However, none of the DO levels in the upper river were high enough to meet the standard of 8.0 mg/L and all samples were below standard saturation levels. Pickett cites Lee et al. (1975), who noted that high organic-matter content in the discharge from marshlands produces low DO levels and high color and that the DO level may be the result of natural processes. Two years of fecal coliform tests showed no presence at 110th Avenue, but at the River Road site immediately north of Littlerock, testing showed higher concentrations. The likely sources of contamination between 110th Avenue and River Road were thought to be storm water, onsite septic systems, agriculture, and wildlife (Pickett 1994a, 1994b). Since that study was completed, a large dairy farm between 110th Avenue and River Road is no longer operational, reducing the potential for fecal contamination.

Between September 2007 and June 2009, a water quality study had 94 test sites on the Chehalis River and its tributaries. Standard water quality tests included pH, DO, fecal coliform, turbidity, and water temperature. The criteria used to evaluate water quality were based on Washington State standards (173-201A WAC). The rationale for these standards is that water quality meeting the standards provides for the habitat needs of fish and other aquatic life, provides a safe environment for people engaged in water recreation, and provides for the production of healthy and safe seafood (Green et al. 2009).

Two sampling sites from this study are relevant to the Unit: one on the Black River at Black Lake and another at 110th Avenue. All the data collected from the two stations fell within the standard range for pH. The standard for DO is $\geq 8\text{mg/L}$ and the north-most site showed excellent DO quality with only 1 sample below the standard, but the 110th Avenue site had 16 of the 29 samples (61 percent) below the standard. Again, an explanation for the sub-standard levels could be that the Black River is a relatively low-gradient river that flows through shrub swamp with mostly agricultural lands or forests in nearby uplands, and these lands and fertilizers may create high nutrient inputs into the river. However, this slow-moving river also accumulates organic debris, such as peat soils and rotting leaves that fall from vegetation along the banks.

The river has dense underwater vegetation and algae above the 110th Avenue sample site. The upper reaches of the river contain shrubs rather than taller trees, resulting in full sun exposure. Decomposing algae, aquatic vegetation, and organic debris in water bodies reduce DO in the water due to cellular respiration of the bacteria and fungi that act as decomposers. These natural processes may be contributing to lower DO in the Black River. No fecal coliform was detected in 28 samples in the Black River at the Black Lake site, in 27 samples at 110th Avenue, nor in 28 samples from the Littlerock boat launch site located south of Littlerock. This shows significant improvement from the

1994 study. One sample of 28 and one sample of 27 showed turbidity over the 7 nephelometric turbidity unit standards at the north-most sample site and from the 110th Avenue location, respectively (Green et al. 2009).

Another factor affecting water quality is the growth of macrophytes and periphyton in the Black River. Pickett noted from Hill (1986) that sediments provide much of the nutrient supply for macrophytes, macrophytes transfer large amounts of nutrients back to the sediments, and that macrophytes could release sediment-derived nutrients into the water column. Furthermore, as macrophytes utilize particulate matter and dissolved nutrients from the water column, nutrients are cycled between the living tissue and the sediment, creating a self-sustaining system. Pickett noted that if an effort was made to reduce nutrient levels and phytoplankton in the water column, the plants would have a sediment nutrient source and macrophyte reduction would occur very slowly, if at all, and the cycle would continue (Pickett 1994a, Green et al. 2009).

In the northern portion of the river, dense growth of submerged plants is currently thought to be primarily native species, although surveys need to be conducted to verify this. Currently submerged plant colonies grow very thick, providing cover and food sources for amphibians and fish. Nonnative reed canarygrass grows densely along the banks and then roots into submersed plants in the mainstem of the river. This dense plant growth can limit light penetration, causing less oxygen to be generated within the water column. Later, decomposition of the decaying vegetation further depletes oxygen levels to the point of excluding fish, mammals, and invertebrates from those areas with the densest growth. The river's anaerobic bacteria can live in low- to no-oxygen water and produce sulfuric waste products, causing the lake and sediments to release gas and odors (SBLC 2012). Algal mats develop on the river during warm summer temperatures and also when water flow is greatly reduced. Algal growth may be enhanced by artificial nutrient sources, inputs from fertilizers, and leaky septic systems. The algal mats grow on the submersed plants, cover them, and form a thick surface scum layer. This quantity of algae may have detrimental effects on water quality. Although river water quality testing took place in the 1990s, recent information on water quality in the upper reaches of the Black River has not been collected.

Napier et al. (2008) notes concerns in the Black River Management Unit (watershed) that poor water quantity exists naturally due to the river's general character; however, the situation may be exacerbated by loss of water flow resulting from the pipeline crossing along with increasing water withdrawals. General actions to help increase water quantity include reducing water withdrawals from surface sources, determining if water withdrawals are followed according to current water rights, and conducting a study on unregulated/regulated withdrawals. Increasing sediment load in the river mainstem also contributes to poor water quality. Suggestions to reduce sediment loading in the river include reducing road densities (abandon/decommissioned) in upland forests and further identifying sources that are contributing to sediment loading (Napier et al. 2008).

In 2010 and 2012, Black Lake, the headwaters for the river, was temporarily closed to swimming and water sports due to a blue-green algal bloom. Black Lake is infested with nonnative plant species including Eurasian watermilfoil and yellow flag iris. Save Black Lake Coalition is a nonprofit organization formed in 2010 in response to the lake closure. The goal of the coalition is to educate landowners about lake water quality and improve water quality by reducing invasive plants and reducing or eliminating algal blooms.

3.9 Surrounding Land Use

Land use in the Black River basin includes undeveloped wetlands, agriculture, and a mixture of residential and commercial development. The uplands are generally commercial timberlands and expanding low- to high-density residential developments. Land use activity in the Black River basin has been transitioning from agriculture to rural residential. A number of dairies in the past have been located in the basin, but most have closed down. Poultry operations, a silviculture nursery, and turf and berry farms have operated in the basin (Pickett 1994a). Timber harvest and management activities currently occur throughout the basin, especially in the Black Hills by WDNR on Capitol Forest lands.

Lands within the Refuge acquisition boundary include approximately 2,293 acres of privately owned tracts, many utilized as residential properties. Two large tracts within the boundary are managed for commercial timber purposes.

Residential housing developments and farms lie outside the Refuge acquisition boundary. A local gravel mining operation lies directly on the northeast side of the Refuge boundary, located both inside and outside of the approved boundary. Interstate 5 is within 5 miles of the boundary and provides access to neighboring cities and communities. Within Thurston County there are a number of recreation areas, parks, and open spaces that benefit wildlife and are open to public access. Some examples are Chehalis Western Trail, Woodard Bay Natural Resources Conservation Area, Capitol State Forest, Mima Mounds Natural Area Preserve, and Glacial Heritage Preserve (see Chapter 5). Thurston County owns the railroad right of way east of the Refuge and is planning the Gate Belmore Trail on the old railroad bed. The State offers approximately 25 areas opened to fishing within the county. The State also offers hunting opportunities throughout the county, which include big game, upland game birds, and waterfowl.

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Chapter 4

Biological Environment

Chapter 1
Introduction
and
Background

Chapter 2
Management
Direction

Chapter 3
Physical
Environment

Chapter 4
Biological
Environment

Chapter 5
Human
Environment

Appendices
A-M



*Cedar waxwing/
J. Whitehead*

Chapter 4. Biological Environment

This chapter addresses the biological resources and habitats found on the Unit. However, it is not an exhaustive review of all species and habitats. The chapter begins with a discussion of biological integrity (historic conditions and ecosystem function), as required under the Refuge Administration Act. The bulk of the chapter focuses on the presentation of pertinent background information for habitats used by each of the priority Resources of Concern (ROCs) and other benefitting species identified in the CCP (see Table 4-1).

ROCs are plant and animal species and their habitats that have been identified by the refuge that manages the Unit through its refuge purpose or other conservation plan to receive special or enhanced management attention; these become the conservation targets for the CCP's goals, objectives, and strategies. A priority ROC requires an even higher level of attention and management. Focal resources are species or species groups sharing the same or similar conservation needs as the priority ROC and selected by a refuge as representatives for the overall condition of the priority ROC. Species of concern (SOCs) are plant and animal species that are declining or appear to be in need of conservation. Their status is determined by the Service's fish and wildlife office in a particular state, but the category is informal and confers no legal status under the ESA.

The background information includes descriptions, conditions, and trends of habitats and identifies threats (stresses and sources of stress) to the habitats or associated ROCs. This information was used to develop goals and objectives for the CCP.

4.1 Biological Integrity, Diversity, and Environmental Health

The National Wildlife Refuge System Improvement Act of 1997 directs the Service to ensure that the biological integrity, diversity, and environmental health of the Refuge System are maintained for the benefit of present and future generations of Americans. To meet this mandate, the Service developed a Biological Integrity, Diversity, and Environmental Health (BIDEH) Policy to provide implementation guidance (see policy 601 FW 3).

Elements of BIDEH are represented by native fish, wildlife, plants, and their habitats as well as those ecological processes that support them. The Refuge System policy on BIDEH provides guidance for consideration and protection of the broad spectrum of fish, wildlife, and habitat resources that represent BIDEH on refuges and in associated ecosystems. This policy provides refuges with a process for evaluating the best management direction to prevent the additional degradation of environmental conditions and to restore lost or severely degraded environmental components. It also provides guidelines for dealing with external threats to the BIDEH of a refuge and its ecosystems. The Unit developed BIDEH tables to examine the habitats supporting key fish and wildlife species (see Appendix E for the BIDEH tables).

4.1.1 Historical Land Use and Conditions

The Black River is a 25-mile long tributary of the Chehalis River, which drains a 144-square-mile basin. It flows from Black Lake at an elevation of 144 feet to the confluence with the Chehalis River at an elevation of 125 feet (Smith and Wegner 2001). The river has a very low gradient (averaging 9 inches/mile) within an oversized channel (Easterly and Salstrom 2008).

The Unit manages over 1,300 acres within the 3,900-acre approved boundary encompassing the upper third of the river, extending from the southern edge of Black Lake to approximately river mile 17.5 just south of 123rd Avenue. Habitats include approximately 7.5 miles of river channel, 6 to 16 miles of tributary channels; bog; shrub swamp; riparian forest; emergent marsh; seasonally flooded, nonnative grasslands; dry, nonnative grasslands; and mixed forest (see Map 2). The surrounding landscape is primarily rural and includes large areas of commercial forest and agriculture, areas of low- to high-density development, and some small industrial development.

The lands within the approved Unit boundary appear relatively less impacted by human activities compared to other low-elevation river systems in the Puget Trough region. However, human activities since European settlement have substantially affected many of the habitats within and adjacent to the current boundary.

Some historically forested habitats were modified for agricultural purposes. For example, within the current Unit boundary, some uplands historically dominated by Douglas-fir and western hemlock forest were modified for agricultural purposes and converted to pastures, hayfields, and crop fields. Several of these areas were former dairy farms at the time of Unit acquisition (Easterly and Salstrom 2008).

The Black River originates from Black Lake, but its historic regime has been altered. In 1922, an approximately 3.4-mile ditch was constructed to connect the north end of Black Lake to what is now Capital Lake, at the southern end of Puget Sound. This additional drainage, which has continued to deepen through subsequent excavations, has lowered the lake level by 2 feet and altered the flow such that the lake seldom drains south into Black River. This loss of water has reduced the flow in the river, especially from October through March, which in turn increases water temperature, decreases DO levels, and concentrates toxins (Smith and Wenger 2001).

In the 1960s a gas pipeline was excavated across the Black River and its riparian zone about 1.5 miles downstream from the lake. Excavated spoils were sidecast. The line of spoils has supported altered vegetation, which in turn encouraged beaver dam building activity and debris accumulation. The berm may have created a blockage for fish access upstream from this point, as well as contributed to the reversal of flow in the wetlands of the upper Black River (Smith and Wenger 2001). Documentation of river dredging was not found, but anecdotal information described deepening of the river both above and below Littlerock to allow ferrying of people and products in the early 1900s (Westby, L. 2011, pers. comm.). Currently the river appears to be over 10 feet deep in areas with very steep, undercut sides that are unstable.

Two public roads cross the northern third of the Black River and associated wetlands within the approved boundary: 110th Avenue SW and 123rd Avenue SW. In both cases, the roads constrict the river's flow. This alters both water flow and connectivity within the wetlands. The roads may influence water quality by increasing sediment and pollutant delivery and can be points of introduction for nonnative species. The physical changes imposed on various parts of the river can be observed, but the effects on the biological integrity and environmental health may not be easily observed or understood without further research and monitoring.

Surface and groundwater availability have also been altered in the Black River system. Various parts of the floodplain have been ditched, drained, cleared, and/or filled in the past primarily in connection with agricultural use. Blooms Ditch drains into the river on the Unit from the east. The implications of such ditches to the habitat are that they reduce surface flooding during the rainy season and

effectively reduce seepage into the aquifer. Overall, they may alter the quantity and timing of surface flow into the river, its tributaries, and riparian systems.

Some forestry practices to the west and some agriculture practices to the east of the river may have increased sediment and nutrient loads. These activities have impacted native habitats and may have introduced populations of invasive, nonnative species.

Land use near the Unit has been changing, with increased residential and commercial development. These changes likely will result in greater amounts of well drilling and groundwater removal from the system.

4.2 Selection of Priority Resources of Concern

In preparing this plan, the planning team reviewed other local, regional, and national plans that pertain to wildlife and habitats within the Chehalis River Basin and southwest Washington. The team also sought input from Washington State conservation agencies, NGOs, and the public (see Appendix J). As a result of this information-gathering and review process, certain species and habitats were identified and listed in Biological Resources of Concern and BIDEH tables (see Appendix E). Wildlife and habitat goals and objectives in Chapter 2 were designed directly around the habitat requirements of species designated as priority ROCs (see Table 4-1).

ROCs are described as conservation targets in conservation planning methodologies used by other agencies and NGOs. In developing objectives, the team followed the process outlined in the Service's *Identifying Refuge Resources of Concern and Management Priorities: A Handbook* (USFWS 2010). As defined in the Service's Policy on Habitat Management Plans (620 FW 1), ROCs are:

“all plant and/or animal species, species groups, or communities specifically identified in refuge purpose(s), System mission, or international, national, regional, state, or ecosystem conservation plans or acts. For example, waterfowl and shorebirds are a resource of concern on a refuge whose purpose is to protect ‘migrating waterfowl and shorebirds.’ Federal or State threatened and endangered species on that same refuge are also a resource of concern under terms of the respective endangered species acts” (620 FW 1.4G).

“Habitats or plant communities are resources of concern when they are specifically identified in refuge purposes, when they support species or species groups identified in refuge purposes, when they support NWRS resources of concern, and/or when they are important in the maintenance or restoration of biological integrity, diversity, and environmental health” (620 FW 1).

Therefore, ROCs for a refuge may be a species or species group, or the habitat or plant community that supports a priority species or species group.

In further refining the extensive ROC tables and using the BIDEH table to create the priority ROCs with focal resources (see Table 4-1), the planning team analyzed the ecological attributes of the habitats to meet the life history requirements of ROCs. Those attributes are therefore critical to sustaining the long-term viability of the priority ROCs and other benefitting species. These provide measurable indicators that strongly correlate with the ability of a habitat to support a given species. Tables listing the habitat types found on the Unit incorporate “desired” conditions based on scientific

literature review and team members' professional judgment. These desired conditions for specific ecological attributes were then used to help develop habitat objectives, as presented in Chapter 2. However, other factors, such as feasibility and the Unit's ability to reasonably influence or measure certain indicators, played a role in determining the ultimate parameters chosen for each habitat objective. Thus, ecological attributes should be viewed as a step in the planning process. The ultimate design of habitat objectives was subject to further discussion and consideration.

Additionally, the planning team refined the species or species groups included in the ROC tables by selecting not only species mentioned in establishing documents for the Unit, but also species that captured the ecological attributes of habitats required by larger suites of species (see "Other Benefitting Species," Tables 4-1 and in Appendix E). Priority ROCs may be species, species groups, or features that the Unit will actively manage to conserve and restore during the life of the CCP. Negative features of the landscape, such as invasive plants, may demand a large part of the Unit's management efforts, but are not designated as ROCs.

Limiting factors were considered in developing objectives. A limiting factor is a threat to, or an impairment or degradation of, the natural processes responsible for creating and maintaining plant and animal communities. In developing objectives and strategies, the team gave priority to mitigating or abating limiting factors that presented high risk to ROCs. In many cases, limiting factors occur on a regional or landscape scale and are beyond the control of individual refuges. Therefore, objectives and strategies may seek to mimic, rather than restore, natural processes. In some cases the structure of plant communities utilized by ROCs can be created, rather than restoring the original native species composition. For example, management of nonnative vegetation by mowing and/or grazing may be necessary to maintain a desirable vegetation structure, when restoring native grassland communities may be impractical. Through the consideration of BIDEH, the Unit will provide for or maintain all appropriate native habitats and species. Unit management priorities may change over time, and because the CCP is designed to be a living, flexible document, changes will be made if needed.

The main criteria for selecting priority ROCs included the following requirements:

- The resource must be reflective of the Unit's establishing purposes and the Refuge System mission;
- The resource must include the main natural habitat types found at the Unit;
- The resource must be recommended as a conservation priority in the Refuge Wildlife and Habitat Management Review;
- The resource is federally or State-listed as threatened or endangered, is a candidate for listing, or is a species of concern.

Other criteria considered in the selection of the ROCs included the following:

- Species groups and/or Unit features of special management concern;
- Species contributing to the BIDEH of the ecosystem;
- Species where it is feasible to estimate population size (needed for future monitoring and adaptive management).

Table 4-1. Priority Resources of Concern with Focal Species and Other Benefitting Species—Black River Unit

Priority Resource of Concern	Focal Resources	Other Benefitting Species
River Channel and Tributary Channels with mud bottom (7.5 miles of river and 3 to 13 miles of tributaries)	Olympic mudminnow	Oregon spotted frog, red-legged frog, rough-skinned newt, northwest and long-toed salamanders; pied-billed grebe; belted kingfisher, green heron; three-spined stickleback, prickly sculpin; benthic and aquatic invertebrates, including freshwater mussels; insects such as Pacific clubtail dragonfly; freshwater sponge species; bat species; mink, muskrat, otter, beaver; possibly water howellia
Tributary Channel with cobble bottom (<3 miles)	Coho salmon	Cutthroat and steelhead trout, Chinook salmon; benthic and aquatic invertebrates, including freshwater mussel species; insects
	Native crayfish	Bat species; great blue and green herons; mink, muskrat
Bog (56 acres)	Bog plants such as Labrador tea/sphagnum moss	Western bog laurel, bog cranberry, sundew, bog orchids, cotton grass, possibly water howellia
		Bog specialists including invertebrates such as Beller's ground beetle, Hatch's click beetle, Queen Charlotte's copper butterfly
Shrub Swamp (512 acres)	Willow/Pacific slope flycatcher	Downy woodpecker, marsh wren, flycatcher species, warblers such as McGillivray's-, Wilson's-, orange-crowned-, yellow-rumped, and common yellowthroat; song sparrow; belted kingfisher; pollinator insects
	Olympic mudminnow	Pacific chorus frog, rough-skinned newt, northwest and long-toed salamander
	Muskrat	Bat species; mink, otter, beaver, raccoon; benthic and aquatic invertebrates; possibly water howellia
Riparian Forest (265 acres)	Yellow warbler	McGillivray's-, Wilson's-, orange-crowned, black-throated gray, and yellow-rumped warblers; warbling vireo, American robin, spotted towhee, purple finch, song and fox sparrows, black-headed grosbeak, Bewick's and winter wrens, cedar waxwing, red-breasted sapsucker; wood duck, hooded merganser; sharp-shinned and Cooper's hawks; rufous

Priority Resource of Concern	Focal Resources	Other Benefitting Species
		hummingbird; belted kingfisher; pollinator insects
	Swainson's thrush/ Downy woodpecker	Bat species; mice, shrew, vole, mole, flying squirrel, mink, raccoon, long and short-tailed weasel, opossum; red fox, coyote, bobcat, black bear, cougar
	Pacific chorus frog	Rough-skinned newt, western red-backed salamander, northwest and long-toed salamanders; garter snake species; aquatic invertebrates; possibly water howellia
Emergent Marsh (34 acres)	Oregon spotted frog/Northwestern salamander	Benthic and aquatic invertebrates; pollinator insects; possibly water howellia; possibly Olympic mudminnow; bat species; mink, muskrat; Pacific chorus frog, red-legged frog, rough-skinned newt, northwest, and long-toed salamanders; garter snake, other snake species
	Marsh wren	American bittern, Virginia rail, sora, Wilson's snipe, great blue and green heron; pied-billed grebe; northern harrier; swallows, red-winged blackbird; dabbling waterfowl such as mallard, American wigeon, northern shoveler, northern pintail, American green-winged, blue-winged, cinnamon teal, coot, geese
Seasonally Flooded Nonnative Grasslands (82 acres)	Red-legged frog	Rough-skinned newt, northwest and long-toed salamanders; benthic and aquatic invertebrates; bats; mink, muskrat
	Mallard	Dabbling waterfowl such as American wigeon, northern shoveler, northern pintail, American green-winged, blue-winged, and cinnamon teal, coot, Canada and cackling geese; purple martin, tree- violet-green, and rough-winged swallow; northern harrier; red-winged blackbird; sora, Virginia rail, American bittern
	Killdeer Killdeer in moist, short-grass areas	Wilson's snipe, greater yellowlegs; migrating shorebirds; northern harrier; cackling and Canada geese; mice, shrew, vole, mole; bat species; garter snake species; freshwater and terrestrial invertebrates
Dry Nonnative	Savannah sparrow	Western meadowlark, lazuli bunting, western

Priority Resource of Concern	Focal Resources	Other Benefitting Species
Grassland (163 acres)		bluebird; killdeer; common nighthawk, red-tailed hawk, American kestrel; Canada and cackling goose; western screech owl, barn owl, possibly short-eared owl, possibly northern shrike
	American kestrel	Bat species; mice, vole, mole; weasel, spotted skunk; snake species, northern alligator lizard; pollinator insects; Roosevelt elk, black-tailed deer; coyote
Mixed Forest (394 acres)	<i>Early-mid successional forest without understory</i> Black-capped chickadee	Yellow-rumped and orange-crowned warbler, white-crowned and song sparrow, rufous-sided towhee, dark-eyed junco, Steller's jay, crow species; butterfly and moth species; garter snake species, northern alligator lizard; western red-backed salamander; mice, shrew, vole; bat species; weasel, opossum, raccoon, spotted skunk; coyote, bobcat, black bear, cougar; Roosevelt elk, black-tailed deer
	<i>Mid-mature successional forest with understory:</i> Chestnut-backed chickadee/ Pileated woodpecker/ Douglas squirrel/Varied thrush	Band-tailed pigeon; bald eagle, Cooper's and sharp-shinned hawk, western screech-, northern saw-whet-, and great horned owl; Vaux's swift, winter wren, Pacific-slope flycatcher, brown creeper, Townsend's warbler, hermit thrush, Steller's jay; snake species; Townsend's chipmunk, Douglas squirrel, flying squirrel; spotted skunk; bat species; weasels; mice, shrew, voles; opossum; coyote, bobcat, black bear, cougar; Roosevelt elk, black-tailed deer; Northern possibly spotted owl

(All habitat types are GIS acres)

4.3 Habitat Types

4.3.1 Channel Habitat

Overview

Within the Unit acquisition boundary, approximately 7.5 miles of free-flowing river channel habitat serves as a vital migration pathway and provides limited spawning grounds and rearing habitat for salmonids, resident fish, and amphibians. The river channel flows within the confines of the riverbanks and includes nearby edges of the sloped bank. The Black River channel is relatively narrow, ranging from 10 to 25 feet wide, with water depths ranging from 2 to 10 feet deep. Annual

high water events spread water out over the floodplain in winter and spring. Currently, the river channel is indiscernible starting at Black Lake and remains indistinguishable due to the shrub swamp habitat above the pipeline berm. South of the pipeline berm, the river flow is visible, but due to the dense stands of reed canarygrass, the channel can be difficult to identify. At approximately river mile 2 south of Dempsey Creek, the channel becomes easily visible.

Regional Distribution, Conditions, and Trends of Channel Habitat

Historically, water from Black Lake flowed down the Black River into the Chehalis River. However, today the start of the flow path is no longer evident. In 1922, the Black Lake ditch was dug to drain the wetlands north of Black Lake and stabilize water levels to allow shoreline development (Smith and Wenger 2001). The lake level is thought to have dropped almost 2 feet through ditch drainage and repeated dredging to maintain the ditch channel. In the 1960s a gas pipeline was dug by Williams Pipeline Company across the north end of the river approximately 1.5 miles south of Black Lake.

Conventional belief is that pipeline construction left spoils in the stream which, along with beaver dam debris accumulation, resulted in vegetation growth (Washington State Conservation Commission in Foster Wheeler 2003). An additional pipeline was placed in the same location using horizontal directional drilling techniques below the riverbed. In 2002, Foster Wheeler Environmental Corp. conducted a study to understand issues of water flow directionality in the Black River. Due to a complex set of issues including topographic effects of the lake, the Black Lake ditch drainage, the pipeline berm, and potential groundwater upwelling in between the lake and pipeline berm, the river flow has been significantly altered (See Chapter 3.3).

A tributary of the Chehalis River, originating in wetlands at the south end of Black Lake, the Black River begins as an extremely low-gradient river system. Its unique features include some of the largest natural freshwater wetlands in western Washington (Pickett 1994, Foster Wheeler 2003, Caldwell et al. 2004, Napier et al. 2008, Easterly and Salstrom 2008, CRC 1992). The slow descent for most of the river allows an accumulation of mud, sand, and decomposing organic material, providing for abundant aquatic and semi-aquatic plant and animal life. Beaver dams help to create and maintain shallow water swamps and wetlands.

Threats to the river and channel include a significantly altered hydrologic regime. A reduction in water flow related to the Black Lake ditch (Foster Wheeler 2003) has most likely reduced water velocity. Other threats include demand for more water from increasing residential and commercial development, including the adjacent gravel mine, and increasing threats of water pollution and contamination.

Anecdotal information indicates the river channel was dredged in some areas. It appears some channel areas within the boundaries were straightened or deepened. Some indications of dredging include removal of natural stream meandering by straightening steep, undercut, and unstable channel edges and in some areas a >10 foot deep channel with a thick silt or muck substrate. The deep U-shaped channel is not usually associated with a slow-moving river and is in contrast to the more natural river channel south of downtown Littlerock, where the channel is cobble-bottom and much shallower. The deep, channeled, tannin-stained, dark water limits light penetration, and in combination with unconsolidated Semiahoo muck, bottom-rooted plant growth in the river bottom can be limited in some areas. Also important to understanding the ecological conditions of the river channel is a comment by a Black River resident who recalled a time when the “Black River ran thick with silt because of logging in the Black Hills ... and that went on for years and years” (TESC 2001).

Historical impacts of high-nutrient water runoff from agriculture fields, silt runoff from logging, and perhaps dredging projects are likely still affecting river conditions.

Nonnative fish and bullfrogs pose significant threats to native amphibians, small native fish, and natural wetland function. They also compete against native animals for prey resources (see Chapter 4.6).

Nonnative and invasive plant species (see Chapter 4.6 and Appendix L) also contribute significant threats to the river channel system by choking water flow, reducing native plant growth, and reducing food resources for wildlife. Reed canarygrass has infested the channel and channel edges to the point of compromising river function. Reed canarygrass establishment has eliminated most exposed mud patches along the river, impeded sunlight penetration, and restricted animal access through the understory. Reed canarygrass also roots on emergent plants within the channel and can grow over the surface of the channel and into the bank. Small, native, understory wetland plants growing along the river and in shrub swamp edge are unable to compete against this thick, tall grass.

Submersed exotic aquatic plants such as hydrilla, elodea, and parrotfeather are expected to colonize the Unit channel habitats at some point, as these invasive plants can be found in the watershed. These submersed exotic and invasive plants choke water flow, impede sunlight penetration, change the natural conditions of the river and tributary channels, limit animal (e.g., amphibian and fish) movement, and out-compete native submersed plants.

Key Species Supported

Key species include the State-endangered and federally threatened Oregon spotted frog, which lives its entire life in the wetland habitats. Oregon spotted frogs depend on the permanent, slow-moving, and almost still channel water during summer months when water levels drop in nearby marshes.

Additionally, specific and unique characteristics of the channel are critical to the endemic Olympic mudminnow, which lives its complete life cycle in densely vegetated, relatively low-oxygenated, tannin-stained water and mud bottom. This fish has evolved to survive warm water conditions and survive in habitats where many native cold-water fish cannot.

Coho salmon, Chinook salmon, cutthroat trout, and perhaps steelhead utilize channel habitat as a migration pathway to upstream tributary spawning grounds. The river provides a rich rearing habitat for juvenile salmonids, resident small fish, and amphibians. Freshwater sponges and freshwater mussels are found in the channel, but species distribution in the river is not well understood.

A variety of birds and mammals utilize tributary channel habitat for water, food, and travel corridors. Birds such as wood ducks, hooded mergansers, pied-billed grebes, and kingfishers are commonly found throughout these aquatic habitats. Beavers are a key species because they directly alter stream hydrology in the river channel habitat. Their dam building activities create and maintain wetlands that provide extensive benefits to fish and virtually all wetland-associated species and organisms (Grannes 2008). Other aquatic-oriented mammals such as river otter, muskrat, and mink are abundant.

The low-elevation gradient and slow-moving river provide a rich environment for a thick growth of submersed, aquatic, native plant species such as pondweed, native western milfoil, and American waterweed; floating plants such as mosquito fern and duckweed; and emergent plants such as water

starwort, spatterdock, smartweeds, and water pennywort. These species are important to this habitat and provide shelter and food for a variety of aquatic and terrestrial animals. Woody debris near the surface of the channel supports plants such as small-flowered touch-me-nots and monkey flower. The vegetation and woody debris provide substrates for algae growth, an important food source to invertebrates and immature amphibians, as well as dense cover and foraging opportunities for amphibians, invertebrates, and fishes.

4.3.2 Tributary Channel Habitat

Overview

There are approximately 16 miles of tributary channel that provide habitat for a variety of aquatic and terrestrial plants and animals located within the Unit acquisition boundary. These waterways historically have been impacted by various habitat alterations since the time of Euro-American settlement in the area. Lands adjacent to the Unit were cleared of forests and managed for various purposes such as agriculture (farming activities, livestock grazing), forest products (lumber), and urbanization (roads, houses). All of these activities have resulted in increased impacts to tributary habitats, including water temperatures, erosion, chemicals, trash, reduced groundwater recharge, and water diversions for agricultural and industrial purposes, all of which affect the quality and quantity of water in the watershed and at the Unit.

Tributaries within the Unit acquisition boundary include Waddell, Dempsey, Stony, Darlin, Blooms Ditch, and several smaller, unnamed creeks, all of which vary considerably in size, length, depth, and character. Waddell Creek water runs clear, cool, has shallow areas with riffles, deep holes, a cobble bottom, woody debris, and in some summers it dries up or goes underground. Dempsey Creek has a soft peat bottom, steep sides, appears abnormally deep and channelized in former agricultural lands. Blooms Ditch is also deep and channelized but has a sandy substrate.

Regional Distribution, Conditions, and Trends of Tributary Channel Habitat

Prior to entering the Unit boundary, these creeks and streams meander through a variety of forest, agricultural, and residential areas presenting a variety of issues and conservation challenges for maintaining a healthy watershed.

An altered hydrologic regime outside the Unit boundary may have affected the health and individual tributary conditions. Perched culverts may prevent salmonid movement into appropriate spawning grounds. Within the Unit boundary, nonnative plant species such as reed canarygrass and yellow flag iris can dominate the channel edges, sides, and beds, impeding stream velocity, temperatures, and plant and animal diversity. Adjacent agricultural lands and development may provide sources for contaminants, including herbicides, fertilizer, fecal coliform from livestock and septic systems, and increases in sediments.

Nonnative plant and animal species (e.g., bullfrogs, nonnative warm-water fish, New Zealand mud snail, hydrilla, Eurasian watermilfoil, parrotfeather, fanwort) may also be problematic to the health of the tributaries. However, data are not yet available to determine which nonnative animals are living in the tributaries within the Unit.

Bridges over tributaries can be supported by wooden structures that are periodically treated with insect and animal retardant. Creosote contamination may impact aquatic invertebrates, Oregon

spotted frog, and salmonids. The Delphi Road Bridge over Dempsey Creek was recently treated with creosote (~2012).

Key Species Supported

Some tributaries such as Waddell Creek have cobble-channel habitat with cool, rapid-flowing water which provides different habitat than the river or muddy bottom tributaries. Invertebrates, freshwater mussels, juvenile salmon (coho), crayfish, and perhaps freshwater sponges can be found in the cobble tributaries—all of which may be different species than those found in the Black River.

Dempsey Creek likely provides habitat for a variety of plants and animals similar to those found in the Black River because the creek has similar characteristics. The creek appears to have been dredged to increase agricultural field drainage; the substrate is muck and most of it is not shaded by trees or shrubs. Oregon spotted frogs have been known to use this creek to move through various habitats.

A variety of birds and mammals utilize tributary channel habitats for water, food, and as a travel corridor. Many of the same plant species found in the river are also found in the creeks (see Section 4.3.1 Channel Habitat).

4.3.3 Bog

Overview

The Unit protects approximately 56 acres of bog habitat that extends from the northern edge of the Unit boundary at Black Lake to the confluence of Dempsey Creek (see Map 2). Other occurrences of bog habitat may be found within the Unit boundary (Easterly and Salstrom 2008).

A bog is a slightly domed, low-nutrient, low-pH system which grows on sphagnum peat and is dependent on low-nutrient rainfall for moisture. The organic, wetland soils retain rainwater and provide a natural water filtration system. Various bog types have been found within the Unit, which include forested bog, shrub bog that contains a dry shrub bog, an intermediate between wet and dry bog, and areas of wet bog (Kunze, L. 2001, pers. comm.).

Regional Distribution, Conditions, and Trends of Bog Habitat

Bogs occur within Puget Sound lowlands, around lakes, slow-moving rivers, and valleys. Only a fraction of western Washington bogs remain undisturbed (Bigley and Hull 2000). Bogs are Category I wetlands because they are sensitive to disturbance and impossible to re-create through compensatory mitigation (Hurby 2004).

“Nutrient-poor wetlands, such as bogs, have higher species richness, many more rare species, and a greater range of plant communities than nutrient-rich wetlands” (reviewed in Adamus and Brandt 1990). They are, therefore, more important than would be accounted for using a simple assessment of wetland functions (Moore et al. 1989). In addition to being sensitive to disturbance, bogs are not easy to re-create. Restoration may be impossible because of changes to the biotic and abiotic properties that preclude the reestablishment of bogs (Schouwenaars 1995, Schrautzer et al. 1996). Furthermore, bogs form extremely slowly, with organic soils forming at a rate of about 1 inch per 40 years in western Washington (Rigg 1958 from Hruby 2004, Bigley and Hull 2000).

Bogs can be damaged by subtle nutrient and mineral inputs which change the chemical equilibrium of the bog system. For example, exposing bare soil near a bog can be particularly damaging as resulting soil-laden runoff alters the chemical character of the bog and can kill living sphagnum. Burning slash, trash, or a wildfire near a bog can also be detrimental due to the release of high-nutrient ash (Bigley and Hull 2000). Typical logging and clearing practices in or around the Unit bogs most likely have had negative effects.

Subtle hydrologic changes cause problems for bog habitats. Diverting water into or around a bog will sever the habitats' isolation, dependence on rainwater for nutrients, and may expose it to damaging chemicals. Removing water from bogs by dropping surface water levels with ditches or drains will lower the water table and will speed the decomposition of the peat, sometimes leaving trees standing on their roots. Loss and lowering of ground water levels may reduce spring flows around bogs. The WDNR Natural Heritage Wetland Program and Thurston County Critical Areas Ordinance regulation states that changes to water, drainage, or nutrient flow cannot occur within a minimum of 250 feet of a bog. Onsite sewage disposal systems or drain fields may not be within 300 feet of a bog (Thurston County 2012).

In addition, nonnative plants will change plant community function and dynamics. Specific invasive species that may cause problems include reed canarygrass, knotweed species, purple loosestrife, yellow flag iris, holly, and potentially New Zealand mudsnail.

Key Species Supported

Those plants dependent upon bog habitats and found in the Unit bogs include western Labrador tea, sphagnum species, sundew, cottongrass, bog cranberry, bog laurel, bog orchid, thinleaf (also called gray alder), bog birch, shore pine, and Sitka spruce trees.

A number of plant and animal species associated with bog habitats may be found with future research and study of this difficult-to-access area. The potential for three State-candidate and SOCs in this habitat include Beller's ground beetle, Hatch's click beetle, and Queen Charlotte's copper butterfly. The State-candidate long-horned leaf beetle (bog idol) and the silver-bordered bog fritillary butterfly are also associated with Washington lowland bogs, but may or may not be found in this particular location (WDFW 1995). Additionally, Bradshaw's lomatium, western or red-root yampah, water howellia, western toad, western pond turtle, and uncommon salamanders could be found in the bog complex with future monitoring. WDNR biologists recorded a patch of bristly (longhair) sedges that are listed in Washington's Natural Heritage Program as a sensitive species (WNHP 2008). In the bog areas, signs of black bear and beaver were evident as were wildlife trails.

4.3.4 Shrub Swamp

Overview

The Unit protects 512 acres of shrub swamp habitat. This habitat occurs extensively in the lowland floodplains along the river channel, secondary channels, and in broad low-lying zones where soils are poorly drained, fine-textured organic muck, and the substrate would be semi- or permanently saturated. This habitat type is most extensive in the northern portions of the Unit and in narrow strips along the river southward to 123rd Avenue. This habitat grows interspersed with emergent marshes and riparian forest. It is wetter than forested swamps and slightly drier than marshes. It has been described as an impenetrable thicket of unstable ground and shrubs (Easterly and Salstrom 2008).

Regional Distribution, Conditions, and Trends of Shrub Swamp

This habitat ranges from Prince William Sound, Alaska, to the southern coast of Oregon (Crawford and Rocchio 2011). Historically this habitat was more prevalent, for example, small patches still exist in the Ohop and Green River valley (Barham, J. 2013, pers. comm.). Because this habitat is now an uncommon lowland wetland system, limited understanding of its requirements for healthy function and process exists. Future study could ensure a healthy ecosystem (Easterly and Salstrom 2008). Evidence of past conditions shows a portion of this habitat type may have been a forested wetland populated with large Sitka spruce and other conifers. Large stumps indicate early logging has likely removed a forested overstory component of the wetland. Former logging may have contributed to converting a conifer-forested wetland to shrub swamp that is now dominated with Oregon ash, Pacific crabapple, willow, Douglas spirea, and slough sedge.

The Black Lake drainage ditch prevents strong flood events from occurring and has most likely caused changes in the shrub swamp plant community composition and disturbance regime, although the changes are not yet fully understood. The loss of river water amounts and flow reduction from water diversion, water withdrawal, and hydrologic changes could cause losses of seasonally occurring high water conditions and has most likely affected the shrub swamp plant community.

Over time, if water sources continue to be reduced, this habitat may transition into a drier forest, and invasive reed canarygrass will most likely increase in open patches or in areas of herbaceous groundcover. Portions of this habitat that extend farther from the river may have been converted to agriculture because of lower water levels. Additionally, because of hydrological changes over time, the shrub swamp may be shifting and moving into bog areas (Kunze, L.M. 2011, pers. comm.). An understanding of the hydrology will be needed throughout the life of this CCP to benefit all species living in the shrub swamp habitat. An examination of plant community interaction between bog and shrub swamp habitats is needed.

Nonnative, invasive plant species, especially reed canarygrass, present a serious threat to the shrub swamp. Reed canarygrass has become densely established in open areas of the shrub swamp, especially along the river channel edge, and has changed the composition of the vegetative community. Its establishment has eliminated exposed mud patches along the river, impeded sunlight penetration, and impeded animal access through the understory. Small, native understory wetland plants growing along the river and in shrub swamp edges are unable to compete against this thick, tall grass. Purple loosestrife and yellow flag iris have become well established in many locations in the shrub swamp.

Submersed aquatic plants such as hydrilla, elodea, and parrotfeather could also be threats when infested surface waters from the river or tributary channels spread under the shrubs. Because the soils in these shrub swamps remain wet and protected from sun throughout the year, many submersed plants could survive. Additional perennial or woody invasive plant threats to the shrub swamp include knotweed species and other new species from elsewhere in the watershed that may be inadvertently introduced.

Nonnative fish presence alters natural habitats and conditions for native animals sharing the same locations. Most nonnative, warm-water fish such as bass, crappie, and northern pikeminnow are predatory on native fish, amphibians, and invertebrates. Their presence changes and likely reduces native fish, amphibian, and invertebrate populations. In addition, nonnative fish reduce prey resource availability for native fish and amphibians. These fish may be especially deleterious to endemic

Olympic mudminnow and the State-listed as endangered and federally listed as threatened Oregon spotted frog and the prey resources they need to survive.

Key Species Supported

The shrub swamp consists of deciduous shrubs comprising a mosaic of willows, Oregon ash, red osier dogwood, Pacific crabapple, ninebark, twinberry, and Douglas spirea that range from 5 to 30 feet tall and support complex growth of lichen and mosses. The herbaceous plant understory typically includes skunk cabbage, veronica, marsh speedwell, burweed, smartweed, sedges, touch-me-not, gallium, Cooley's hedge nettle, horsetail species, and Pacific water parsley.

North of the pipeline, plant species composition also includes gray alder and patches of bog-related species. South of the pipeline, Easterly and Salstrom (2008) noted thinleaf alder to be a major component on this habitat along the river.

This habitat provides important cover and food resources for migrating passerines and landbirds such as Pacific-slope and willow flycatcher, yellow warbler, orange-crowned warbler, American goldfinch, and black-capped chickadee. During spring migration, high numbers of flycatchers have been observed using this habitat.

Extended periods of high water that inundate the shrub swamp habitats provide excellent habitat and foraging conditions for aquatic animals including small fish (e.g., juvenile salmon and mudminnows), salamanders, and frogs, including the Oregon spotted frog and Pacific chorus frog (also called tree frog).

Potential ROCs that may utilize this habitat include Chinook and coho salmon, steelhead trout, and cutthroat trout. Bristly sedge, a Washington State rare plant species, has been recorded where the shrub swamp and river channel edge intersect. Another Washington State rare species, the Pacific clubtail dragonfly, has been recorded in the same habitat as bristly sedge. The endemic Olympic mudminnow and the threatened Oregon spotted frog are likely to use this habitat as refugia during high-water conditions in winter and early spring and to avoid higher flow rates in the river channel.

4.3.5 Riparian Forest

Overview

The Unit supports approximately 265 acres of riparian forest habitat. Riparian forest habitats occur at slightly higher elevation than adjacent shrub swamp habitats and support plants that need slightly drier soil conditions. The Unit's riparian forests consist of native deciduous trees of mixed age and species, dominated by big leaf maple, western cottonwood, red alder, and Pacific willow. Lichen and moss growth can be found on the trees. Larger trees provide large woody debris (LWD) to the river channel and floodplain (Rocchio 2011a).

Some areas show an early to mid-successional stage of maturity with tree canopy, thick midstory cover, and good ground cover. Very early successional stages are sparsely vegetated and dominated by shrubs, small saplings, and herbaceous vegetation, and in this case often-dense reed canarygrass growth as well.

A key function of riparian habitat is to provide a safe corridor for animals to move between areas, including isolated natural areas. The importance of riparian areas as travel corridors and routes for dispersion is amplified in developed or fragmented landscapes (Knutson and Naef 1997). Even in early seral stages, this habitat can provide excellent nesting, cover, and foraging conditions for passerines and other landbirds, amphibians, and mammals, in part because of its proximity to the river and its tributaries. Over time, as young riparian habitats mature, the diversity and complexity of the habitat can support greater wildlife numbers and increased diversity (Knutson and Naef 1997).

Regional Distribution, Conditions, and Trends of Riparian Forest

At least 50 percent, and as much as 90 percent, of the riparian habitat in Washington has been lost or extensively modified since the 1800s (Knutson and Naef 1997). What remains of the diminished riparian areas are often small, disjunct patches in generally poor condition due to human impacts (Johnson and O’Neil 2001). Due to the density and diversity of species using riparian habitat, intact riparian areas are important to the conservation of Washington’s vertebrate species.

Threats to this habitat include a slow recovery of large-sized trees that were logged out earlier, loss of developing snags, water diversion or water removal from tributaries and the river, fragmentation, and a history of excessive nutrients from agriculture or development. Once again, invasive species are a large threat. Reed canarygrass is the main impediment to natural regeneration and can dominate logged areas, while other invasive plants can also impact the habitats. An understanding of climate change and possible management options regarding potential impacts to this habitat type need to be addressed.

Key Species Supported

Broadleaf tree species found in the riparian community are big leaf maple, black cottonwood, red alder, Sitka and Pacific willow, red osier dogwood, ninebark, Pacific crabapple, black hawthorn, and Oregon ash. Conifers tend to increase with succession in the absence of major disturbance and can include Sitka spruce, grand fir, and western red cedar. Native shrubs such as twinberry, red osier dogwood, snowberry, salmonberry, thimbleberry, salal, red and evergreen huckleberry, rose species, stinging nettle, osoberry, and devil’s club comprise the midstory, and a rich understory of skunk cabbage, inside-out flower, twinflower, wild ginger, trillium, vanilla leaf, false lily of the valley, and lilies provide flowers for pollinators and vegetation for wildlife foraging. Diverse lichen and moss communities grow on trees and shrubs in this habitat.

Approximately 85 percent of Washington’s terrestrial vertebrate species use riparian habitat for essential life activities (Knutson and Naef 1997). Of the 118 species of migrant landbirds occurring in Washington, 67 species (57 percent) use riparian habitat (Andelman and Stock 1994, Knutson and Naef 1997). The density of wildlife in riparian areas is comparatively high (Knutson and Naef 1997). Bird species that use riparian habitats include both resident and migrant species such as rufous hummingbird, red-breasted sapsucker, northern flicker, pileated woodpecker, Swainson’s thrushes, and warblers. In older riparian forests, accipiters (such as Cooper’s and sharp-shinned hawks) and owls can reside.

Riparian habitats are also important for amphibians such as Pacific chorus frog, rough-skinned newt, and others species. Mammals including several species of *Myotis* bats, rodents, and carnivores such as long-tailed weasel and mink use the habitat throughout most of their lives, while larger mammals

such as black bear, bobcat, and cougar use riparian habitats as travel corridors within their home territories.

Riparian habitat is additionally important to supporting healthy native fish populations by improving channel characteristics including LWD, temperature, water quality, water chemistry, cover, and nutrients. Riparian habitat importance to the watershed includes providing leaves, twigs, and branches that provide basic food and nutrients to support instream habitats and animals. Riparian vegetation, litter layers, and soils filter incoming sediments and pollutants assisting in the maintenance of high water quality (Knutson and Naef 1997).

Potential ROCs include migrating passerines and nesting birds on watch lists or SOC lists such as Vaux's swift, purple martin, pileated woodpecker, and merlin, as well as Keen's myotis and Townsend's big-eared bat.

4.3.6 Emergent Marsh

Overview

Emergent marsh is generally found in western Washington valley bottoms, lowlands, along slow-moving rivers, in oxbows, saturated soil depressions, and where there is abundant rainfall (Rocchio 2011b). The Unit supports more than 34 acres of emergent marsh habitat. On the Unit, the emergent marsh usually forms a mosaic with other wetlands such as shrub swamp, riparian forest, and the edge of the river channel. A lowland depression located around 123rd and 110th Avenues also supports emergent marsh.

Herbaceous wetland plants in shallow, seasonally to semi-permanently or permanently flooded areas dominate freshwater emergent marshes. The habitat is characterized by undrained hydric soils (muck or mineral) where nutrient-laden water is at or above the surface for most of the growing season. Surface water depths range from <2 to 25 inches deep with deeper-water conditions closer to the river. Surface water depth increases with fall, winter, and early spring rains.

In good quality habitat, there would be a moderate amount of soil exposure (no vegetation), some decaying LWD brought in by high-water events, and 30–70 percent cover of emergent hydrophytic vegetation and native seed-bearing plants.

The river and tributaries are consistent and permanent freshwater sources for these wetlands, which are essential to the function of this vegetative system and provide direct access to and from deeper water sites for amphibians and fish.

Regional Distribution, Conditions, and Trends of Emergent Marsh

It is estimated that 33–50 percent of Washington's wetlands have been lost since colonization, with some metropolitan areas in Puget Sound losing over 90 percent of their wetlands (WDOE 1992). Emergent marsh is found throughout western Washington and is still found near the Unit. Beaver, a species which can create and maintain these types of wetlands, was almost eliminated earlier in the century and these wetlands have decreased along with the diminished influence of beavers on the landscape. Even with regulatory protection, the amount of herbaceous and emergent marshes continues to be altered, farmed, and converted to other uses in Washington (Johnson and O'Neil 2001).

Reed canarygrass has aggressively invaded this habitat. Small, native sedges and low-growing herbaceous perennial plants are not able to compete against such an aggressive invader. This loss of habitat diversity negatively effects native wildlife species' ability to use these compromised areas.

Additional threats include the potential loss of connectivity to the river or tributaries due to roads and barrier construction; off-Refuge water diversion, water withdrawals and hydrologic regime alteration; passage barriers; water quality issues (temperature and sedimentation); conversion of former emergent marsh to seasonally flooded, nonnative grasslands; and natural succession to shrub swamp.

Bullfrogs are large, successful, nonnative predators of native frogs, salamanders, small fish, ducklings, and invertebrates (Hallock and McAllister 2009). Oregon spotted frogs did not evolve with bullfrogs and have no defense mechanisms (Leonard et al. 1993). Nonnative fish also negatively affect the native fish and amphibian populations and compete with wildlife for wetland invertebrates (Maxwell et al. 2010, Howell 2010). A worldwide chytrid fungus that is thought to contribute to the overall decline in amphibians, especially frogs (Weldon et al. 2004, Pearl et al. 2009), has been found in Unit emergent marsh waters where Oregon spotted frogs live part of their lives. The fungus, found on all tested Oregon spotted frogs, could be negatively affecting all species of amphibians in the Unit (Pearl et al. 2009).

Key Species Supported

Slough sedge and cattail can dominate in permanent, deeper-water areas. In shallow areas a diverse array of small sedges, bulrushes, rushes, spike rushes, bur-reed, beggar ticks, monkey flower, small-flowered forget-me-nots, skunk cabbage, creeping buttercup, possibly bristly sedge, and other low-growing, moisture-loving plants are found.

This habitat is exceptionally important for good-quality juvenile Oregon spotted frog-rearing conditions. It provides relatively warm surface water, shallow to moderately deep (2–24+ inches) in late spring and summer. Low to moderate vegetation density and algal growth on vegetative stems and leaves provide foraging opportunities. Herbaceous or shrubby vegetative cover provides direct swimming access to deeper water. This plant community provides adult Oregon spotted frog habitat in late spring and summer that includes still, standing, or slow moving surface water; connection to deeper and cooler water conditions; moderately complex vegetative cover; and invertebrates and small fish prey. This habitat is vital to the State-endangered and federally threatened Oregon spotted frog.

The presence of the federally listed water howellia plant is possible, but is unknown. Bristly sedge, a State-sensitive and rare plant, was recorded in a thin, long patch of emergent marsh between the river channel edge and shrub swamp. Another rare species, the Pacific clubtail dragonfly, has been recorded in this habitat. Additional key species include the Olympic mudminnow, Chinook and coho salmon, steelhead trout, and possibly western toad and western pond turtle.

Secretive marshbirds such as American bittern, sora, Virginia rail, green heron, great blue heron, pied-billed grebe, and American coot depend upon this habitat for their life histories. During higher water conditions, migrating and wintering waterfowl also use this habitat type.

Elk and black-tailed deer browse on emergent plants, while otter, mink, beaver, and muskrat forage and den in this habitat. Northern harriers hunt over the habitat and use it to nest. Large numbers of

amphibians, such as northwest and long-toed salamanders, rough-skinned newts, red-legged frogs, and Pacific chorus frogs, lay their eggs and the juveniles mature into adults in the marsh.

4.3.7 Seasonally Flooded, Nonnative Grasslands Overview

The Unit supports over 82 acres of seasonally flooded, nonnative grasslands. These lowlands are relatively flat, generally are seasonally flooded in winter and early spring, and can be covered with water nearly 36 inches deep. Portions of this habitat closest to the river tend to be inundated with water during most months except September and early October. The saturated, poorly drained Semiahoo muck soils generally remain wet even during extended late-summer dry conditions. Most sites are located along river and tributary edges, in swales, oxbows, and land depressions that connect to other wetlands and deeper waters.

Historically, these areas may have previously been emergent marsh, wet prairie, open areas within shrub swamp or riparian forest, or part of a forested wetland. However, after Euro-American settlement, these areas have been converted to grasses that are adapted to the saturated soils and surface water coverage found in lowland river valleys. The most likely plant found in these nonnative grasslands is reed canarygrass.

Regional Distribution, Conditions, and Trends of Seasonally Flooded, Nonnative Grasslands

Planting of reed canarygrass in the Pacific Northwest began in the late 1800s and has been widely used in northern states and Canada. No other forage plant is as well adapted to wet, marshy areas as reed canarygrass. This aggressive, cool-season, mat-forming, nonnative grass moves out of pasturelands and into stream bottoms, wetlands, and canal banks and persists where it is not desirable. It now dominates where wetland herbaceous plants or open moist soil would have been found on the Unit and in other areas throughout the watershed. It grows so vigorously that it seriously inhibits or completely eliminates all other plant growth (Reinhardt and Galatowitsch 2004) and it is a major threat to wetland ecosystems (Kilbride and Paveglione 1999). It is estimated that over 98 percent of what was emergent marsh, wet prairie, or wetland forest has been converted to seasonally flooded, nonnative grassland (reed canarygrass).

Unlike native wetland vegetation, dense stands of reed canarygrass have little value for wildlife (Tu 2004). In summer and early fall, reed canarygrass stems grow over 8 feet tall and are dense enough to impede both large and small animal movement.

Key Species Supported

This monoculture of nonnative grass does not provide the diversity of a native marsh-plant complex, which is necessary for a healthy plant community and associated wildlife. However, some wildlife use this habitat, including waterfowl (dabbling ducks, Canada and cackling geese) during late fall, winter, and spring when it is flooded. Some secretive marshbirds, such as American bittern, sora, and Wilson's snipe, may use shallow water edges. Elk and black-tailed deer graze on new grass shoots in late spring and summer. Leaf-mats are sometimes used as basking, resting, or feeding platforms by small aquatic mammals such as muskrats and waterfowl.

These grasslands obstruct movement of mature amphibians and fish. Negotiating through the dense grass (even when flooded) may cause both amphibians and fish to expend high energy levels that

ultimately may reduce their ability to survive and reproduce. Stems and leaves provide an abundance of surfaces for algal growth in late spring and early summer and may provide food for juvenile amphibian growth and some insects.

4.3.8 Dry, Nonnative Grasslands

Overview

There are 163 acres of dry, nonnative grasslands on the Unit. Dry, nonnative grasslands on the Unit border include mixed forests; seasonally flooded, nonnative grasslands; riparian habitats; and marshes. These areas are now composed of a mixture of nonnative pasture grasses, herbaceous plants, and shrubs. This habitat occurs in a mosaic throughout the Unit acquisition boundary and in a large field approximately 100 acres near the 123rd Ave and Endicott Road area. Vegetation in this habitat is a mixture of nonnative pasture grasses (such as velvet grass, orchard grass, perennial rye, timothy), native perennial grasses (such as Roemer's and red fescue), and some native and nonnative forbs (such as alfalfa). The mixture of vegetation heights ranges between 6 and 30 inches high. The edges of the grasslands may contain a shrubby component that transitions into mixed forests or riparian habitats.

Regional Distribution, Conditions, and Trends of Dry, Nonnative Grasslands

Generally, nonnative grasslands in western Washington are former prairie, oak woodlands, and forest habitats that were converted for agricultural purposes, such as horse or cattle pastures. Livestock grazing is necessary to keep the grasslands open and not overcome with other species.

Extensive work by TNC, Center for Natural Lands Management, South Puget Sound Prairie Landscape Working Group, and the Service (Western Washington Fish and Wildlife Office) has defined where native prairie habitats are located in the Puget Trough based on soil types. Prairie habitat is considered among the most imperiled habitats in western Washington, and many species associated with it are State candidates or SOCs. The Unit's dry, nonnative grasslands are not considered true prairie because they are not native to western Washington. However, because of the large losses of western Washington native prairie habitat, retaining Unit nonnative grassland habitat may be helpful in supporting some species that rely on open uplands.

Threats include invasion from nonnative pest plants that thrive in open areas without competition, such as wild chervil, Scotch broom, common burdock, common teasel, Canada and bull thistle, Himalayan blackberry, and poison hemlock. Forest encroachment or conversion into shrub lands will take place in the absence of management by prescribed fire, mowing, grazing, or haying. Conversion into forestlands will reduce the habitat mosaic in the Unit and reduce open habitat availability for reliant wildlife species.

Key Species Supported

Although no listed species are known to rely on this habitat type, a number of grassland species that evolved to use open areas of relatively short grass and forbs may use dry, nonnative grasslands.

This habitat type provides ground-nesting and foraging areas for birds such as savannah sparrow, western meadowlark, purple martin, mourning dove, and killdeer, as well as denning sites for small mammals such as mouse, mole, and vole. It provides hunting sites for raptors such as American

kestrel, red-tailed hawk, great horned and barn owls, and northern shrike. In winter, dry, nonnative grassland provides thermal cover for short-eared owl, small mammals, and other wildlife. These areas also provide winter forage and loafing sites for ungulates such as black-tailed deer and elk. In addition, they provide migration or dispersal corridors for small and large mammals as well as amphibians. This habitat may contain an occasional deciduous tree such as big leaf maple or Garry oak. These trees can grow into large cavity-producing specimens that enhance the habitat for American kestrel, owl, bat, Vaux's swift, and insects. A tapered edge of flowering shrubs provides nectar and attracts pollinating insects and provides a transition area for animals utilizing both grassland and woodlands.

4.3.9 Mixed Forest

Overview

Mixed conifer and deciduous forest habitat is generally the most extensive forest system in the lowlands west of the Cascades and forms the matrix within which other plant communities occur as patches. Many of the local area forests managed for conifer production lack species diversity and forest function that benefits wildlife (Carey 2006). The Unit supports 394 acres of upland mixed forest habitat of varying ages. These forests have well-drained soils that are moist much of the year and dry for approximately 3–4 months.

Most forests on the Unit are young mixed forest stands reestablishing after logging prior to Unit acquisition. In naturally regenerating young forests, commonly represented species include grand fir, western red cedar, big leaf maple, and red alder. Reestablishing forests usually lack western white pine because there are few natural seed sources for this species. As stands mature, Douglas-fir, grand fir, western hemlock, western red cedar, and big leaf maple dominate the canopy as early successional and short-lived red alder dies off. Eventually big leaf maple needs more light than the conifers allow and it too become less common. Individual trees or groups of trees with >12" diameter and 20' long become snags that provide nesting cavities, and fallen trees become nurse logs. Over time, this habitat can mature into old-growth forest.

Most of the Unit forests are products of restoration efforts. Carey (2003) notes

“...many managed forests are impoverished in species. Intentional management can reduce the need for wide riparian buffers, produce landscapes dominated by late-seral stages that are hospitable to wildlife associated with old-growth forests, provide a sustained yield of forest products, and contribute to economic, social, and environmental sustainability.”

Regional Distribution, Conditions, and Trends of Mixed Forest

The State of Washington manages 1.4 million acres of forested lands in western Washington (DNR 1997). Long-term sustainable forest practices are a management priority in the State. Both public and private forestlands throughout the region are actively managed for a variety of purposes, including timber sales, recreation, and habitat conservation. Locally, Douglas-fir is the timber preferred by land owners and is currently the dominant species adjacent to the Unit.

Threats to this habitat include forest management narrowly focused on timber production, limited species diversity, poor function for wildlife species, habitat fragmentation due to development

pressure, and some timber harvesting practices (Carey 2003, 2006, Heiken 2007). Other threats to the mixed forest ecosystem include invasive species infestations such as reed canarygrass in wetter areas; holly, spurge laurel, English laurel, English ivy, yellow archangel, and periwinkle in shaded areas and Scotch broom and blackberry in drier, more open locations.

Key Species Supported

Mid-story plants in older forests include vine maple, red-osier dogwood, evergreen and red huckleberry, salmonberry, thimbleberry, salal, osoberry, and perhaps native rhododendron. Additionally, rose species, stinging nettle, and devil's club can be found. The understory is populated with sword fern, salal, dull Oregon grape, trailing blackberry, twinflower, inside-out flower, wild ginger, trillium, false lily of the valley, Pacific bleeding heart, and lilies. In the more mesic sites, lady fern and sword fern can be more dominant.

Wildlife associated with older, structurally complex and more diverse forests are rufous hummingbird, red-breasted sapsucker, northern flicker, pileated woodpecker, Steller's jay, Vaux's swift, purple martin, tree swallow, chestnut-backed chickadee, golden-crowned kinglet, winter wren, Swainson's and varied thrushes, Pacific slope flycatcher, Wilson's, Townsend's, and MacGillivray's warblers, Keen's myotis, Townsend's big-eared bat, elk, and black-tailed deer. Black bear and cougar use forests when enough habitat acreage exists and habitat corridors link to other large-scale appropriate habitats.

4.4 Major Species Groups

4.4.1 Fish

The Black River Unit encompasses a complex mosaic of wetlands and connecting uplands, extensive plant communities, and varied species of wildlife. The Creveling et al. study in 1980 is likely the most comprehensive natural history investigation of the upper Black River to date. It covers more area than the Unit acquisition boundary, so it encompasses most habitats found in the Unit and is an excellent baseline source of information. The Unit species lists include those animals and plants that have been observed or are strongly thought to exist within Unit.

Twenty-nine species of fish are known to occur in the Black River, 20 of which are native. Native anadromous fish found in the river and likely within the Unit boundary are Pacific lamprey, coho and Chinook salmon, cutthroat trout, and steelhead. Native resident fish are cold-water species and include western brook lamprey, mountain whitefish, peamouth, speckled dace, reidside shiner, large scale sucker, three-spined stickleback, Olympic mudminnow, and five species of sculpins. Nonnative fish are widespread in the river and, unlike the native fish, many are warm-water species: American shad, brown bullhead, pumpkinseed, bluegill, rock bass, large and smallmouth bass, black crappie, yellow perch, and northern pikeminnow (Kunze, L. 2011, pers. comm., Creveling et al. 1980, Caldwell et al. 2004).

Spring Chinook salmon, fall Chinook salmon, fall chum salmon, coho salmon, winter steelhead, and cutthroat trout, all of the Chehalis River Evolutionarily Significant Unit, occur in the Black River but mostly downstream of the Unit (Caldwell et al. 2004). No salmon of this Evolutionarily Significant Unit are listed with State or Federal agencies. Salmon and steelhead spawning habitat in the Black River drainage is primarily in tributaries because the majority of the mainstem has a mud or fine

sediment bottom due to the extremely low gradients (Smith and Wegner 2001). Spring Chinook salmon spawn in the lower 9 miles of the river mainstem and likely do not spawn in the Unit. Fall Chinook salmon spawn up to river mile 9 and also between river miles 16 and 17.3, which is also downstream of the Unit. However, they also spawn in the first mile of Waddell Creek within the Unit (Smith and Wegner 2001).

Chum salmon were once abundant but their numbers have greatly diminished since the 1970s, and now they spawn only within the first 10 river miles (Phinney and Bucknell 1975 [cited in Smith and Wegner 2001]). Coho salmon spawning is widely distributed in Black River tributaries, with the most productive spawning habitat located in Waddell, Mima, and Allen Creeks (Caldwell et al. 2004). There is excellent rearing habitat for juvenile coho salmon in the upper reaches of the river, but high temperatures and low DO may limit use. Nonetheless, there is some rearing of juvenile coho salmon in the low gradient reaches within the Unit. Winter steelhead spawn in the lower 7 miles of the river below the Unit and in Blooms Ditch, Dempsey, Salmon, Beaver, Waddell, and Mima Creeks (Caldwell et al. 2004, Smith and Wenger 2001), some of which drain into the river within the boundary. Juvenile steelhead rear for 2 years and likely use the Unit, but may be limited by summer low-flow conditions (Caldwell et al. 2004). Cutthroat trout use the Black River from October through April with anadromous fish spawning January through mid-March and resident cutthroat trout spawning February through mid-March. Although the status is unknown, the stock is believed to be relatively abundant and widely distributed in the system (Caldwell et al. 2004).

Historically Chinook, coho, chum, and steelhead salmonids all migrated up the Chehalis River, through the Black River and into its tributaries, and into Black Lake, where they spawned in Black Lake's tributaries. More recently, man-made alterations to lake water levels and the installation of a pipeline have impeded fish passage, contributing to the elimination of salmonid movement between Black River and Black Lake (Hawkins 2000, Smith and Wegner 2001, Caldwell et al. 2004). Salmon populations are likely much smaller than they were historically. The reduction of salmon abundance in the Black Lake and Black River watershed is of special concern because salmon are a keystone species, meaning that a wide array of organisms benefit from or depend on the trophic inputs salmon provide to the food web (Cederholm et al. 2000 in TNC 2005).

Low flows, high water temperatures, low DO levels, increased sediment loads, and concentrated toxins reduce survival of all salmonid life cycle stages. Pre-spawning mortality can be caused by low flows or reduced water quality. In 1989 there was a fish-kill in the river, south of Unit lands, which resulted in the death of adult Chinook salmon due to low DO, high nutrient levels, and warm water temperatures (Berg et al. 1995, Pickett 1994). Survival of eggs is dependent upon clean, stable gravel substrates. Low flows and high water temperatures can force early out-migration of juvenile fish, reducing their survival (see Chapter 3).

The small Olympic mudminnow (*Novumbra hubbsi*) is State-listed as a sensitive species and is a priority species under WDFW Priority Habitat and Species Program (PHS), but has no Federal status. Only three other species of *Novumbra* are found in North America and one in Eastern Europe, but the endemic Olympic mudminnow is found only in Washington State. The current distribution of the Olympic mudminnow includes the southern and western lowlands of the Olympic Peninsula, the Chehalis and lower Deschutes River drainages, and south Puget Sound, west of the Nisqually River (Mongillo and Hallock 1999). It occurs in quiet waters with several centimeters of soft mud substrate, little-to-no water flow, and abundant aquatic vegetation. If any of these characteristics are missing, no mudminnows are found (Mongillo and Hallock 1999). Meldrim noted that marshy

streams with brownish water and overhanging banks are also important to the mudminnow (Meldrim 2012).

Adults are about 2 inches long and feed on live, moving prey, mostly ostracods, isopods, oligochaetes, mysids, mollusks, and dipterans. Spawning occurs over an extended period from late November to the following June (Mongillo and Hallock 1999). Females deposit eggs on vegetation and they hatch in approximately 10 days. Olympic mudminnows appear to be quite sensitive to competition or predation from exotic and native fish species (Mongillo and Hallock 1999). Because of this, the Olympic mudminnow's restricted range, and the continuing loss of wetlands, WDFW biologists believe the Olympic mudminnow is vulnerable and likely to become threatened or endangered in a significant portion of their range without cooperative management (Simon and Peoples 2006). Threats include habitat destruction, competition, and predation, particularly by exotic spiny-rayed fish (NatureServe 2012a).

Nonnative and invasive fish populations in the Black River include American shad, brown bullhead, pumpkinseed, bluegill, rock bass, largemouth and smallmouth bass, rainbow trout, black crappie, and yellow perch (Creveling et al. 1980). See Appendix L for the fish species list and Chapter 4, Section 4.7, for more information on these fish and their impacts on the habitat and native species.

Between August 6 and 7, 1989, a fish-kill occurred in the Black River and another on August 10 and 11 in the Chehalis River (Yake et al. 1989). Evidence suggests that a toxic substance entered the Black River at about river mile 9.2 on August 6 and moved downstream entering the Chehalis River. Estimates of the number of fish killed between river mile 9.2 and the mouth of the Black River include 100,000 coho salmon fingerlings, 17,000 cutthroat trout, and 118,000 forage fish (sculpins, dace, shiners, suckers, and lamprey). Over 300 adult Chinook salmon were killed in the Chehalis River. This fish-kill occurred below the Unit.

4.4.2 Waterfowl

Mallards, American wigeon, green-winged teal, northern shoveler, northern pintail, hooded merganser, wood duck, bufflehead, ring-necked duck, and American coot use habitats within the Unit. Dabbling ducks are usually found in the open areas of emergent marsh, whereas diving ducks are usually found associated with the river's deeper-channel waters. Typical seasonal rains create mild-to-moderate surface flooding conditions, which in turn support habitat for both dabbling and diving ducks and geese. Canada and cackling geese also use emergent marsh; seasonally flooded, nonnative grasslands; and dry, nonnative grasslands in late fall, winter, and early spring.

Waterfowl surveys were conducted by Unit staff twice a week in 2002, from mid-February to the end of March, in the open wetlands just north of 123rd Avenue. At that time approximately 115 ducks and geese a day were observed, and species included mallard, northern shovelers, green-winged teal, and American wigeon.

4.4.3 Water Birds

The Black River wetlands are excellent locations for migratory and resident waterbirds, especially secretive marshbirds such as green heron, American bittern, Virginia rail, and sora. These birds nest and forage in the dense cover that can be found in the emergent marsh, shrub swamp, and along the edge of the river channel. Great blue herons use the same habitats but also forage in more open areas

such as the seasonally flooded, nonnative grassland. Pied-billed grebes use the deeper waters of the river channel to forage and nest in the cover where the shrub swamp and emergent marsh converge.

4.4.4 Shorebirds

Shorebirds such as greater yellowlegs, dunlin, Wilson's snipe, spotted sandpiper, and killdeer forage in the open, shallow wetlands. Yellowlegs winter there, dunlin may winter or stop during migration, Wilson's snipe most likely nest there, and killdeer move up to the drier, nonnative grasslands to nest.

4.4.5 Raptors

Some raptors reside on the Unit year round, some use it as a stopover site during migration, and some winter in the area. Greater species diversity and larger numbers are observed in the fall and winter months. Owls that are common and nest in the area include barn and great horned owl. Owls that may use or nest in the area, but are not verified, are western screech, northern pygmy, and northern saw-whet. The short-eared owl may use the open old fields as hunting grounds during the nonbreeding season. Hawks expected to use the Unit include northern harrier, red-tailed hawk, Cooper's and sharp-shinned hawk. American kestrels forage over the open grassland areas and are expected to be nesting nearby. Turkey vultures and bald eagles soar over open meadows and floodplains. Ospreys may also forage in the Unit.

4.4.6 Landbirds and Passerines

Over 74 species of migrant or resident landbirds and passerines have been recorded within the Black River Unit boundary, including 8 species of raptors, including owls, hawks, falcons, and eagles. Long-distance migrants travel between breeding grounds in temperate North America and wintering grounds in Central and South America. Resident species both breed and winter in the local area.

Within the Unit, mixed forests, riparian forests, and shrub swamps provide differing growth forms, layers of vegetation structure, plant diversity, and food resources which support many species of landbirds. A mosaic of habitats and the transition zones between them provide bird species greater use of the areas. Many passerines rely on the cover, food availability, foraging space, undisturbed areas for nesting, branches to support nests, and access to water that the thickets and wetlands provide.

Year-round resident woodpeckers using mixed and riparian forests include northern flicker; downy, hairy, and pileated woodpeckers; and red-breasted sapsucker. Rufous hummingbird is the only known hummingbird species on the Unit, but Anna's hummingbirds are expanding their range throughout western Washington and may now occur on the Unit. Belted kingfisher forages for fish in the river, band-tailed pigeon and cedar waxwing forage on fruit-bearing plants in the forests, and mourning dove use the open areas of dry, nonnative grasslands. Nesting violet-green swallow, tree swallow, barn swallow, cliff swallow, and northern rough-winged swallow consume insects over the floodplain. Some habitats should be appropriate for Vaux's swift.

Many passerines rely on the Unit during migration to and from distant breeding grounds. Large numbers of warbler, vireo, flycatcher, thrush, and swallow stop to refuel in the mixed forest, riparian forest, and shrub swamp habitats. Habitat in the riparian and shrub swamp is used by yellow warbler, yellow-rumped warbler, common yellowthroat, red-eyed vireo, Cassin's vireo, warbling vireo, black-

headed grosbeak, evening grosbeak, western tanager, bushtit, black-capped chickadee, chestnut-backed chickadee, Bewick's wren, Pacific wren, and sparrow species.

The drier mixed forests support American robin, spotted towhee, Swainson's thrush, varied thrush, hermit thrush, American goldfinch, Steller's jay, American crow, raven, red-breasted nuthatch, Pacific wren, Bewick's wren, Wilson's warbler, Townsend's warbler, black-throated gray warbler, brown creeper, chestnut-backed chickadee, ruffed grouse, blue grouse, and band-tailed pigeon.

The emergent marsh supports the marsh wren, common yellowthroat, and red-winged blackbird. Dry, nonnative grasslands could provide habitat for western meadowlark, American kestrel, California quail, sparrow species, killdeer, American robin, purple martin, Vaux's swift, and swallow species.

4.4.7 Mammals

The most comprehensive inventory of mammal species for the Black River drainage was done by Creveling et al. in 1980 for the Washington Department of Game. They identified a total of 54 species of mammals from habitats found the Black River watershed: 4 species in aquatic habitats, 13 species in wetland habitats, 15 species in the riparian zone, 15 species in shrub habitats, and 36 in the forests. Today nutria, eastern gray squirrel, opossum, and eastern cottontail should be added to the list as nonnative mammals. Creveling et al. also found Norway rat and house mouse, but those are expected in more developed areas instead of natural areas.

Native species found exclusively within the aquatic and wetland habitats include water and vagrant shrew, shrew mole, Townsend's and water vole, beaver, muskrat, mink, long-tailed weasel, and river otter. Those species found exclusively within upland habitats include masked and Trowbridge's shrews, mountain beaver, Townsend's chipmunk, Douglas' squirrel, northern flying squirrel, deer mouse, bushy-tailed woodrat, Gapper's red-backed vole, creeping vole, porcupine, coyote, red fox, ermine, striped skunk, Roosevelt elk, and black-tailed deer. Species which use both the upland and riparian habitats include Pacific water shrew, Townsend's mole, long-tailed vole, Pacific jumping mouse, snowshoe hare, black bear, western spotted skunk, mountain lion, and bobcat. At least eight species of bat have been identified using the area: Yuma, Keen's, long-eared, California myotis, Townsend's big-eared, silver-haired, big brown, and hoary bats (Creveling et al. 1980). Many of these species use abandoned structures for roosting and maternity sites.

Beavers are an important source of disturbance in the Black River lowland floodplain ecosystem. Most beavers were removed from rivers and streams in the Pacific Northwest in the late 1800s as a result of the fur trade. Beaver populations were also reduced by eradication efforts to prevent flooding in lands planned for agricultural use and development and to reduce insect populations. Until recently, fisheries biologists encouraged natural-land managers to break up beaver dams because according to early studies, they thought the dams hindered passage for anadromous salmonids and decreased fish habitat (Reid 1952 [cited in Pollock et al. 2008], Sanchez 2008). In areas where human development grew, beaver populations never rebounded to former levels. Areas impounded by beaver dams have been associated with biomass or diversity increases in a wide range of taxa, including birds, mammals, plants, and insects (Pollock et al. 2008). Beaver-impounded wetlands provide important off-channel rearing habitat for juvenile salmon during seasonal high water periods, and submerged vegetation and woody debris associated with beaver ponds provide excellent cover for rearing salmon. Beaver activity holds water through the dry season, providing needed habitat and water resources to a large number of species, animal populations, and plant communities. Beaver ponds also create a nutrient sink, which increases productivity of aquatic

invertebrates, both in the ponds and in tributaries downstream of the ponds. Beaver dams provide storage areas of fine sediment and stabilize flows during high water events as water is stored in ponds and released slowly over the beaver dams (Cederholm et al. 2000, Smith and Wegner 2001).

In the entire Black River system, the only undeveloped or unaltered floodplain remaining is the wetlands along the upper reaches of the river. The low-gradient floodplain provides ideal conditions for beaver colonization and an abundance of off-channel habitats that are preferred by juvenile salmon species. In the river, the beaver dams across the river channel do not create characteristic open ponds. Instead, water spreads widely over the flat floodplain landscape. They help create the shrub swamp and emergent marshes which provide important ecological benefits to a variety of wildlife species. By constructing dams and impounding streams, beavers considerably alter stream hydrology in a way that provides extensive benefits to fish as well as other organisms, resulting in a high species diversity supported by these systems (Rossell et al. 2005). It is most likely that cutthroat trout and coho salmon make extensive use of these areas for overwintering and feeding.

4.4.8 Reptiles and Amphibians

A total of 13 species of amphibians have been found within the Black River basin (Creveling et al. 1980). Most were found in the wetland zones, but many were also found in forested locations, including riparian habitats. Not all species found by Creveling et al. may occur within the Unit, but the expected species include northwestern, long-toed, and ensatina salamanders and rough-skinned newt. Native frogs or toads using the Unit include the Pacific chorus frog, red-legged frog, and Oregon spotted frog, and possibly western toad. Nonnative bullfrogs occur in localized areas. Detailed information on the Oregon spotted frog can be found in Section 4.5 Rare Species.

Ten species of reptiles were found within the entire watershed that might occur within the approved Unit boundary; eight of these were found in forested habitats, six in riparian, and three in both the aquatic and wetland areas. Two species of turtles occur in the wetland and aquatic habitats: painted turtle (native to eastern Washington) and the nonnative red-eared slider. At one time, Pacific (western) pond turtles, a State endangered species, were found but they are now thought to be extirpated. Two species of lizards are possible in the upland habitats: northern alligator and western fence lizard. Six species of snakes may occur within the Unit, including two species occurring exclusively in the uplands: gopher and northwestern garter snake. Species that could occur in both uplands and wetlands include rubber boa and common and western terrestrial garter snakes.

4.4.9 Invertebrates

Studies of freshwater benthic invertebrates are incomplete, but water quality studies in the lower portions of the river (samples collected at 110th Avenue) noted that the invertebrate population generally is not diverse, is dominated by pollution-tolerant species, and has low numbers of pollution-sensitive species. Midge larvae, which are pollution-tolerant, are the most abundant, while mayfly, stonefly, and caddisfly, which are pollution-intolerant, were uncommon. The populations recorded from six sites along the river included mayfly, stonefly, caddisfly, dragonfly, scud (amphipods), water beetle, true fly (including midges), true bug, moth, and alderfly. The Berg et al. study (1995) also found freshwater clam, snail, aquatic sow bug, crayfish, and leech.

More recent observations include broken freshwater mussel shells found on top of bent-over reed canarygrass in a flooded area next to the river. They were identified as Oregon floaters by Service biologist Donna Allard. Additional shells were found in Waddell Creek and were also identified as

Oregon floaters. Crayfish have been observed in Waddell Creek, but the species has not yet been identified. However, a native signal crayfish was identified in emergent marsh near 123rd Avenue by Unit staff. Freshwater sponge (species unknown) are also thought to be living in the river within the Unit boundaries, and Mumford (2013, pers. comm.) has noted freshwater sponge are abundant between river miles 4 through 15. Nonnative bryozoan colonies have been found in the river just south of Littlerock and may also be within the Unit boundary.

Rare invertebrates that may occur at the Unit include Beller's ground beetle, Hatch's click beetle, and the Pacific clubtail (Kunze, L. 2011, pers. comm.).

4.5 Threatened, Endangered, and Sensitive Species

One goal of the Refuge System is “to conserve, restore where appropriate, and enhance all species of fish, wildlife, and plants that are endangered or threatened with becoming endangered.” In the policy clarifying the mission of the Refuge System, it is stated, “We protect and manage candidate and proposed species to enhance their status and help preclude the need for listing.” In accordance with this policy, the CCP planning team considered species with Federal or State status, and other special status species, in the planning process.

Fish

Pacific lampreys are an SOC (NatureServe 2012b). They occur from Alaska south through California, are widespread, but have declining numbers. They are anadromous parasitic fish that spawn in June and July in Washington. Juveniles live in freshwater for 4–6 years, then metamorphose into adults and migrate to the Pacific Ocean. Pacific lampreys use shallow, backwater areas or eddies along edges of streams with mud, silt, and sand bottoms. They spawn in riffles with rock, sand, or gravel substrates in clear streams. Juveniles are filter feeders. Adults are parasitic on fish, particularly salmon, staying attached for 20–40 months. Primary threats are channelized streams, pollution, barriers to migration, and reduced food resources (salmon). Pacific lampreys have been found in tributaries draining into Black River (WDFW 2013).

Olympic mudminnows are a State-sensitive and endemic species. They require slow-moving rivers, ponds, or wetlands with muddy substrates and dense submerged vegetation such as in Black River. Mudminnows prey on an assortment of small invertebrates and depend on healthy wetland habitat for their survival. This species does not fare well when sharing habitat with nonnative species of fish. It is uncertain if this is a result of competition or predation, but some combination is likely. Because of this, and the Olympic mudminnows' restricted range and the continuing loss of wetlands, they are thought to be vulnerable and likely to become threatened or endangered in a significant portion of their range without cooperative management (Mongillo and Hallock 1999).

Plants

Water howellia is a federally threatened species and a State-threatened species. It is regionally endemic, currently known from California, Montana, Idaho, and Washington and was historically known from Oregon (USFWS 1996a). In Washington, it occurs within the Columbia Basin and Puget Trough physiographic provinces. It occurs in wetlands, mostly in small, vernal ponds, although some of the ponds may retain water throughout the year. Soils are rich in organic matter and frequently contain partially decomposed leaves, stems, and wood. Water howellia is known to exist in the Black River watershed, although its presence is unknown within the Black River Unit.

The most significant threats and management concerns are changes in wetland hydrology, an increase in weedy species (e.g., reed canarygrass), the threat of invasion by noxious weeds (e.g., purple loosestrife), livestock overgrazing, and timber harvest activities on adjacent uplands (USFWS 1996a).

Bristly sedge is listed as State-sensitive and WDNR recorded its presence in what is now the Black River Unit (Kunze L. 2011, pers. comm.). Its status on the Unit is currently unknown.

Birds

There are no federally listed (threatened or endangered) birds using the Black River Unit.

Pileated woodpeckers are a State-candidate species. These woodpeckers prefer mature deciduous, coniferous, or mixed forests where larger trees provide appropriate habitat for nest cavities which are excavated new each year. They forage on insects and eats fruit and nuts (Seattle Audubon Society 2002).

Purple martins are a State-candidate species. Purple martins are loosely colonial and prefer natural cavities near water to nest. They often use holes excavated by woodpeckers in mature mixed deciduous and conifer forests where larger trees provide appropriate habitat for cavities. Purple martins build a cup nest within the cavity. They forage for aerial insects over open lands near water such as emergent marsh, open wetlands, or open fields (Seattle Audubon Society 2002).

Vaux's swifts are a State-candidate species. Vaux's swifts are loosely colonial and forage in open sky over woodlands, lakes, and rivers, where flying insects are abundant. Nesting habitats include either coniferous or deciduous forests that provide large, hollow trees or snags with vertical entrances for nesting and roosting. The nest is a shallow half-cup attached to the inside of a tree with sticky saliva (Seattle Audubon Society 2002).

Mammals

Townsend's big-eared bats are an SOC and a State-candidate species that are known to use habitats in the Black River watershed and may occur within the Black River Unit boundary. Townsend's big-eared bats can be found in British Columbia, throughout the western United States, and in Mexico. They commonly occur in mesic coniferous and deciduous forested regions. Townsend's big-eared bats feed on flying insects, primarily moths, near trees and shrubs in the mid- to upper canopy. They typically use caves, mines, and buildings for both maternity colonies and hibernating. Nursery colonies tend to be small, up to 200 individuals. They hibernate singly or in small groups. These bats mate in late fall through winter, and a single young is born in mid-July. Primary threats are loss of habitat and disturbance of maternity roosts and hibernacula (NatureServe 2013, WDFW 2013).

Amphibians

Oregon spotted frogs are a federally threatened and State-endangered species. They have occurred from southwestern British Columbia to northeastern California but have been extirpated from California. Much-reduced populations are in British Columbia. Remaining extant populations are in isolated areas of eastern and western Washington and western Oregon. As of 2001, Oregon spotted frogs are known from eight sites in Washington State (USFWS 2011). Oregon spotted frogs are highly aquatic, staying in or in close proximity to open water. They prefer streams, lakes, ponds, and

marshes that provide open, permanent, quiet waters with relatively warm temperatures and short vegetative cover throughout the year. Adults are opportunistic feeders on a wide range of insects, mollusks, crustaceans, and arachnids. Larvae and tadpoles depend upon vegetative detritus and algae.

Optimal Oregon spotted frog breeding, egg-laying, and rearing conditions occur between January and June and contain open, short vegetation locations in sun-warmed, shallow water which are hydrologically connected to permanent waters. Herbaceous plants used by Oregon spotted frogs are low-growing and sparse; some preferred areas show exposed mineral soils, and an occasional shrub provides a source of cover from predators. Shallow water allows surface water temperatures to rise and speeds egg development. Stable, shallow water levels are critical to keep egg masses hydrated during development into the larvae stage. As spring progresses to summer, surface water must remain connected to nearby deeper, permanent waters to allow tadpole migration. If surface water evaporates and water levels drop before tadpole migration occurs, the young frogs become isolated, desiccate, and cannot survive (USFWS 2011).

Major threats to Oregon spotted frogs include breeding and egg-laying habitat loss and limitations to natural life cycles. Densely growing reed canarygrass may cause frogs to expend large amounts of energy to move through it daily and seasonally. It potentially prevents frogs from reaching optimal breeding and egg-laying sites. Nonnative bullfrogs and nonnative fish in Unit wetlands and channels may prey upon both Oregon spotted frog adults and tadpoles (USFWS 2011, Cucherousset and Olden 2011, Howell 2010). Oregon spotted frogs tested in the Black River drainage showed exposure to chytrid fungus (*Batrachochytrium dendrobatidis*), which is responsible for the decline of many amphibian species worldwide. Dermal infections by chytrid fungus are thought to cause amphibian mortality by interfering with skin functions (Pearl et al. 2009, Speare and Berger 2004, in USFWS 2011).

The Service, WDFW, WDNR, and private landowner biologists in Thurston County coordinate with surveying, monitoring, and research on this species throughout the drainage, including the Unit. Annual egg surveys help gauge frog populations and habitat quality. WDFW and Service data suggest the Black River drainage population is declining.

Invertebrates

Five invertebrate species of specific interest may occur on the Black River Unit. Future inventory of Unit habitats for these species should be conducted.

Beller's ground beetles are a State-candidate species. They occur in sphagnum bogs in open areas with native cranberry, sundew, and low-growing graminoids (Xerces Society 2011). Adults breed in the spring. They eat seeds, vegetation, and small insects. Little is known about the larvae. Threats include habitat loss, changes in hydrology, trampling, and pollution. This species is distributed from the Queen Charlotte Islands through coastal British Columbia, Washington, and Oregon, but only about 25 populations are currently known (Maynard 2009). Two populations are found in Thurston County, including one within the Black River drainage.

Hatch's click beetles are a State-candidate species. They occur in sphagnum bogs, possibly in drier areas associated with Labrador tea (Xerces Society 2011). Adults are capable of flight and have been found April through June. Little is known about the larvae but they may take several years to develop. Adults feed on honey dew, pollen, nectar, and floral structures. This species is endemic to

the Puget Trough region and is known from King County. The primary threats to this species are loss of habitat and loss of connectivity between populations (Kunze, L. 2011, pers. comm.).

Queen Charlotte's copper butterflies are a State-candidate species (NatureServe 2011). They were previously known as the Makah copper butterfly and occur in coastal bogs associated with native cranberry. Their range is from the Yukon Territory south through British Columbia and Washington.

Bog idol leaf beetles (formerly Long-horned leaf beetle) are a State-candidate species that is specifically associated with lowland sphagnum bog habitats and is at risk of extinction due to their limited distribution and isolated populations. The beetles' larvae feed on submerged portions of aquatic plants, whereas adults feed on exposed portions of aquatic plants (White 1983 [cited in Larsen et. al 1995]). Threats are from urban runoff waters that may contain pesticides and other pollutants, and from exotic, nonnative fish that could potentially prey on beetle larvae (Larsen et al. 1995).

Pacific clubtail dragonflies are a State-candidate species. They occur from Washington south through California and east into Idaho. They are found in a variety of aquatic habitats including lakes and slow-moving rivers. Adults fly early June through mid-August. Adults feed on flying insects, whereas larvae feed on invertebrates and possibly small vertebrates. There are currently two known populations in Washington, one on the east side of Black Lake and the other in Skamania County. Larvae require fine-textured substrates for burrowing, and disturbance of appropriate substrates is a key threat. Additional threats include wind- or water-born insecticides, herbicides, and other contaminants (Kunze, L. 2011, pers. comm.).

4.6 Invasive and Nuisance Species

Invasive species are one of the most serious challenges that affect natural resources worldwide. Recent estimates of environmental and economic costs of invasive species in the United States alone approach \$120 billion per year (Pimentel, Zuniga, and Morrison 2005). Invasive plants are plants that have been introduced to the region or U.S. from a different region or country. They may have been introduced intentionally (as an ornamental plant, for example) or accidentally (as a contaminant in crop seeds, for example). Many terms, such as nuisance, noxious, alien, invasive, pest, nonindigenous, are used in referring to nonnative plants and animals. While many nonnative plants are extremely beneficial to society, like rice or potatoes, invasive, noxious, and pest plants spread rapidly and cause or are likely to cause harm to economic, environmental, or human health. President Clinton signed the Invasive Species Executive Order (EO 13112) in 1999 "to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause." The EO further defines an invasive species as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health" (USFS 2015).

The Unit encompasses diverse habitat types, all of which are threatened by exotic or invasive plant species. An *exotic* species may be defined as any species occurring in a particular ecosystem or habitat that is not native to that ecosystem or habitat. An *invasive* species may be defined as an exotic species whose introduction is likely to cause economic or environmental harm or harm to human health (USFWS Executive Order 13112). The Washington State Noxious Weed Board maintains an official State list of noxious weeds and each county keeps a more locally prioritized list. Those lists provide guidance to the refuge staff that manages the Unit, especially about plant species that are

required to be controlled. Some species are more problematic than others on Unit habitats, and some nonnative species are not targeted for control.

The Unit strives to maintain healthy plant communities to ensure that high-quality habitat is available for native flora and fauna, and management of invasive plants is a major strategy. The management strategy utilized is Integrated Pest Management (IPM) (see Appendix G), an ecological approach that uses a number of mechanical, physical, biological, and chemical control methods, including herbicide application, mechanical mowing, haying, selective hand cutting and thatch removal, herbivore grazing, prescribed fire, water control methods, or barrier cloth placement that are minimally detrimental to rare or declining species populations. Preferred methods are those that have the least environmental impact while effectively controlling invasive species. Early detection of new invasions and rapid response is considered critical for cost-effective control and prevention of invasive species from rapidly spreading.

Nonnative animal species are present on the Unit and threaten native animals, especially rare, sensitive, or listed species, as well as potentially impact habitats. In 2001, over 42 species of introduced or nonnative species of wildlife (birds, mammals, amphibians, reptiles) were identified in Washington and Oregon, and more species have become established since then (Witmer and Lewis 2001). Many nonnative species have adverse ecological consequences through direct or indirect mechanisms (e.g., resource competition, displacement, predation, hybridization, disease transmission). Management and control efforts are often difficult and costly, and each situation must be assessed on a species- and site-specific basis (Witmer and Lewis 2001).

The establishment of any invasive species has the potential to cause significant ecological and economic damage to the host ecosystem. Invasive species are typically established without the predator they would experience in their native habitats, often allowing their populations to grow rapidly once introduced (Beck 1994).

Some nonnative species have been targeted for greater levels of control than others based on budget levels, staffing, perceived threat, and ability to enact effective reduction or control. The following descriptions are some of the species known to affect the Unit and fish and wildlife populations.

Plants

Reed canarygrass is the most threatening and major invasive plant problem on the Unit. It is a cool-season, sod-forming, wetland grass native to the northern temperate regions of Europe, Asia, and some parts of North America. Its use in the Pacific Northwest began in the late 1800s. Farming followed logging operations and reed canarygrass was often used to stabilize rough logging areas as it was extremely productive, easy to establish, and persisted very well. No other forage plant is as well adapted to wet, marshy areas as reed canarygrass. It can withstand flooding and can tolerate continuous inundation for as long as 60–70 days without permanent injury (possibly longer depending on temperature, current, and silt content of the water). It thrives along stream banks, wet meadows and pastures, wetlands, roadside ditches, river levees and dikes, drainages, and floodplains. Although wet areas in full sun are preferred, reed canarygrass is also very drought tolerant and able to withstand high degrees of variability in soil type, PH levels, fertility, temperature, and exposure (Tu 2004, Kilbride and Paveglio 1999).

Unfortunately, reed canarygrass has proven to be aggressive in the Pacific Northwest. It moves out of pastureland and into stream bottoms, wetlands, and canal banks and persists where it is not desirable.

Reed canarygrass can outcompete most native species, threatening natural wetlands by forming large, single-species stands. It has limited value to wildlife. Limited foraging occurs from deer and elk while it is young and tender, however, they do not continue to graze on it when it grows tall and coarse. It grows so densely that it inhibits movement of small mammals, waterfowl, amphibians, and reptiles. It causes increased siltation in slow-moving creeks and rivers. It produces large amounts of pollen and other grasses; pollen from reed canarygrass is easily airborne and is moderately allergenic to humans. Once established, reed canarygrass is very difficult to control because it spreads rapidly by rhizomes, seeds, and is so adaptive (Tu 1974, WDOE 2015a, TCNWCA 2013a).

This difficult pest has long dominated the Puget lowlands and is a serious threat to the Black River channel and tributary habitats and to the animals that depend upon this habitat. It is solidly established along the river edge growing out from the riverbanks and overtaking all open, sun-warmed, muddy bank sites that are so important for animals to bask in and rest. The river edge has become a dense, tall, grass monoculture instead of a diverse plant community of flowering plants. It has rooted on the abundant woody debris in the river. In the northern portion of the Unit between the pipeline and 110th Avenue, it has shown an ability to root on top of submerged native plants in the river channel and spread across to root on the banks. In the northern segments of the river, it has obscured the shallow river channel, choking water flow, impeding sunlight penetration, and preventing canoe access. It has significantly changed the wetland vegetative community of the Black River area.

In 2001, an extensive wetland habitat enhancement project was completed near 123rd Avenue in the Black River Unit. Dense, tall-growing, invasive reed canarygrass biomass, including roots, was dug out with heavy equipment and removed from approximately 10 acres. An open water pond and some smaller deeper water areas were created and some native wetland plants were planted around the ponded site on exposed ground. This enhancement project improved habitat for all Oregon spotted frog life stages including adult breeding and egg-laying, rearing, non-breeding, and over-wintering activities. However, the reed canarygrass grew back via nearby rhizomes and seed sources to nearly the same biomass density within 7 years.

To retard growth and emulate low wetland plant structure at Billy Frank Jr. Nisqually NWR headquarters area, mid- to late-summer dry season mowing is used to reduce the above ground biomass, then plow or disc to break up the root mass and dry the roots. This enhances wildlife use and movement in winter. Winter rains usually flood lowlands and covers short reed canarygrass which helps retard its growth until late spring when it begins to grow. But without regular controls reed canarygrass grows to ~15' high and becomes incredibly dense again. This treatment would not be applicable to the Black River channel or edges. Coordination with specialists would be needed and the ability to use selective herbicides would most likely be the best option.

Poison hemlock's entire plant structure is toxic to humans and animals. It grows in both uplands and moist sites. Ongoing efforts to control this species have been successful and only a few small, resilient patches persist. For those sites where manual control is difficult, an appropriate herbicide has been used.

Purple loosestrife is identified throughout the U.S. as an invasive wetland marsh plant and has been found in many locations along the Unit. The Thurston County Noxious Weed Agency has worked diligently to control it for years, and recently the Billy Frank Jr. Nisqually Refuge Weed Warriors have taken up the challenge and continue the work to control it by hand-digging. Although the control work has gone on for years, the seed bank allows plants to come up every year. Herbicide

spot treatment is used judiciously on difficult-to-reach purple loosestrife plants. Bio-control beetles have been successful in helping to control large loosestrife populations in Oregon, but most likely would not be effective on the few plants that pop up each year on the Unit.

Yellow flag iris is a nonnative, ornamental flowering bulb that has escaped cultivation into wetland marshes, river channel edges, and wetland shrub-scrub. It forms dense clumps and thick mats of bulbs in freshwater wetlands and can tolerate brackish conditions. Its large seedpods float and spread viable seeds downstream to produce additional plants. Fragmented roots and bulbs rip off during high water events or can be torn out by animals and become new plants. Control of this species along the river will be difficult as the riverbanks are unstable muck that supports floating mats of reed canarygrass, shrub roots, and iris bulbs. Controlling the spread of this plant is dependent on annually removing seedpods before they are released into the river and treating with a wetland-approved herbicide using a cut-stump technique.

Wild chervil used to occur in a large infestation off 118th Avenue (originally about 15 acres) but is nearly gone as of 2012 and is closely monitored.

Tansy ragwort is occasionally found in dry, open areas or on margins of forest. A history of control has reduced the amount of ragwort to a very small level, and control efforts are ongoing annually.

Holly is generally found in uplands. It is a popular ornamental shrub or tree that has escaped and birds spread seeds by eating the fruit. Small plants can be pulled or dug with good results. In the past, larger specimens were cut (flowers and fruits are bagged and removed), but because of the cut stem's ability to successfully develop roots and survive, they are now girdled and herbicide is painted onto the stripped area.

Himalayan and evergreen blackberry species are found along forest edges, in uplands, and along the transition zones with wetlands. This plant invades disturbed areas, open areas where low-growing native vegetation exists, and near where seed sources are located. Often this plant is not controlled unless intense restoration is planned. In many areas, this plant is first cut low to the ground, and regrowth is sprayed with herbicide and native plants are installed. On the Unit, blackberry is also found in upland mixed forests, riparian forest edges, dry nonnative grasslands, and open areas.

Canada thistle and **bull thistle** are located in upland sites but can be found along wetland margins. Deflowering methods are temporary control measures to prevent the spread of seeds. Bull thistle can be manually controlled by cutting the vegetated top from the root at the soil line. Canada thistle grows through rhizomes and is not controlled with cutting. These invasive plants are controlled with herbicides in areas of soil disturbance, initial clearing for restoration, maintenance of past restoration sites, or maintenance of areas where buildings occur or were recently removed (TCNWCA 2013b).

White watercress is a "naturalized" submerged plant that is densely growing in the river channel, especially north of 110th Avenue. Its thick growth should be examined regarding its possible impact on the waterway. Some of the factors most likely related to the growth are increased nutrient levels, decreased pressure from healthy native populations, increased sedimentation or water temperatures, and decreased predation (Seery, M.J. 2012, pers. comm.). Unimpeded growth of nonnative, submerged plants chokes water flow, impedes sunlight penetration, changes the natural conditions of the river and stream channels, limits animal (e.g., amphibian and fish) movement, and outcompetes native submersed plants (WDOE 2015b).

Fish

Nonnative fish are widespread in the Black River and, unlike the native fish, they are warm-water species. They have been introduced most likely for sport fishing and include American shad, brown bullhead, pumpkinseed, bluegill, rock bass, largemouth and smallmouth bass, black crappie, yellow perch, northern pikeminnow, and others (Creveling et al. 1980, Kunze, L. 1996b. pers comm.).

Nonnative fish presence alters natural habitats and conditions for native animals sharing the same locations. Most nonnative, warm-water fish (or spiny-ray) are predatory on native fish, amphibians, and invertebrates. Their presence changes (and most likely reduces) native fish, amphibian, and invertebrate populations. In addition, nonnative fish compete for and most likely reduce prey resource availability for native fish and amphibians. These fish may be especially deleterious to the populations of endemic Olympic mudminnow, the State-listed as endangered and federally listed as threatened Oregon spotted frog (in every life phase), State candidate species Pacific clubtail dragonfly (egg, nymph, and naiad stages), and other sensitive species, and the prey resources they need to survive.

Birds

Brown-headed cowbirds forage in open areas and breed wherever small landbirds nest. Historically, they inhabited short-grass prairies of the mid-western U.S., but with development, agriculture, and forest fragmentation, they have expanded their range significantly. Females lay eggs in other birds' nests and leave the rearing to other species. They find nests to parasitize by looking for birds building nests, either by walking along the ground, perching quietly in shrubs or trees, or making noisy flights back and forth, possibly to flush potential hosts. Young cowbirds are at a competitive advantage as they mature faster than other young in the host nest. Over 220 species have been observed supporting brown-headed cowbird eggs in their nests, and at least 144 species have raised brown-headed cowbird young to the fledgling stage, often at the expense of their own young (Seattle Audubon Society 2002).

European starlings have expanded their range westward ever since they were introduced to the east coast of America. They forage in open areas usually near development. They require nearby nesting cavities and are creative in using crevices in building structures such as plane hangars. Starlings can be aggressive and will persistently harass other species to take over limited numbers of nesting cavities such as natural hollows, old woodpecker holes, and birdhouses (Seattle Audubon Society 2002).

House sparrows were introduced to this country from Europe and are found in settled areas. These sparrows are opportunistic and eat whatever is available. While they are not highly territorial with their own species, they are aggressive toward other species and may drive native birds out of their nests. They typically breed in cavities or crevices in buildings, nest boxes, or other birds' nests, but if they are in an area with no available cavities, they will nest in trees or shrubs, often in small colonies (Seattle Audubon Society 2002).

Mammals

Eastern gray squirrels were introduced in Washington in the early 1900s and have been repeatedly released in parks, campuses, estates, and residential areas and are adept at taking over cavities and

birdhouses. They are now the most common squirrels in urban and some rural areas, such as around the Unit.

The increasing number of introduced Eastern gray squirrels is often said to be responsible for the decrease in Douglas squirrels in certain areas. However, given that these squirrels have different food and shelter preferences, it is likely that increasing housing and other development and loss of coniferous forests is responsible for some of the decline in Douglas squirrel populations (Link 2004).

Nutria are semi-aquatic rodents native to southern parts of South America. In the 1930s, they were sold throughout North America to fur farmers and as a means of controlling unwanted aquatic vegetation. Various associations, magazine and newspaper articles, and demonstrations at county fairs promoted the sale of nutria in Washington. More than 600 nutria farms existed in Oregon and Washington from the 1930s to the 1950s. Flooding and storms damaged holding structures, allowing nutria to escape. Farmers also released their stock when nutria farming became uneconomical. By the 1940s, nutria were present on both sides of the Cascade Mountains in Washington (Link 2004).

Nutria generally occupy a small area throughout their lives. Daily travel distances for most nutria are less than 600 feet, although some individuals may travel much farther (Link 2004). Nutria are suspected to occur on the Unit based on observations of feeding platforms and clipped vegetation floating in the water. Nutria skulls found on the Unit in 2012 confirmed this animals' presence.

Nutria are known for 'eating out' herbaceous vegetation and negatively impacting plant communities and plant diversity. The habitat and specifically plant cover needed by native wildlife would be compromised by nutria populations.

Virginia opossums were found only in Central America and the southeastern United States prior to European settlement. During the 1900s, their range expanded northward and westward and first arrived in Washington in the early 1900s as pets and novelties. Some of these animals, or their offspring, later escaped from captivity or were intentionally released. With few natural predators, the absence of hunting, and an abundance of food and shelter, opossums have adapted well to living close to people in urban and suburban environments. Except for higher elevations, opossums now occupy most human-occupied habitats in western Washington. These animals are most likely present in or near the Unit. Opossums prey on native invertebrates, small mammals, amphibians, reptiles, and ground nesting birds, nestlings, and eggs.

Eastern cottontails were introduced to several areas in Washington as a game animal beginning in the 1930s. They often are associated with Himalayan blackberry thickets which provide them with a secure hideout to foray out at dawn and dusk or other shrubby cover areas. No rabbit is native to the west side of the Cascades. Some potential or realized ecological consequences of eastern cottontail rabbit presence include damage to native plants, competition with native species for forage, and spread of disease and parasites.

Reptiles and Amphibians

Red-eared sliders are native to the southern midwestern U.S. In Washington, this turtle occurs in the Puget lowlands (Brown et al. 1995, Dvornich et al. 2001). Red-eared sliders compete with indigenous species for food and basking sites (Frank and McCoy 1995, Williams 1999, Salzberg 2000). Red-eared sliders seem to be adaptable to many climates. This, combined with their

omnivorous diet and ability to adapt to various habitats, gives them great potential for altering native habitats should reproducing populations become established. In Washington, they are a potential threat to *Clemmys marmorata*, the Pacific pond turtle (Williams 1999), a declining species endemic to the Pacific states (Brown et al. 1995).

Bullfrogs are native to the eastern and midwestern U.S. and southeastern Canada. They have been introduced to most of western North America and to Washington by the early 1930s to provide opportunities for frog hunting, food, and stock for frog farms. The bullfrog is the largest true frog in North America, measuring 8 inches in length, and lives nearly 10 years. Bullfrogs can leap up to 3 feet, cross pastures and grasslands, and may travel overland up to 1 mile. This mobility allows them to expand their range from the location where they were introduced. The large number of eggs (10,000 to 20,000) in each egg mass laid by the females allows bullfrogs to quickly establish themselves within a new territory. In the Pacific Northwest, tadpoles usually take 2 years to mature, thus they require year-round water (Corkran and Thoms 1996).

In Washington, bullfrogs thrive in the warm waters of natural and man-made ponds, marshes, sloughs, reservoirs, and sluggish irrigation ditches and streams. Disturbance and development around wetlands often create warmer conditions. Bullfrogs tolerate polluted and muddy waters better than most native frogs and may be found within cities in wetlands, reservoirs, and stormwater ponds (Corkran and Thoms 1996, Link 2004).

Large populations of this species are believed to have contributed both directly and indirectly to the drastic decline of native amphibians and reptiles. Bullfrogs are much larger than native frogs and have few predators in Washington. Adult bullfrogs usually are "sit and wait" predators that readily attack almost any live animal smaller than themselves—insects, frogs, tadpoles, fish, small snakes, turtle hatchlings, newts, salamanders, rodents, bats, hummingbirds, ducklings, and birds up to robin size (Link 2004, McKercher and Gregoire 2012). Large multi-year larvae (in Washington) can have a significant affect upon benthic algae, and thus perturb the aquatic community structure (McKercher and Gregoire 2012).

The effects of bullfrogs on Oregon spotted frog populations were summarized in the final rule for Oregon spotted frog threatened status listing (78 FR 53581):

Bullfrogs share similar habitat and temperature requirements with the Oregon spotted frog, and the overlap in time and space between the two species is believed to be extensive (Hayes 1994, Hayes et al. 1997). Bullfrog tadpoles outcompete or displace tadpoles of native frog species from their habitat or optimal conditions (Kupferberg 1997, Kiesecker and Blaustein 1998, Kiesecker et al. 2001). Studies have shown Oregon spotted frog remains in bullfrog stomachs at multiple sites (McAllister and Leonard 1997, Hayes 1999, pers. comm., Haycock and Woods 2001, unpubl. data cited in COSFRT 2012, Pearl 2012, pers. comm., Wilson 2014, pers. comm.). Oregon spotted frogs and northern red-legged frogs historically coexisted in areas of the Pacific Northwest that are now invaded by bullfrogs. However, the Oregon spotted frog has declined more severely than the northern red-legged frog (Pearl et al. 2004).

Invertebrates

There are no known nonnative invertebrates within the Black River Unit.

Potential New Threats from Nonnative and Invasive Species

Several plant species from the Washington State and Thurston County noxious weed lists are likely to become threats to the Black River Unit. A few of them are described below.

Knotweed (Japanese, Bohemian, Himalayan, giant knotweed, or hybrids) is likely to be found infesting Unit habitats in the watershed. This aggressive, perennial plant dies back each winter; spring growth reaches 10–20 feet high and it overtakes all but tall trees. It seems to grow almost anywhere there is sunlight. It grows in moist conditions along wetlands, along the edges of riparian and mixed forests, and is aggressive in dry grasslands, old pastures, and open areas. Knotweed spreads with each high water or flood event, which carries pieces of the plant to new locations where they can root. This plant successfully roots from any leaf or root node on the stem, even when it is broken or cut into many pieces. High water, flood events, mowing, and careless cutting are known to enhance its ability to spread (King County 2013). It has been found within the Unit acquisition boundary (Thurston County 2013), but is not on currently on Service-owned parcels.

Hydrilla, Brazilian elodea, variable-leaf (Eurasian) milfoil, fanwort, parrotfeather, nonnative bladderwort, and other submersed aquatics are serious threats in Unit waterways, especially because some have been found in other parts of the watershed. Although it is not known if any of these species infest Unit waters, Eurasian milfoil occurs in Black Lake, which is linked to the headwaters of the Black River. Downstream from the Black River, in the Chehalis River, a large Brazilian elodea infestation that extended 6 miles was recently controlled by Thurston County.

4.7 Biotic Responses to Climate Change

Existing and strengthening evidence shows changing climatic conditions have affected, and will continue to affect, many biotic communities (Parmesan 2006, Rosenzweig et al. 2008, Geyer et al. 2011). Projections of continued and likely accelerating changes in temperature and precipitation are well supported, especially at global scales (see Section 3.2). However, at our current level of understanding, it is difficult to assess near-term biotic responses to changing climatic conditions at specific locations because of the inherent spatial and temporal complexity of ecological systems, coupled with short- and long-term weather pattern variability (Akçakaya et al. 2006, Parmesan et al. 2011). Compared to present-day conditions, most climate-related effects likely will not be detectable during the 15-year timeframe of this CCP, at least to document changes outside the wide, “normal” inter-annual range of expected physical conditions in the Pacific Northwest region. However, the seriousness of potential, long-term, climate-change-induced impacts to Black River Unit ecological resources warrants their assessment and inclusion in relevant planning efforts (USFWS 2010), including this CCP.

Several climate-related factors may impact the Unit’s aquatic and upland habitats. In particular, species (especially amphibians) that rely on wetland, riparian, and aquatic habitats are vulnerable to many climate-change-related effects in the Pacific Northwest (Lawler et al. 2008).

The nearer-term factors of most importance to Black River Unit include increased prevalence of invasive plants and animals, as well as further-altered hydrology (e.g., stream flow, water temperature) within the Black River watershed. Over time, many other climate-induced changes could affect Unit environments—these include more-intense outbreaks of insects, diseases, and

pathogens, and range shifts and/or phenological changes that disrupt plant and invertebrate community structure.

Following are brief discussions of those climate-related impacts most relevant to the habitats and ecological communities at the Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge. Details concerning historic and projected climate change effects to the physical environment are provided in Chapter 3. Additional background regarding general responses of biotic communities to climate change is available in Littell et al. (2009), Tillmann and Siemann (2011), and National Fish, Wildlife and Plants Climate Adaptation Partnership (2012).

Effects to Aquatic Habitats

Invasive Species. Controlling the extent of nonnative and invasive plants, such as reed canarygrass, yellow flag iris, and purple loosestrife is a major, ongoing Unit management activity to maintain the quality and functioning of aquatic habitats. Other invasive/introduced species, including aquatic plants (e.g., hydrilla, Brazilian elodea, Eurasian milfoil), algae, warm-water fish (e.g., northern pikeminnow, bullhead, bass, crappie), bullfrogs, and invertebrates (e.g., New Zealand mudsnails, red swamp crayfish), are or may be present within Unit habitats. Increased air and water temperatures, altered precipitation amounts and seasonality, and other factors associated with climate change likely will exacerbate the occurrence and prevalence of invasive plant and animal species (Hellman et al. 2008, Rahel and Olden 2008, HDR Alaska 2009, Willis et al. 2010). This may be particularly important regarding future management activities for Oregon spotted frogs. Invasive plants (especially reed canarygrass) and bullfrogs already are substantial threats to these frogs, and any additional impact from climate-enhanced invasive species populations would require greater management effort to maintain and enhance the Unit's Oregon spotted frog population.

Hydrological Changes to the Black River Watershed

The hydrology of the upper Black River watershed has already been impacted by anthropogenic alterations (see Chapter 3). These changes have affected water quality and quantity, and ultimately the Unit's biological resources.

Climate change effects within the rain-dominated Black River watershed likely will be muted during the next few decades. However, projections for reduced summer (low) flows and increased air temperatures would undoubtedly impact water temperature and quality. Even these muted impacts likely would exacerbate algal blooms (Kundzewicz et al. 2007) and the prevalence of invasive plant and animal species (see above). Increased stream temperatures also could negatively affect salmonid use of the Black River as well as its tributaries (Mantua et al. 2010, Isaak et al. 2012). These same climate impacts have been associated with increased infectious disease occurrence and resulting population declines in amphibians (Blaustein et al. 2012).

As described above for invasive species, any further degradation of hydrologic conditions would pose additional threats to priority Unit resources such as Oregon spotted frogs and Olympic mudminnows.

Effects to Upland Habitats

Relative to riverine habitats, near-term climate-related impacts to Unit upland habitats likely will be minimal. The Unit's forest species have low vulnerability to projected climate change (Aubry et al.

2011) because of the generally muted changes in temperature and precipitation projected for the Black River watershed (Mauger and Mantua 2011). The Unit's dry, nonnative grassland habitats are already greatly altered, and the plant species composition there likely is resilient to near-term projected changes in precipitation and air temperature (IPCC 2007:11).

Changes in temperature and precipitation likely will cause some level of physiological stress that will affect forest health (Vose et al. 2012). The greatest threat is the increased risk for insect and pathogen outbreaks, potentially resulting from both new range expansions as well as greater susceptibility to existing insects and pathogens (Ryan and Vose 2012). However, great uncertainty exists because of the complex interactions of insects, pathogens, hosts, and climate (Kliejunas 2011).

Similar to aquatic habitats, climate change may exacerbate occurrence and prevalence of nonnative invasive plants that could alter species composition and expected forest community succession (Shafer et al. 2010). Also, drier and warmer summer weather could increase occurrence of wildland fires (Climate Impacts Group 2004), which could affect forest composition and regeneration as well as grassland forage availability.

Other Potential Long-term Climate Change Effects

Over time, many additional climate-related factors could impact Unit biota. For the Black River watershed, the most important might be range shifts and altered phenology of plants and animals. Warming temperatures and altered precipitation patterns may alter many processes, including leaf unfolding, flowering, insect emergence, and the arrival of migratory birds (see Tillmann and Siemann 2011).

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A close-up photograph of an Oregon spotted frog in a pond. The frog is dark brown with reddish-brown spots and a prominent yellow eye. It is surrounded by dry reeds and water.

Chapter 5

Human Environment

Chapter 1
Introduction
and
Background

Chapter 2
Management
Direction

Chapter 3
Physical
Environment

Chapter 4
Biological
Environment

Chapter 5
Human
Environment

Appendices
A-M

Chapter 5. Human Environment

5.1 Cultural and Historical Resources

The U.S. Fish and Wildlife Service is mandated by law to appropriately manage the cultural resources under its control (Appendix F). The cultural history of the Black River Unit is identified primarily from a report concerning differences in vegetation over time in the Black River lowlands (Easterly and Salstrom 2008) and a cultural resource report and overviews prepared by Service archaeologists (Parks 2011).

5.1.1 Prehistoric and Ethnographic Resources

Paleontological and Prehistoric Sites

There is no known information about paleontological resources occurring on the Unit; there are no prehistoric archaeological sites recorded. However, there has been virtually no systematic archaeological survey or testing conducted. Moreover, a large portion of the approved boundary is not currently under Federal ownership. All ground-disturbing activities proposed for the Unit and for parcels that are acquired in the future will be subject to compliance with Section 106 of the National Historic Preservation Act, which may include pedestrian surveys and other identification efforts as appropriate (Parks 2011).

Native American Cultural History and Landscape

The Black River Unit lies within the territory of the Southwestern Coast Salish peoples (Hajda 1990). In particular, the Upper Chehalis Tribe fished the waters of the Black River and harvested camas (an edible plant) from the surrounding prairies (south of the Unit) and used fire to maintain open fields for game species (elk and deer) and plants. As noted by Cooper, one of the “naturalists to the expedition” surveying the route of the Pacific Northern Railroad in the mid-1850s:

A few remarks are necessary upon the origin of the dry prairies so singularly scattered through the forest region. Their most striking feature is the abruptness of the forests which surround them, giving them the appearance of stands which have been cleared and cultivated for hundreds of years. From various facts observed I conclude that they are the remains of much more extensive prairies, which, within a comparatively recent period, occupied all the lower and dryer parts of the valleys, and which the forests have been gradually spreading over in their downward progress from the mountains. The Indians, in order to preserve their open grounds for game, and for the production of their important root, the camas, soon found the advantage of burning, and when they began this it was only those trees already large enough that could withstand the fires. (Cooper 1859, as quoted in Storm 2004, in Parks 2011)

Ethnographic evidence indicates that the Southwestern Coast Salish peoples were divided into small bands that claimed resource areas such as watersheds (Larson and Jermann 1978:10). The Upper Chehalis-speaking Squiaitl or Kwaiailk ranged from the Black River northward to Eld Inlet (Hajda 1990). The individual groups were loosely affiliated, sharing similar dialects and resource-based lifestyles, but not political connections. Most villages were located at the mouths or confluences of creeks and rivers for easy access to fisheries. Houses were constructed with posts and cedar planks in a long, rectangular form that accommodated several families. Rivers were important transportation

routes for the inland Upper Chehalis, but trails were also important in areas where streams were impassible or infrequent (Hajda 1990 in Parks 2011).

Subsistence patterns were defined by seasonal availability of salmon runs, roots, and berries, supplemented by gathering shellfish and hunting. In the spring and summer, villages would divide into smaller clusters to gather berries and hunt. Stone tools, net weights, shell middens, and fire-cracked rocks used for cooking foods are the most obvious evidence of occupation sites (Speulda 1997 in Parks 2011).

Euro-American Exploration and Settlement

Descriptions of conditions along the river near the beginning of European settlement are provided by official records made by early explorers in the area. Comments on the vegetation from two expeditions in the area thought to be within the current boundaries of the Black River. The first of these was in 1824, when the Hudson Bay Company sponsored the James McMillan Expedition, a 41-man expedition to the Fraser River from the Columbia River in search of sites for trading forts. The McMillan Expedition noted:

[T]he river became . . . so narrow and nearly choked up with willow and trees that we found it necessary to make a portage. . . the shores are complete thickets of willows and different kinds of deciduous trees, mostly ash. The portage is a fine road through a handsome plain. Saw several marks of beaver by their cuttings they seem to be fonder of the ash than other trees” ([Work 1824] in Easterly and Salstrom 2008).

The second expedition through the area was in 1841, when Charles Wilkes commanded the earliest U.S. Exploring Expedition to reach the Oregon Country. Wilkes sent a party of nine men in July of that year from the Hudson Bay Company’s Fort Nisqually to Grays Harbor by way of the Black River. From an area just below Black Lake, the Wilkes’ Expedition noted:

This appeared at first almost impassable, for it was for four miles almost choked up with Sparganium, Nup[h]ar, &c., so that it was difficult to pass even with the small canoe. Its breadth was from twenty to sixty feet, and it was from three to twelve feet deep. The turns were sometimes so short, that the large canoe would be in contact with the thickets on the banks at both ends, and it required much force to drag her along, by pulling by the branches, and caused great labor in cutting their way. . . They were obliged to continue their course down the river, until nine o’clock at night, before they could find any place to encamp, on account of the bog and jungle ([Wilkes 1844, pp 132-133]in Easterly and Salstrom 2008).

Euro-American settlement in the Nisqually Delta occurred in the early 1800s. The Hudson’s Bay Company established Fort Nisqually in 1832. The small settlement of farmers developed a thriving livestock industry to support other Hudson’s Bay Company outposts. Overland migration beginning in the 1840s brought Americans into the Northwest, many of whom chose the Puget Sound Region in which to settle (Speulda 1997). Settlement of the Littlerock and Black River area began in the 1850s by the Dodge, Shotwell, and Rutledge families. In 1852, Thurston County was established and Olympia selected as the provisional capitol of the Washington Territory (Parks 2011).

At each section corner GLO surveyors recorded notes about the vegetation encountered along the line in the previous mile segment. Records included the species encountered (generally trees and shrubs); presence, extent, and/or sign of fire along the GLO transect; and general composition of the

understory (sparse/dense). Also noted were the transition points between prairies, hills, marshes (or bottomlands), timber and burnt timber, usually with the bearing direction of the ecotone/margin noted. The locations, width, and direction of rivers and streams were also recorded. Township maps were then drawn using GLO field notebook data. These maps showed the section line locations of rivers, streams, prairies, hills, and marshes, and the estimated direction or shape of the feature (Easterly and Salstrom 2008).

More quantitative historic information was provided by surveys done for the GLO and Donation Land Claims, which were done during the 1850s in the study area. For the GLO surveys, transects were made first to establish Township boundaries; later surveys established the corners of each Section within the Township. The GLO survey maps are among the earliest documentation/description of the landscape prior to farming and development (Parks 2011) (Table 5-1).

Table 5-1. Summary of Landscape Descriptions on GLO survey maps in the vicinity of Black River

Township	Range	Date Completed	Notes on landscape in study area
16 North	3 West	1855	Soil in the river bottom first rate; rolling gravelly prairie soil second rate; Land rolling soil second rate. Timber for cedar and maple; undergrowth hazel, fern, vine, maple, salal
17 North	2 West	1854	Unsurveyed land unfit for settlement or cultivation
17 North	3 West	1856	Alder, willow, and spruce swamp, entirely covered with water. Unfit for cultivation. Impassible and unsurveyed (Black River floodplain)

Known Historic Sites

As parcels are acquired within the approved boundary of the Unit, they often come with standing structures associated with the area's agricultural history. Several farm complexes or residential structures have been documented and evaluated by the Service's Cultural Resources Team as they were acquired. One site was determined to be eligible for the National Register of Historic Places (NRHP), and a Memorandum of Agreement (MOA) to mitigate effects of demolition was adopted and its stipulations were completed in 2005. Three farms were determined to be ineligible. Where needed, the subject buildings have been recorded and removed or are slated for removal through demolition and salvage.

Historic Resources Recorded on the Black River Unit

The history of land use and development associated with the farms provides an important source of background information for Unit management when making decisions regarding habitat restoration and enhancement. The following text from Parks (2011) summarizes information about the various parcels within the Unit boundaries.

Weiks-Evergreen Dairy

The first settler to acquire land in the area encompassed by the Evergreen Dairy was Nathaniel Z. Thallheimer in 1866, when he filed for a Donation Land Claim for 162.26 acres in the NW ¼ of the

section (GLO Records #216). Another claimant, possibly William Morey, filed for a homestead claim in 1869 for the NE ¼ of the section. The homesteads were not successful and there is no evidence remaining of the pioneer period.

In 1879, Thomas Rutledge opened a post office, designated Littlerock, to serve the local community. Logging increased during the 1880s, and there were 40 logging camps operating in Thurston County (Costantini and Stevenson 1985:7). The town of Littlerock was platted in the 1890s. The railroad, constructed in about 1890, crosses through the eastern portion of section 2, connecting through the community of Littlerock. Land speculation followed the railroad, and by 1900 two land development companies, Everett's Addition and Waddell Valley Garden Tracts, were advertising in the Black River Valley for small 5- to 10-acre tracts. The Waddell Valley Garden Tracts B-9, B-10, and B-11 encompass most of the area that later became the Evergreen Dairy.

The early 1900s was a period of growth for Thurston County, with Olympia growing in population and expanding its government offices. The dairy industry also began to thrive because the growing population created a local market for fresh milk. By the 1920s and 30s, electricity extended to many farms and all-electric milking machinery and modern equipment for bottling milk added to the convenience and safety of fresh milk. Home delivery increased with modern delivery trucks. After World War II (WWII), the dairy industry consolidated as larger, regionally based dairies began marketing their products at supermarkets. This trend continued, reducing the number of small, family-owned dairies.

Carl Weiks was born in 1876 in Norway and stowed away on a vessel bound for the United States, drawn to Washington by the logging boom of the 1890s. By 1910, Weiks had settled his growing family near Littlerock and was working as a logger and later became a livestock and dairy farmer.

The Polk's Directory for Thurston County lists Carl Weiks in the 1919–1920 directory, but it was not until 1923–1924 that he was listed as the Carl Weiks Dairy. By the early 1930s, there were 16 dairies listed in the vicinity. Weiks' was one of the first, and thanks to his ability to draw on family members, the enterprise was able to diversify and became successful during and after the Depression. The Evergreen Dairy bottled milk and had the home delivery route for most of Tumwater from the mid-1920s to about 1940. After WWII, they branched out into poultry and livestock breeding. The family operation continued, evolving to adapt to the changing industry, until the mid-1980s, when the time of the independent, family-owned dairy was coming to a close. In 1985, Darigold, a large national dairy chain, began leasing the operation, but then began to close it down (Speulda 2004a).

A 1985 countywide cultural resources survey which inventoried representative “prevalent styles of architecture, important social organizations, commercial governmental and agricultural development and important individuals who have influenced the culture, history and government of Thurston County” (Costantini and Stevenson 1985), included the Weiks-Evergreen Dairy among the 143 out of 318 properties that met the criteria of significance.

In 1997, the dairy, situated at an elevation of about 130 feet on a 100-year floodplain, was inundated by floodwaters, soon followed by a downturn in the market in 1999. These factors forced the Weiks family into foreclosure and they lost the farm in 1999. Scatter Creek Holdings purchased several farms at auction, then sold them to The Nature Conservancy, which in turn offered selected parcels to the Service, including the Weiks-Evergreen Dairy, the La France Farm, and the North Farm. The Service acquired the parcels in 2002 with 20 buildings still standing.

La France Farm

The first settler to acquire the land in the La France Farm area was Marcy C. William, who in 1869 completed the requirements for a homestead for the 160-acre parcel. Her claim encompassed most of the area currently developed as the community of Littlerock. No additional information about Marcy William has been uncovered. The parcel was subsequently subdivided with the railroad, constructed in 1890 crossing through the claim northwest to southeast, and La France Road dividing east and west halves of the claim. By 1900, two land development companies, Everett's Addition and Garden Tracts, were operating in the Black River Valley, subdividing the valley into small 5- and 10-acre tracts. The La France Farm area was included in the Everett's Addition subdivision as Lot 24 (Metsker 1900).

In about 1914 Carl Weiks began purchasing lots within the Everett's Addition and Garden Tracts subdivision, amassing several hundred acres for a dairy operation from the development companies that had proven unsuccessful. After WWII, the family used the La France Farm for raising pigs. The family owned the La France Farm as part of their extensive operations until 1998, when a downturn in the market led to foreclosure on the property. Scatter Creek Holdings purchased several farms in the Black River Valley during an auction following the foreclosure. Several parcels, including La France Farm, were subsequently purchased by The Nature Conservancy, which then offered the parcels to the Service. The farm did not contain a house or other elements of a farm to distinguish it, and the two sheds on the land at time of the Service's purchase were determined to be ineligible to the NRHP (Speulda 2001a).

North Farm

When the GLO survey of this location was completed in 1856, it was listed simply as a swamp with no improvements. The first transfer of the property from Federal ownership occurred in 1894, when it was included in a railroad grant of more than 9,000 acres. In about 1911, a development grant was issued for Waddell Creek Valley Garden Tracts by N.J. and Lucy Redpath and C.E. and Barbetta J. Maynard. The garden tracts were 5- to 10-acre plots for a subdivision type of development. They had been logged over and were described locally as "stump farms" (Weiks, M. 2001b. pers comm.). The subdivision never materialized; instead the lots were combined into larger blocks for agricultural development.

The North Farm is among the Waddell Creek Valley tracts that were purchased by Carl Weiks in about 1914. Members of the family remember living adjacent to the North Farm, but not on it. The family continued to own the North Farm as part of their extensive operations until 1997, when a change in family interests led to foreclosure on the property and an auction sale to Scatter Creek Holdings (along with La France Farm and the Weiks' Evergreen Dairy Farm).

When the farm was evaluated in 2001, there were 10 buildings. All were constructed between the 1930s and 1980s, and were determined to be ineligible for listing on the NRHP (Speulda 2001b). All but two have been removed.

Kiser Tract

The Kiser Tract is a 68.8-acre parcel of agricultural land in the Black River floodplain that was acquired for inclusion in the Black River Unit in 2000. A complex of buildings on 3 acres at the western edge of the property was evaluated for its significance in 2004 in anticipation of demolition

for safety and management reasons. The Kiser buildings were not included among the significant historic properties identified in the 1985 Thurston County cultural resources survey (Costantini and Stevenson 1985). In 1856, when the GLO survey was completed, the area where the farm was later situated was identified as swampland with no improvements. The SE ¼ of section 35 was homesteaded by John F. Shotwell. No buildings or features on the property correlate with the original homestead period of the 1870s. None of the existing buildings on the parcel were determined to be eligible to the NRHP when purchased by the Service (Speulda 2004b).

Although only the historic sites above have been recorded on lands owned by the Refuge, there are very likely additional tracts that will be acquired in the future which include infrastructure greater than 50 years old.

5.2 Infrastructure and Facilities

The infrastructure and facilities discussed in this section include buildings, roads, trails, regulatory and interpretive signs, and other physical structures.

The Unit has been closed to all public use and activities during the development and ongoing acquisition phase. Unit boundary signs or fences are generally installed around the perimeter of all newly acquired lands. As parcels are acquired, the buildings on them are often not needed. The Unit has several derelict buildings in need of removal. These include barns, outbuildings, and houses that are in disrepair and need to be demolished. The remaining buildings are subject to trespass and vandalism. Removal of these buildings is a priority and will continue as funding becomes available.

The Black River Unit does not maintain any roads, parking areas, or trails.

5.3 Recreation Overview

All areas of the Unit are closed to public access; no lands have been officially opened. Some Unit-owned lands are fenced, gated, and posted.

Service ownership of the Black River Unit does not include the waters of the Black River. The river is used as a recreational site for boating, fishing, canoeing, wildlife observation, and other activities. All areas of the Unit are closed to public access.

5.4 Wildlife Observation and Photography

All areas of the Unit are closed to public access.

5.5 Interpretation and Outreach

All areas of the Unit are closed to public access.

5.6 Environmental Education

There is currently no environmental education at the Unit.

5.7 Volunteers

The Unit does not maintain a volunteer program, however, if appropriate, volunteers from Billy Frank Jr. Nisqually Refuge could be used.

5.8 Law Enforcement

Law enforcement is an integral part of managing the National Wildlife Refuge System. Protecting resources and people on our refuges is the fundamental responsibility of Refuge law enforcement officers. The mission of the Refuge Law Enforcement Program is to support the administration of the National Wildlife Refuge System through the management and protection of natural, historic, and cultural resources, property, and people on the lands and waters of our national wildlife refuges.

These are our objectives:

- Protect Refuge visitors and employees from disturbance or harm by others
- Assist visitors in understanding Refuge laws, regulations, and the reasons for them
- Enhance the management and protection of fish and wildlife resources on Refuges
- Ensure the legally prescribed, equitable use of fish and wildlife resources on Refuges
- Obtain compliance with the laws and regulations necessary for the proper administration, management, and protection of the National Wildlife Refuge System

The Unit receives law enforcement coverage from a Service zone officer located at Billy Frank Jr. Nisqually National Wildlife Refuge in Olympia. Zone officers are assigned to multiple refuges and large geographic regions. They enforce special refuge regulations via periodic patrols of refuge lands to protect resources and maintain public safety. The most common law enforcement issues encountered are violations of Unit closures (trespass into closed areas), vandalism (defaced signs and destruction of trees), littering, and trash dumping (household and commercial) along the roads or on Federal property.

5.9 Area Outdoor Recreational Opportunities

A variety of outdoor pursuits are readily available in the local area. Locally, Millersylvania State Park is approximately 8 miles from the Unit on the east side of I-5. The park offers camping (tent and RV), boating, swimming, mountain biking, hiking, fishing, day-use areas, metal-detecting areas, amphitheater, environmental learning center, and interpretation.

The State also manages the Scatter Creek Wildlife Area, which has several nearby units:

The State-owned Black River Unit has 109 acres and is located 5.5 miles south of the Refuge-owned Black River Unit in Thurston County. The property provides upland and wetland habitats and fishing opportunities.

Davis Creek Unit is approximately 500 acres and is located just outside the town of Oakville, near State Highway 12. Popular activities include hunting for waterfowl, deer, elk, and doves. The site also hosts numerous specially permitted events for dog field trials and training.

There is Chehalis River access for fishing on the eastern boundary of the property. This is an excellent birding area recognized by the Puget Lowlands Riparian Bird Conservation Area as a priority habitat.

The 492-acre Scatter Creek Unit is located 20 miles south of Olympia. Hunting, dog training, dog field trials, and exercising the family pet are dominant uses, as well as horseback riding, botanical studies, educational field trips, bird and wildlife watching, picnicking, and fishing. The landscape is a mixture of uplands with upland game bird hunting opportunities.

Just north of the Unit boundary is Black Lake, which offers boat launch access to fish or waterski. Personal watercraft is allowed and annual high-speed boat races take place.

The Black River offers anglers opportunities to fish. Several boat launch sites are found near the communities of Littlerock and Gate. A private canoe rental location near Rochester also allows access to the River.

Fishing and waterfowl hunting by boat on the main stem of the river corridor occurs, although the Unit has never opened these recreational uses on Unit lands. The patchwork of land ownerships along the river prevents the Unit from administratively controlling these activities.

A boat launch site is located at 123rd Avenue. A small, undesignated area on the southeast side of the intersection of 123rd Avenue SW and La France Street SW provides access to the river. From this Thurston County property, boaters may proceed north or south on the main stem of the river. There is only a primitive dirt/gravel launch area at this location.

Motorized and non-motorized boating occurs on the main stem of the Black River, particularly between 110th and 123rd Avenues. The river provides a unique, non-motorized boating experience in the South Sound area because of the river's wild setting. Boaters may also go north of 110th Avenue, but this section, north to Black Lake, is challenging because of the dense vegetation, beaver dams, and the meandering nature of the river channel.

During the winter months, an elk herd browses in the open fields off Endicott Road/123rd Avenue SW and has become a somewhat popular attraction in recent years. Vehicles pull off the road in this area to view the overwintering herd and sometimes people leave their cars to stand beside fences to see them more clearly. The cars and people on the road are a safety hazard. There are currently no viewing facilities or parking in this area of the Unit.

Thurston County proposes constructing the Gate-Belmore hike-and-bike trail on the abandoned Burlington Northern Railroad. The proposed trail corridor would link the urban trail system from Tumwater at Kenneydell County Park with the south county communities of Gate and Rochester. The 12.5-mile trail would offer access to the Black River and would run adjacent to the Black River-Mima Prairie Glacial Heritage Preserve and Black River Natural Area just south of Littlerock. The trail would run near the Unit and access to the Unit has been proposed (see <http://www.co.thurston.wa.us/parks/docs/preserve-plan-2013.pdf>).

5.10 Recreation Trends

According to the National Survey on Recreation and the Environment (NSRE 2000), the six most popular individual outdoor recreational activities and percentage of the U.S. population participating

were walking (87.1 percent), family gatherings (76.1 percent), viewing natural scenery (69.8 percent), visiting a nature center, nature trail, or zoo (62.8 percent), driving for pleasure through natural scenery (60.0 percent), and picnicking (59.9 percent). These types of activities are likely popular because the costs to participate are relatively low, physical exertion is minimal, and special equipment or developed skills are not required.

In the state of Washington, the Statewide Comprehensive Outdoor Recreation Plan (SCORP) developed by the Washington State Recreation and Conservation Office (RCO, formerly known as the Interagency Committee for Outdoor Recreation [IAC]) inventories outdoor recreation sites and opportunities; assesses recreational participation, preferences, and trends; and considers issues such as recreation equity, sustainability, land supply and use, the balance between habitat protection and recreation opportunities, economic and funding issues, and technology. The SCORP concludes with recommendations to help meet the outdoor recreation needs of residents and visitors and to enhance future outdoor recreation planning efforts. The most recently released Washington SCORP (RCO 2013) identified the 16 major categories of outdoor recreation. Table 5-2 lists the activities in order from most to least in terms of participation rates. Walking, hiking, climbing, and mountaineering activities, followed by recreational activities, had the highest levels of participation

Table 5-2. Ranking of Major Activity Areas of Washington State Residents (RCO 2013)

Activity Category	Percentage of Population
Walking, hiking, climbing, mountaineering	90.0
Recreational activities (team and individual sports, fitness activities, swimming, roller and inline skating, skateboarding)	82.7
Nature activities (including visiting nature centers, wildlife viewing, gathering/collecting things, and gardening)	81.4
Picnicking, barbequing, or cooking out	80.9
Water-related activities (including beach activities, boating/floating, surfing, water skiing, scuba/snorkeling, spray/splash parks)	75.2
Sightseeing	56.8
Camping	42.4
Bicycle riding	36.9
Fishing or shellfishing	34.1
Snow and ice activities (including snowshoeing, skiing, skating, and ATV riding on snow/ice)	31.3
Indoor community facilities	28.4
Hunting or shooting	21.4
Frisbee activities (including disc golf and ultimate frisbee/frisbee)	16.8

Activity Category	Percentage of Population
football)	
Off-roading for recreation	15.3
Horseback riding	7.7
Air activities (including bungee jumping, sky diving, flying various aircraft, and ballooning)	3.8

Trends reported in the SCORP show that between 2006 and 2012, there was an increase in participation in many of the activities based in nature (including activities not encompassed by the more narrow definition of “nature-based activities”), such as hunting, visiting a nature interpretive center, fishing, camping, hiking, and wildlife viewing/photographing. While the most recently released Washington SCORP examined past trends, it did not offer forecasts of future regional recreation demands. A previous survey released by the Washington IAC (IAC 2002) states that outdoor recreation in most activities continues to increase at high growth rates. Many outdoor activities generally permitted on refuges are expected to show increases of 20–40 percent over the next 20 years. Table 5-3 shows the percentage change expected for Washington State by activity as reported by IAC in 2006.

Table 5-3. Projected Future Increase in Participation for Selected Outdoor Recreation Activities

Activity Estimated Change	10 Years (2002–2012) Estimated Change	20 Years (2002–2022) Estimated Change
Hiking	10%	20%
Nature activities	23%	37%
Fishing	-5%	-10%
Hunting	-15%	-21%
Sightseeing	10%	20%
Camping	10%	20%
Canoeing/kayaking	21%	30%
Motor boating	10%	No estimate
Equestrian	5%	8%
Non-pool swimming	19%	29%

5.11 Special Designations

The Unit has no special designations.

5.12 Socioeconomic Environment

5.12.1 Population and Area Economy

The Unit is located southwest of Olympia, Washington, in Thurston County. Table 5-6 shows the population and area economy. The county population increased 21 percent from 2001 to 2011, compared with a 14 percent increase for Washington State and a 9 percent increase for the United States. County employment increased by 16 percent from 2000 to 2010, compared to a smaller employment increase in Washington State (9 percent) and the United States (6 percent). Per capita income in Thurston County increased by 4 percent between 2000 and 2010, while Washington State and the United States both increased by 5 percent.

Table 5-4. Black River Unit: Summary of Area Economy, 2011 (Population & Employment in thousands; Per Capita Income in 2011 dollars)

	Population		Employment		Per Capita Income	
	2011	Percent change 2001-2011	2011	Percent change 2001-2011	2011	Percent change 2001-2011
Thurston County	256.6	21%	129.3	16%	\$41,251	4%
Washington	6,830.0	14%	3,828.6	9%	\$43,878	5%
United States	311,591.9	9%	175,834.7	6%	\$41,560	5%

Source: U.S. Department of Commerce 2013.

The largest industry sectors for Thurston County are ranked below by employment (Table 5-5). The largest employers are the State and local governments followed by retail trade. Over the last 10 years, the largest employment increase occurred in administrative and waste management services (41 percent) while there was a decline in construction employment (8 percent).

Table 5-5. Employment Summary for Thurston County, 2011

Industry	Employment	Percentage Change 2001-2011
State and local government	34,763	2%
Retail trade	14,809	14%
Health care and social assistance	14,253	24%
Accommodation and food services	8,172	31%
Other services, except public administration	7,402	13%
Professional, scientific, and technical services	7,065	33%

Industry	Employment	Percentage Change 2001-2011
Real estate and rental and leasing	5,625	39%
Administrative and waste management services	5,617	41%
Construction	5,532	-8%
Finance and insurance	4,249	31%

Source: U.S. Department of Commerce 2013.

5.12.2 Local Community

The northern portion of the Unit is within 5 miles of Tumwater, 10 miles of Olympia, 15 miles of Lacey, and the southern end of the Unit is immediately north of Littlerock, a village based on a rural economy.

The cities of Tumwater, Lacey, and Olympia have grown together such that it is hard to know which municipality you are in. These three cities have a small-town feel to them and residents who value museums, theatre, and outdoor activities. The cities are well-situated for people passing through while traveling from Portland to Seattle or to the Olympic peninsula, Mt. Rainer National Park, or to the Cascade mountain range.

5.13 References

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Appendices A-M

Chapter 1
Introduction
and
Background

Chapter 2
Management
Direction

Chapter 3
Physical
Environment

Chapter 4
Biological
Environment

Chapter 5
Human
Environment

**Appendices
A-M**

*Bog moss and sundew
plants/mmb*

Appendix A. Appropriate Use Findings

A.1 Introduction

The Appropriate Refuge Uses Policy (603 FW 1) outlines the process that the Service uses to determine when general public uses on refuges may be considered. Priority public uses previously defined as wildlife-dependent uses (hunting, fishing, wildlife observation and photography and environmental education and interpretation) under the National Wildlife Refuge System Improvement Act of 1997 are generally exempt from appropriate use review. Other exempt uses include those situations where the Service does not have adequate jurisdiction to control the activity and refuge management activities. In essence, the Appropriate Refuge Uses Policy provides refuge managers with a consistent procedure to first screen and then document decisions concerning a non-priority public use. When a use is determined to be appropriate, a refuge manager must then decide if the use is compatible before allowing it on a refuge. For purposes of this CCP an “appropriate use” must meet at least one of the following three conditions:

- The use is a wildlife-dependent recreational use as identified in the Refuge Improvement Act.
- The use involves the take of fish and wildlife under State regulations.
- The use has been found to be appropriate as specified in Section 1.11 of the policy and documented on FWS Form 3-2319.

During the CCP process, the refuge manager reviewed all existing and proposed refuge uses for the Black River Unit of Billy Frank Jr. Nisqually NWR for the selected alternative (Alternative 2 in the draft CCP). Documentation of appropriateness findings for wildlife-dependent uses is not included in this appendix because wildlife-dependent uses are appropriate by definition. They are, however, evaluated for compatibility in Appendix B, Compatibility Determinations. All other Unit uses were evaluated using the criteria described in policy and listed on FWS Form 3-2319. The table below shows the uses evaluated and appropriateness findings made by the refuge manager. Additional documentation is included in this appendix for each use identified in the table.

Table A-1. Summary of Appropriate Use Findings for Black River Unit

Unit Use	Appropriate
Research, Surveys, and Scientific Collections	Yes
Grazing, Haying, Mowing	Yes

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Finding of Appropriateness of a Refuge Use

Refuge: Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge, Thurston County, Washington

Use: Research, Surveys, and Scientific Collections

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

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

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

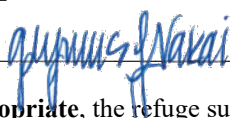
If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes X No

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

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

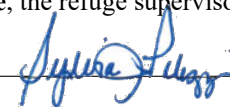
Not Appropriate

Appropriate X

Refuge Manager: 

Date: 3-09-2017

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use. If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence. If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: 

Date: 3/9/17

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

FWS Form 3-2319

02/06

Justification for “Appropriate” finding.

The proposed use evaluated herein for appropriateness is more fully described and evaluated in the compatibility determination (CD) for this use and the documents referenced in that CD.

Criterion (a): The area proposed for this use lies within the Black River Unit (Unit) of Billy Frank Jr. Nisqually National Wildlife Refuge (Refuge). The U.S. Fish and Wildlife Service (Service) owns and administers the Unit and, consistent with Title 50 of the Code of Federal Regulations (Wildlife and Fisheries), has jurisdiction over public uses of the Unit.

Criterion (b): This use will comply with applicable laws and regulations. Permittees will be required to obtain necessary local, State, and Federal permits.

Criterion (c): This use will be consistent with applicable Executive orders and U.S. Department of the Interior and Service policies, including the policies on Research and Management Studies (4 RM 6) and Administration of Specialized Uses (5 RM 17).

Criterion (d): This use will be consistent with public safety. Permittees will be required to limit their use of the Unit to specifically designated areas and access routes, and review and understand Unit rules and regulations and any hazardous conditions.

Criterion (e): This use is not inconsistent with any Unit goals and will usually support several goals. Each research proposal will be evaluated individually to determine the degree of support.

Criterion (f): This is not the first time this use has been proposed on the Unit. Research as a Refuge use and research projects have been approved in earlier analyses.

Criterion (g): The Refuge has adequate budget and staff to manage the current number of research, survey, and scientific collection projects.

Criterion (h): It is expected that the Refuge will have adequate budget and staff in the future to manage research, survey, and scientific collection projects at the rate they are occurring at present.

Criterion (i): Almost all research, surveys, and scientific collections on refuges are inherently valuable because they contribute to our understanding and appreciation of a refuge’s natural or cultural resources. This is beneficial because it enhances our understanding of and often our ability to properly manage these resources. Proposed research projects that did not result in these benefits will not be a priority for the Refuge and will likely not be authorized.

Criterion (j): Because the Unit is closed to general public use, research, surveys, and scientific collections will have no effects on other visitors at this time. However, subject to evaluations for compatibility, it is proposed that the Unit also be opened in specific locations for wildlife observation and photography, and environmental interpretation.

If research is conducted at one of the proposed new visitor facilities, it is possible that it could result in some crowding, especially with school groups. If field research is conducted in habitats near one of these new facilities, it could result in flushing of birds and other wildlife, or it could cause some animals to move farther afield. This will reduce the quality of experience for observers and photographers. Such conflicts are expected to be infrequent and temporary.

General and project-specific stipulations and permit conditions regarding the locations and scheduling of research will be used to greatly minimize the likelihood that such activities will impair compatible, wildlife-dependent uses. The exception could be research and surveys specifically focused on public use. In such cases, approved study protocols will help ensure that such projects do not significantly reduce the quality of compatible, wildlife-dependent public uses.

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Finding of Appropriateness of a Refuge Use

Refuge: Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge, Thurston County, Washington

Use: Grazing, Haying, and Mowing

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

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

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

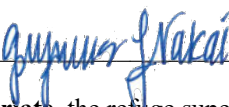
If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes X No

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

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

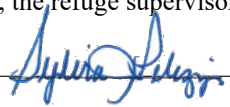
Not Appropriate

Appropriate X

Refuge Manager: 

Date: 3.09.2017

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use. If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence. If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: 

Date: 3/9/17

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

FWS Form 3-2319

02/06

Justification for “Appropriate” finding.

The proposed uses evaluated herein for appropriateness are more fully described and evaluated in the compatibility determination (CD) for these uses and the documents referenced in that CD.

Criterion (a): The areas proposed for these uses lie within the Black River Unit (Unit) of Billy Frank Jr. Nisqually National Wildlife Refuge (Refuge). The U.S. Fish and Wildlife Service (Service) owns and administers the Unit and, consistent with Title 50 of the Code of Federal Regulations (Wildlife and Fisheries), has jurisdiction over public uses of the Unit.

Criterion (b): These uses will comply with applicable laws and regulations, including 50 C.F.R. 29.1. It is expected that properly managed grazing, haying, and mowing could be used as valuable management techniques to increase wildlife values in dry, nonnative grasslands; seasonally flooded, nonnative grasslands; and emergent marshes. It is expected that these management practices will contribute to achievement of Refuge purposes and the National Wildlife Refuge System mission by reducing encroachment of woody plants, removing thatch, and increasing the vigor of native plants in overgrown and rank grasslands and marshes; maintaining a habitat mosaic in grasslands and marshes by setting back succession in treated areas; and controlling or reducing the presence of invasive plants. CD stipulations and conditions of special use permits, cooperative land management agreements, or other agreements will help ensure that potential adverse effects of these practices were minimized or avoided.

Criterion (c): These uses will be consistent with applicable Executive orders and U.S. Department of the Interior and Service policies, including the policy on Administration of Specialized Uses (5 RM 17). If found appropriate and determined compatible, grazing, haying, and mowing will be authorized through issuance of special use permits, cooperative land management agreements, contracts, or other agreements. Appropriate fees or in-kind exchanges of services will be charged to those grazing or haying.

Criterion (d): This use will be consistent with public safety. Most if not all areas where these uses are proposed are and will remain closed to general public use. There are no more risks to public safety associated with these uses on the Unit than exist in agricultural areas across America.

Criterion (e): When properly managed, these uses will directly support Unit goal numbers 1, 2, 3, and 4.

Criterion (f): Haying and mowing uses currently occur on the Unit. They have been found compatible and approved in the past.

Criterion (g): The Refuge has adequate budget and staff to manage grazing, haying, and mowing, as proposed.

Criterion (h): It is expected that the Refuge will have adequate budget and staff in the future to continue to manage these uses.

Criterion (i): Grazing, haying, and mowing are not expected to directly contribute to the public’s understanding and appreciation of the Unit’s natural or cultural resources. However, use of these habitat management techniques will provide an interpretive opportunity for the Unit to explain to

visitors the value of such practices. For the reasons described earlier, properly managed grazing, haying, and mowing is expected to be beneficial to the Unit's natural and cultural resources.

Criterion (j): The Unit is closed to general public use, so grazing, haying, and mowing will have no effects on compatible, wildlife-dependent, or other recreational uses at this time. However, subject to evaluations for compatibility, it is proposed that the Unit also be opened wildlife observation, photography, and interpretation.

The presence of grazing livestock, fencing, corrals, loading ramps, and dung and associated insects could adversely affect the quality of experience for those who visited the Unit for wildlife observation, photography, and interpretation. Workers conducting grazing, haying, or mowing programs could flush wildlife from treatment sites and reduce or enhance their observation or photography by Unit visitors. Activities associated with these management programs will not be ongoing and these effects will be infrequent. As noted above, it is expected that the larger effect of these proposed uses is an improvement of grassland and marsh habitats and an increase in abundance and diversity of wildlife using these habitats. This will enhance wildlife observation, photography, and interpretation opportunities in the future.

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Appendix B. Compatibility Determinations

B.1 Introduction

The compatibility determinations (CDs) developed during this planning process evaluate uses as projected to occur under Alternative 2, the preferred alternative in the draft Comprehensive Conservation Plan (CCP) and Environmental Assessment (EA), for the Black River Unit (Unit) of Billy Frank Jr. Nisqually National Wildlife Refuge (Refuge or NWR) (USFWS 2016), which was carried forward as the management direction for the Unit in this CCP. The evaluation of funds needed for management and implementation of each use is described in Appendix C, Implementation. Chapter 6 of the draft CCP/EA, published in September 2016, contained an analysis of the impacts of public uses to wildlife and habitats. That document is incorporated through reference into this set of CDs.

B.1.1 Uses Evaluated at This Time

The following section includes full CDs for all uses that are required to be evaluated at this time. According to Service policy, CDs are to be completed for all uses proposed under a CCP that have been determined to be appropriate. Existing compatible, wildlife-dependent recreational uses must also be re-evaluated and new CDs prepared during development of a CCP. According to the Service's compatibility policy, uses other than wildlife-dependent recreational uses are not explicitly required to be re-evaluated in concert with preparation of a CCP, unless conditions of the use have changed or unless significant new information relative to the use and its effects have become available or the existing CDs are more than 10 years old. However, Service planning policy recommends preparing CDs for all individual uses, specific use programs, or groups of related uses associated with the proposed action. Accordingly, the following CDs are included in this document for public review.

Table B-1. Summary of Compatibility Determinations.

Refuge Use	Compatible?	Year Due for Reevaluation
Wildlife Observation, Photography, and Interpretation	Yes	2032
Research, Surveys, and Scientific Collections	Yes	2027
Grazing, Haying, and Mowing	Yes	2027

B.1.2 Compatibility—Legal and Historical Context

Compatibility is a tool refuge managers use to ensure that recreational and other uses do not interfere with wildlife conservation, the primary focus of national wildlife refuges. Compatibility is not new to the Refuge System and dates back to 1918 as a concept. As policy, it has been used since 1962. The Refuge Recreation Act of 1962 directed the Secretary of the Interior to allow only those public uses of refuge lands that were “compatible with the primary purposes for which the area was established.”

Legally, national wildlife refuges are closed to all public uses until officially opened through a CD. Regulations require that adequate funds be available for administration and protection of refuges

before opening them to any public uses. However, wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, environmental education and interpretation) are to receive enhanced consideration and cannot be rejected simply for lack of funding resources unless the refuge has made a concerted effort to seek out funds from all potential partners. Once found compatible, wildlife-dependent recreational uses are deemed the priority public uses at the refuge. If a proposed use is found not compatible, the refuge manager is legally precluded from approving it. Economic uses that are conducted by or authorized by the refuge also require CDs.

Under the compatibility policy, uses are defined as recreational, economic/commercial, or management use of a refuge by the public or a non-Refuge System entity. Uses generally providing an economic return (even if conducted for the purposes of habitat management) are also subject to CDs. The Service does not prepare CDs for uses when the Service does not have jurisdiction. For example, the Service may have limited jurisdiction over refuge areas where property rights are vested by others, where legally binding agreements exist, or where there are treaty rights held by tribes. In addition, aircraft overflights, emergency actions, some activities on navigable waters, and activities by other Federal agencies on “overlay refuges” are exempt from the compatibility review process.

New compatibility regulations, required by the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act), were adopted by the Service in October 2000. The regulations require that a use must be compatible with both the mission of the Refuge System and the purpose(s) of the individual refuge. This standard helps to ensure consistency in application across the Refuge System. The Improvement Act also requires that CDs be in writing and that the public have an opportunity to comment on most use evaluations.

The Refuge System mission emphasizes that the needs of fish, wildlife, and plants must be of primary consideration. The Improvement Act defined a compatible use as one 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.” Sound professional judgment is defined under the Improvement Act as “. . . a finding, determination, or decision, that is consistent with principles of sound fish and wildlife management and administration, available science and resources . . .” Compatibility for priority wildlife-dependent uses may depend on the level or extent of a use.

Court interpretations of the compatibility standard have found that compatibility is a biological standard and cannot be used to balance or weigh economic, political, or recreational interests against the primary purpose of the refuge (*Defenders of Wildlife v. Andrus* [Ruby Lake Refuge]). The Service recognizes that CDs are complex. For this reason, refuge managers are required to consider “principles of sound fish and wildlife management” and “best available science” in making these determinations (House of Representatives Report 105-106). Evaluations of the uses on the Black River Unit are based on the professional judgment of Refuge and planning personnel, including observations of Refuge uses and reviews of relevant scientific literature.

In July 2006, the Service published its Appropriate Refuge Uses policy (603 FW 1). Under this policy, most proposed uses must also undergo a review prior to compatibility. Uses excepted from the policy include priority wildlife-dependent recreational uses, and uses under reserved rights—see policy for more detail. Appropriate Refuge Uses Findings are in Appendix A.

B.2 References

Defenders of Wildlife v. Andrus (Ruby Lake Refuge I). 11 Envtl. Rptr. Case 2098 (D.D.C. 1978), p. 873.

House of Representatives. 1997. Report 105-106 on the National Wildlife Refuge System Improvement Act of 1997.

U.S. Fish and Wildlife Service (USFWS). 2016. Draft Comprehensive Conservation Plan and Environmental Assessment for Grays Harbor National Wildlife Refuge and the Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge. United States Department of the Interior, Fish and Wildlife Service, Nisqually National Wildlife Refuge Complex and Pacific Region Planning Team, Olympia, WA and Portland, OR.

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Compatibility Determination

Use: Wildlife Observation, Photography, and Interpretation.

Unit Name: Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge

Establishing and Acquisition Authorities:

Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715–715r)

Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a–742m)

Refuge Purposes:

... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds (16 U.S.C. 715–715r).

... 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 (Refuge System or NWRs) Mission:

“The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans” (National Wildlife Refuge System Administration Act of 1966 as amended, 16 U.S.C. 668dd–668ee).

Description of Use:

For purposes of this CD, wildlife observation and photography include viewing and capturing images of wild plants and animals, wildlife habitats, wildlands, waters, landscapes, cultural resources, and cultural activities; noncommercial recording of all types (e.g., filming, videography, audiography, writing, and drawing or painting); and general nature study and appreciation. This CD does not address recording of images and audio for commercial purposes. Nor does it address observation, photography, and interpretation opportunities offered by commercial tours, sometimes referred to as ecotourism.

Interpretation is the communication of information and explanation of the nature, origin, and purpose of historical, natural, or cultural resources, objects, sites, and phenomena using personal or nonpersonal methods. The National Association for Interpretation defines interpretation to be, “a mission-based communication process that forges emotional and intellectual connections between the interests of the audience and the meanings inherent in the resource.” For national wildlife refuges, the purposes of interpretation are to convey an understanding and appreciation for refuge resources, the issues that affect them, and the conservation techniques and programs pursued in their management

(USFWS 2006a). For purposes of this compatibility determination (CD), interpretation addresses environmental and cultural resources and values.

Wildlife observation, photography, and interpretation are often enhanced with the provision of brochures, wildlife and plant lists, interpretive signs and displays, trails, auto tour routes and vehicle pullouts, viewing platforms or towers, viewing equipment, photography or viewing blinds, interpretive presentations and tours, visitor stations or centers, and bookstores or similar retail outlets. Many of these facilities and information sources serve all three activities. In addition, refuge visitors often enjoy all three activities together. Information can be conveyed in person, in writing, with images, with sound, and, increasingly, through a diversity of electronic media and devices.

At present, the Black River Unit (Unit) of Billy Frank Jr. Nisqually National Wildlife Refuge (Refuge) is not officially open for general public use. However, public roads define some boundaries and cut through portions of the Unit so individuals have always been able to access portions of the Black River Unit via boat. There are two undeveloped boat launch sites within the Unit boundary. Individuals traveling local roads or boating on the river currently have undeveloped opportunities to observe and photograph wildlife on the Unit.

Comments received during the CCP process reveal a desire of the public for interpretive signs, off-road parking and viewing areas, opportunities to view elk, trails, viewing blinds, a visitor center and information kiosks, and barrier-free facilities on the Unit. Under the management direction in the CCP, portions of the Unit will be officially opened for wildlife observation, photography, and interpretation, and that associated infrastructure and management programs will be developed to facilitate these public uses, subject to funding availability. Specifically, two observation, photography, and interpretation sites will be developed near the southern end of the Unit, on either side of Endicott Road, between 118th and 123rd Avenues. The east side site will focus on wetland, riparian forest, and riverine habitats, and include a parking area near a viewing deck. The west side site will focus on upland forest bounding an open grassland where wintering elk are commonly seen, feature a viewing deck, and accommodate bus parking. Both sites will include parking areas for automobiles, some interpretive and regulatory signs or panels, and opportunities for wildlife viewing and photography, and will be fully accessible for those with limited mobility. Following establishment of the Thurston County Gate-Bellmore Trail, the Service will also explore potential spur trails into the Unit to provide additional opportunities for observation, photography, and interpretation. These areas of the Unit will be open for visitation every day of the year, from sunrise to sunset.

In addition, a boat launch site and parking area will be developed where 123rd Avenue crosses Black River. Boating on the river will provide additional opportunities for Unit visitors to enjoy wildlife observation and photography.

Observation, photography, and interpretation are priority, wildlife-dependent public uses and are to be given special consideration in refuge planning and management. When determined compatible on a refuge-specific basis, a wildlife-dependent use becomes a priority public use for that refuge and is to be facilitated and encouraged (see National Wildlife Refuge System Administration Act, 16 U.S.C. 668dd–668ee).

This CD was developed and made publicly available concurrently with the draft comprehensive conservation plan (CCP) and environmental assessment (EA) for Grays Harbor NWR and Black

River Unit of Billy Frank Jr. Nisqually NWR Much of the information and some of the analyses contained in this CD are addressed in detail in the CCP/EA.

Availability of Resources:

Following is an estimate of one-time costs associated with the Unit's wildlife observation, photography, and interpretive facilities, as described under the CCP's management direction.

Table B-2. Costs to Administer and Manage Wildlife Observation and Photography and Interpretation

Category	One-time Expenses (\$)	Recurring Expense (\$/year)
New parking and viewing area on east side of Endicott Road	110,000	1,000
New parking and viewing area on west side of Endicott Road	90,000	1,000
New boat launch, parking, and kiosk at 123 rd Avenue	130,000	2,000
Monitoring and administration	5,000	12,000
Maintenance	5,000	21,000
Law Enforcement	5,000	13,000
Total Costs	345,000	50,000

Funding and/or in-kind support will be sought to develop the new facilities. The Nisqually National Wildlife Refuge Complex's annual operations budget will support the annual costs (staff) associated with the wildlife observation and photography and interpretive program on the Unit.

Anticipated Impacts of the Use(s):

Unit Goals and NWRS Mission

The management direction of the Black River Unit is guided by the protection of biological diversity, and enhancement and management of a valuable wetland ecosystem for the benefit of anadromous salmonid production, migratory birds, and other wetland-dependent wildlife (USFWS 1996). The Unit has developed the following six goals as part of its comprehensive conservation planning process.

1. Protect, maintain, and enhance aquatic habitats characteristic of the upper Black River Watershed while maintaining historical characteristics of the north Puget Trough Lowlands for the benefit of native fish, amphibians, migratory birds, and a diverse assemblage of other native species.
2. Protect and maintain upland habitats characteristic of the upper Black River watershed.

3. Contribute to the protection and long-term environmental health of the greater Black River watershed and ecosystem.
4. Gather scientific information (inventories, monitoring, and research) necessary to support adaptive management decisions.
5. Provide quality opportunities for visitors to experience a diversity of wildlife and habitats to enhance their understanding and appreciation of the Unit's natural resources and foster a connection with nature.
6. Support and develop an active volunteer program and partnerships to assist in providing quality visitor services programs and outreach.

Observation, photography, and interpretation activities would directly support Unit goal number 5. It is expected that these uses would enhance the public's understanding of and appreciation for the importance of conservation and for the Unit's management programs; therefore, they would also indirectly support the Refuge System mission and goals 1, 2, and 3.

Fish, Wildlife, Plants, and Their Habitats

The Black River is a tributary to the Chehalis River, which drains to the Pacific Ocean through Grays Harbor. The slow-moving Black River and surrounding wetlands form the most intact lowland river system remaining in western Washington. The Unit includes upland forest, riparian forest, grassland, various wetland types, including shrub swamp and rare sphagnum bog, and aquatic systems.

The Black River, tributaries, wetlands, grasslands, shrub swamps, and forests support a diversity of resident and migratory wildlife species. Wildlife species of special management concern at the Unit include salmonids such as steelhead trout (*Oncorhynchus mykiss*), coastal cutthroat trout (*Oncorhynchus clarki clarki*), coho salmon (*Oncorhynchus kisutch*), and Chinook salmon (*Oncorhynchus tshawytscha*), which use the Black River and its tributaries for migration, spawning, and rearing. Many species of frogs, salamanders, and newts are found in the mosaic of wetlands. River otter (*Lutra canadensis*), mink (*Mustela vison*), muskrat (*Ondatra zibethicus*), and beaver (*Castor canadensis*) can be seen in the Black River; a herd of Roosevelt elk (*Cervus elaphus roosevelti*) graze in Unit grasslands. Ducks, geese, and grebes; rails, bitterns, herons; raptors; and neotropical songbirds occur throughout the Unit.

Unit management focuses on protecting, restoring, and maintaining quality habitats—especially freshwater streams, bogs and emergent marshes, and upland grasslands—for a diversity of native wildlife and plant species, including those that are rare and declining. The Unit provides valuable habitat for an endemic, State-sensitive species, the Olympic mud minnow (*Novumbra hubbsi*), and the State-endangered and federally threatened species Oregon spotted frog (*Rana pretiosa*). The frog is known to occur in three subbasins in the State and in two locations on the Unit. It is suspected that the Unit may support rare bog-adapted insects, federally endangered water howellia (*Howellia aquatilis*) and possibly the federally threatened streaked horned lark (*Eremophila alpestris*),.

Invasive species of actual or potential concern include reed canarygrass (*Phalaris arundinacea*), purple loosestrife (*Lythrum salicaria*), knotweed species (*Polygonum spp.*), yellow flag iris (*Iris pseudacorus*), Scotch broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus armeniacus*), holly

(*Ilex spp.*), New Zealand mudsnail (*Potamopyrgus antipodarum*), feral cat (*Felis catus*), bullfrog (*Rana catesbeiana*), and various warm water fish species.

It is expected that the greatest effects upon wildlife of visitors engaging in wildlife observation, photography, and interpretation would likely be associated with disturbance. Human disturbance has differential effects on wildlife and is dependent upon, among other variables, the species involved and its age; the time of year; the breeding cycle stage (if applicable); the surrounding environment; whether the activity involves vehicles; the intensity, speed, noise, nature, and frequency of the disturbing activity; and the directness of approach to an animal (Blanc et al. 2006; Goss-Custard and Verboven 1993; Holmes et al. 2005; Hammitt and Cole 1998; Kirby et al. 1993; Knight and Cole 1995a; Knight and Cole 1995b; Lafferty 2001a). Disturbance can cause animals stress and alter their normal behavior, cause them to stop feeding, cause abandonment of nests and young, and allow predators access to nests/young, reduce parental attention to young, and otherwise impact survival of individual birds, eggs, nestlings, or broods (Burger and Gochfeld 1991; Haysmith and Hunt 1995; Lafferty 2001b). The effects of disturbance on individual animals are likely additive.

Naylor et al. (2009) examined the effects of four types of off-road recreational disturbance (all-terrain vehicle riding, mountain biking, hiking, and horseback riding) on North American elk (*Cervus elaphus*) in northeast Oregon. They found that all types of disturbance studied affected elk behavior. Hiking generally caused an increase in the time elk traveled, especially in the morning; resulted in a decrease in resting time; and had no effect on time spent feeding. Ciuti et al. (2012) studied the effects of various human disturbances (e.g., hiking, biking, horseback riding, hunting, fishing, riding all-terrain vehicles, general vehicle traffic, and roads) in various landscapes with different management programs in southwest Alberta. They also found that hiking caused elk travel time to increase and that an increase in the number of hikers caused an increase in travel behavior in elk. Behavioral responses of tule elk (*Cervus elaphus nannodes*) to off-trail hikers and off-shore boats were investigated by Becker et al. (2012) at Point Reyes National Seashore, California. They learned that elk exhibiting rutting behavior and those in the presence of off-trail hikers displayed the most disturbance behaviors (i.e., head up, stand, move off, run, or alarm cry). Elk were more sensitive to human disturbance when herd sizes were smaller (<15 animals).

The distances of observers or photographers to wildlife subjects and the numbers of observers or photographers involved are important disturbance variables. Holmes et al. (2007) found that vigilance behavior of Gentoo penguins (*Pygoscelis papua*) increased as the numbers of observers increased. A study of visitors to a colony of kittiwakes (*Rissa tridactyla*) and guillemots (*Uria aalge*) revealed that nesting success was influenced by the distance observers were from the birds (positively correlated) and the number of observers involved (negatively correlated) (Beale and Monaghan 2004). Breeding birds are especially sensitive to human disturbance (Trulio 2005; Hammitt and Cole 1998). In a study of the effects of trail users (walkers, joggers, bicyclists, and in-line skaters) on shorebirds in San Francisco Bay, Trulio and Sokale (2008) found there was no difference in shorebird use between sites without trail use and those sites with low numbers of trail users. However, after a certain point on high-use days, increasing numbers of trail users resulted in reduced numbers of foraging shorebirds. In a study of sanderlings (*Calidris alba*) on a California beach, Thomas (2000) found that the number, proximity, and activity of recreationists all affected foraging time by the birds. The presence of off-leash dogs was especially disturbing.

A variety of factors affect flushing and flushing distances among waterbirds, including the species involved; the activity in which the birds are engaged (e.g., foraging versus nesting); prey density and nutritional requirements for feeding birds; flock size (large flocks may be more easily disturbed);

whether the species is hunted; and the type, size, speed, and noise of disturbance (e.g., dogs versus humans, cycling versus walking, or approaching birds by walking versus in a motorized boat) (Goss-Custard and Verboven 1993; Lafferty 2001b; Rodgers and Smith 1997; Rodgers 1991; Smit and Visser 1993). Flushing of birds or even raising their alert levels (which usually occurs at a greater distance than that for flushing) creates stress and requires animals to expend energy that otherwise would be invested in essential life history activities such as foraging, migration, predator avoidance, mating, nesting, and brood-rearing.

Wildlife disturbance can be a special concern with wildlife observation and photography (Cline et al. 2007; DeLong 2002; Knight and Cole 1995). Observers and photographers often want to enhance their view or photograph by encroaching closer and closer to their subject. This can cause increased stress in wildlife and eventually lead to flushing. If a bird is nesting or brood-rearing, disturbance can cause temporary or permanent nest desertion. Even if only temporary, eggs and nestlings can face survival challenges associated with temperature extremes and predation.

Studies have had mixed results regarding potential habituation of birds and some other taxa to human disturbance. Wildlife is often less disturbed by routine human activities that repeatedly occur along defined routes (e.g., trails, roads, or water channels), especially frequent disturbance that does not involve direct contact or other threat, compared with those activities that occur irregularly and outside predictable paths/channels (Blanc et al. 2006; Holmes et al. 2007; Knight and Cole 1995b; Smit and Visser 1993). Some species can habituate to the presence of humans who stay in the same general location and remain relatively still (Goss-Custard and Verboven 1993; Smit and Visser 1993). In an elk study in southwestern Alberta, Ciuti et al. (2012) found that, where hunting is not allowed, elk can exhibit habituation (e.g., reduced vigilance behavior) to some types or levels of human disturbance. Habituation to some types and levels (intensity and frequency) of human disturbance appears to vary among species, within species, between resident and migratory populations, and potentially between inexperienced and experienced breeders. This makes it difficult to forecast habituation in actual field situations.

Observers, photographers, or participants in interpretation programs could also cause trampling of native plants, erosion, and introduction or spread of exotic species, including invertebrates, plants, and invasive species. All of these impacts could adversely affect native fish, wildlife, plants, and their habitats. The degree of actual effects upon important life history parameters such as foraging, predator avoidance, reproduction, survival of individuals, and diversity and abundance of native species (community health) would depend on specific circumstances.

The public use facilities described above would invite visitors into the Unit to enjoy observation, photography, and interpretation and, at the same time, bring them closer to wildlife and their habitats. However, it is expected that wildlife disturbance and other potential impacts would be greatly limited because participating visitors would enjoy these uses within the bounds of new facilities that are adjacent to a public road and within a large block of Service-owned land, they would follow Principles of Ethical Field Practices, developed by North American Nature Photography Association, and open-field travel would be prohibited.

The highest potential for wildlife disturbance might involve boaters on the Black River who were observing or photographing wildlife. For much of its reach through the Unit, the Black River is fairly narrow and not very deep. Wildlife approached by a boat would not likely have adequate space to move aside or dive under water and allow a boat to pass. Instead, such species might head to shrub cover along the shore, or swim or fly up or down the river away from the approaching craft. Boat use

of the river is not expected to be high, so such disturbances would be infrequent, and there would be ample, undisturbed areas of the river for displaced wildlife to relocate.

In addition, the presence of wildlife observers or photographers, or those enjoying interpretation at the new facilities on either side of Endicott Road, would have some effects on habitat use and movement by elk. The elk currently use the entire area, readily crossing the road and grazing or resting in much of the area. It is expected that elk would avoid the immediate footprint of the public facilities when in use by people, although the footprint is a relatively small part of the overall block of habitat available there, so effects would be fairly localized.

Public Use

It is possible that visitors participating in wildlife observation, photography, and interpretation could meet up with a school group on an environmental education field trip at one of the new visitor facilities. It is unlikely that a handful of visitors enjoying observation, photography, or interpretation would adversely affect those participating in environmental education or any of the other uses that would occur on the Unit such as research, grazing, haying, and mowing.

Visitors would be expected to not disturb or otherwise interfere with animal behaviors by using telephoto lenses to photograph animals and adhering to local regulatory requirements. Other practices that can reduce wildlife disturbance when observing or photographing include use of observation or photo blinds and use of binoculars or spotting scopes to enable good viewing while maintaining a respectable distance from individuals or colonies.

Social, Cultural, and Other Values

To date, few cultural resource surveys have been conducted on the Unit. There are no recorded archaeological sites, but some local farms and associated structures are of historic value. Prior to construction of any new facilities, the Service would undertake appropriate surveys and engage in consultations consistent with requirements of the National Historic Preservation Act (16 U.S.C. 470). This process results in avoiding, minimizing, and/or mitigating any potential effects.

Comments received during the CCP process reveal a concern by some members of the public that increased visitation on the Unit could result in vandalism (e.g., of old houses or other buildings on the Unit) or impacts to adjacent private property, such as trespass or illegal dumping. Substantial private property remains within the approved Unit boundary and public versus private property boundaries are not always well marked. Drawing additional visitors to the Unit could result in trespass or damage to private property. The sites planned for the new visitor facilities lay along a public road and well within a large area of Service-owned property. That, along with improved signing, possibly maps and other visitor information, and the presence of other visitors, should reduce the likelihood of trespass or vandalism.

Public Review and Comment:

This CD was available for public review and comment in the draft CCP/EA.

Determination: (check one below)

☐ Use is Not Compatible

☒ Use is Compatible with following Stipulations

Stipulations Necessary to Ensure Compatibility:

General

1. In addition to the stipulations listed here, visitors will be required to comply with Refuge System-related and other applicable laws, regulations, and policies including “Prohibited Acts” listed in the Code of Federal Regulations (50 C.F.R. 27).
2. Portions of the Unit will be open for public use daily, year-round, from sunrise to sunset, pending authorization. Visitation will not be authorized until the procedural and substantive requirements described earlier had been satisfied. The Service will also develop appropriate digital and hardcopy visitor information in support of wildlife observation, photography, and interpretation, including rules and requirements and State consumption advisories.
3. Members of the public accessing the new visitor facilities will be required to park their vehicles in the Unit-designated parking areas and stay on designated walkways or trails and the observation and photography decks. Open-field travel will be prohibited.
4. Rules to help ensure public safety and minimize adverse effects upon native fish, wildlife, plants, their habitats, and private property will be posted on sign boards and enforced by Unit staff.
5. Interpretive materials will be used to inform visitors of desired behaviors when viewing and photographing wildlife. Examples include Principles of Ethical Field Practices developed by the North American Nature Photography Association. The Unit will provide signs, pamphlets, and verbal instructions from Unit staff and volunteers, as well as promote appropriate use of trails, blinds, and platforms to minimize wildlife and habitat disturbance. These materials will clearly state pertinent Unit-specific regulations.

Among others, these principles include not disturbing or otherwise interfering with animal behaviors, using telephoto lenses to photograph animals, and adhering to local regulatory requirements. Other practices that can reduce wildlife disturbance when observing or photographing include use of observation or photo blinds, and use of binoculars or spotting scopes to enable good viewing while maintaining a respectable distance from individuals or colonies.

6. Observers and photographers will be prohibited from using feed, manual elk calls, or recorded audio playback devices (e.g., those used to attract birds and other wildlife). This includes tape and digital recorders, portable computers (e.g., laptops, tablets, notebooks), and smart phones. Also, photography through use of kites, remote-controlled aircraft, drones, or extended poles (anything taller than a standard photographic tripod or monopod) will not be allowed.
7. In order to avoid harassment, disease, and/or death of native wildlife, or transport of exotic or invasive plant parts, insects, or other undesirable species, individuals participating in observation,

photography, and interpretation will be prohibited from bringing dogs or other pets with them onto the Unit. The exceptions will be legitimate, leashed guide animals.

8. No changes could be made to any of these stipulations without specific, prior written approval of the refuge manager (for the purpose of these stipulations, the refuge manager is the project leader of Nisqually National Wildlife Refuge Complex).
9. The Unit will establish a program to monitor compliance with the stipulations enumerated herein.

Justification:

Service policy states that, “Viewing and photographing wildlife in natural or managed environments should foster a connection between visitors and natural resources” (USFWS 2006b). Policy also advises that wildlife observation and photography can promote understanding and appreciation of natural resources and their management across the Refuge System (USFWS 2006c and USFWS 2006d). Participation in Unit interpretive and informational programs can instill a sense of wonder, cultivate a connection with nature, foster a life-long relationship with the Unit and the Refuge System, encourage a conservation ethic, enhance the public’s understanding and appreciation for fish, wildlife, plants, their habitats, cultural resources, and Unit management programs to conserve these valuable resources.

Service policy and Federal law require that wildlife-dependent public uses identified in the Improvement Act (including wildlife observation, photography, and interpretation) be given special consideration in refuge planning and management, and opportunities to allow these uses are to be considered in each CCP (USFWS 2000 and NWRS Administration Act). When determined compatible on a refuge-specific basis, those wildlife-dependent uses becomes priority public uses for that refuge and are to be facilitated, and strongly encouraged. Safe and compatible opportunities for families to participate in wildlife-dependent uses are to be provided across the Refuge System.

The Unit will monitor wildlife and habitat disturbance, and other potential impacts to determine if these stipulations were resulting in expected and desirable outcomes. The Unit will apply adaptive management principles to modify stipulations or adjust objectives, as necessary, to achieve desirable results (USDI 2008 and Williams et al. 2009).

The Unit reserves the right to add to or otherwise modify the stipulations listed herein in order to ensure the continued compatibility of these uses. New or modified stipulations could be instituted as a result of new information generated by ongoing or new studies; new legal, regulatory, or policy requirements; significant changes to the Unit environment or status of native fish, wildlife, plants, or their habitats; or for other legitimate reasons. Visitors will be appropriately advised of any such changes.

The Unit also reserves the right to terminate permission for these uses if individuals were violating Unit rules or regulations; if unacceptable impacts were occurring to native fish, wildlife, plants, or their habitats, cultural resources or Unit facilities, or other Unit visitors; or for other legitimate reasons.

Compatibility Standard

Providing opportunities for wildlife observation, photography, and interpretation is directly supportive of one of the Unit's goals, but could cause some wildlife disturbance and other effects. Carefully designed and constructed facilities, proper program management, and the stipulations included herein will greatly reduce this potential. This is primarily the case because Unit visitors will enjoy these uses within the bounds of new facilities that are adjacent to a public road and within a large block of Service-owned land, and open-field travel will be prohibited.

In order to be allowed on the Unit, observation, photography, and interpretation need to be determined compatible. By allowing these uses to occur under the stipulations described above, it is anticipated that wildlife which was disturbed would find sufficient food resources and resting places so their abundance and use would not be measurably lessened on the Unit. Additionally, it is anticipated that monitoring, as needed, would prevent unacceptable or irreversible impacts to fish, wildlife, plants, their habitats, other public uses, cultural resources, Unit facilities, and private lands. For the several reasons stated above and consistent with the stipulations described herein, this use will not materially interfere with or detract from maintenance of the Unit's biological integrity, diversity, and environmental health; fulfillment of the Refuge's purposes; or the Refuge System's mission.

Mandatory 10- or 15-Year Re-evaluation Date: (provide month and year for "allowed" uses only)

_____ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

_____ Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Unit Use Decision: (check one below)

___ Categorical Exclusion without Environmental Action Statement

___ Categorical Exclusion and Environmental Action Statement

X Environmental Assessment and Finding of No Significant Impact

___ Environmental Impact Statement and Record of Decision

This CD was developed and issued concurrently with the draft CCP/EA for Grays Harbor NWR and the Black River Unit of Billy Frank Jr. Nisqually NWR.

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Compatibility Determination

Use: Research, Surveys, and Scientific Collection.

Unit Name: Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge

Establishing and Acquisition Authorities:

Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715–715r)

Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a–742m)

Refuge Purposes:

. . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds (16 U.S.C. 715–715r).

. . . 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 (Refuge System or NWRs) Mission:

“The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans” (National Wildlife Refuge System Administration Act of 1966 as amended, 16 U.S.C. 668dd–668ee).

Description of Use(s):

This use involves research, surveys, and scientific collections conducted by non-Refuge System parties on the Black River Unit (Unit) of Billy Frank Jr. Nisqually National Wildlife Refuge (Refuge).

Research refers to a planned, organized, and systematic investigation of a scientific nature. Such studies are designed to determine the cause(s) of observed biotic or abiotic phenomenon over a finite time period, where cause and effect relationships usually can be inferred through statistical analyses.

Survey activities include scientific inventories and monitoring of fish, wildlife, plants, public use, and abiotic refuge resources (e.g., soils, water).

Scientific collecting involves gathering of refuge natural resources or cultural artifacts for scientific purposes. Examples include collection of vegetation, small mammals, and soils; contaminant sampling; adult and larval mosquito trapping/monitoring; and collection and curation of cultural resources.

Unit staff periodically receive requests from outside parties (e.g., universities, state agencies, other Federal agencies, and nongovernmental organizations) to conduct research, surveys, and scientific collecting on Unit lands. These project requests can involve a wide range of natural and cultural resources as well as public-use management issues, including basic absence/presence surveys, collection of new species for identification, habitat use and life-history requirements for specific species/species groups, practical methods for habitat restoration, extent and severity of environmental contaminants, techniques to control or eradicate pest species, effects of climate change on environmental conditions and associated habitat/wildlife response, identification and analyses of paleontological specimens, wilderness character, modeling of wildlife populations, bioprospecting, and assessing response of habitat/wildlife to disturbance from public uses. Projects may be species-specific, Unit-specific, or evaluate the relative contribution of Unit lands and waters to larger landscapes (e.g., ecoregion, region, flyway, national, and international), issues, and trends.

The Service's Research and Management Studies (4 RM 6, USFWS 1982) and Appropriate Unit Uses (603 FW1.10D(4), USFWS 2006) policies indicate priority for scientific investigatory studies that contribute to the enhancement, protection, use, preservation, and management of native wildlife populations and their habitat as well as their natural diversity. Projects that contribute to refuge-specific needs for resource management goals and objectives, where applicable, would be given a higher priority over other requests. Attached to this compatibility determination (CD) are examples of high-priority research, survey, and scientific collection topics for the Black River Unit.

Under the management direction of the CCP, an approximately 300-acre area at the northern end of the Unit will be evaluated for designation as a research natural area (RNA). This area includes a reach of the Black River, adjacent shrub swamp, and a large portion of the known bog habitat. If proposed and designated, the RNA would help further protect natural ecological processes surrounding these rare bogs and would facilitate long-term research and monitoring of these unusual habitats.

Research, surveys, and scientific collections on the Unit would generally be authorized through individual special use permits (SUPs) consistent with Service policy (USFWS 1986). Before being allowed on the Unit, this use would need to be found appropriate (see Appropriate Unit Uses) and then be determined compatible (USFWS 2000).

This CD was developed and made publicly available concurrently with the draft comprehensive conservation plan (CCP) and environmental assessment (EA) for Grays Harbor NWR and Black River Unit of Billy Frank Jr. Nisqually NWR. Much of the information and some of the analyses contained in this CD are addressed in detail in the CCP/EA.

Availability of Resources:

Unit staff responsibilities for research, surveys, and scientific collections by non-Refuge System entities would be primarily limited to the following: review of proposals, preparation of an SUP(s) and other appropriate compliance documents (pursuant to the National Environmental Policy Act [42 U.S.C. 4321–4347], Endangered Species Act [16 U.S.C. 1531–1544], National Historic Preservation Act [16 U.S.C. 470], etc.), and monitoring project implementation to ensure that impacts and conflicts remain within acceptable levels (compatible) over time. Additional administrative, logistical, and operational support could also be provided depending on each specific request. Estimated costs for one-time and annually recurring tasks by Unit staff are determined on a project-by-project basis. Sufficient funding in the Nisqually National Wildlife Refuge Complex's (Refuge

Complex) general operating budget would need to be available to cover expenses for these projects. The terms and conditions for funding and staff support necessary to administer each project on the Unit would be clearly stated in the SUP(s).

The Refuge Complex has the following staffing and funding to administratively support and monitor research, surveys, and scientific collections that are currently taking place on the Black River Unit (see table below). Any substantial increase in the number of projects would create a need for additional resources to satisfy administrative and monitoring of the investigators and their projects and to ensure the projects were implemented in a compatible manner. Any substantial additional costs above those itemized below could result in finding a project not compatible unless expenses were offset by the investigator, sponsoring organization, or other party.

Table B-3. Costs to Administer and Manage Research, Surveys, and Scientific Collections.

Category	One-time Expense (\$)	Recurring Expense (\$/year)
Administration and Management		3,500
Total Costs		3,500

Anticipated Impacts of the Use(s):

Unit Goals and NWRS Mission

Use of the Unit to conduct research, surveys, or scientific collecting would generally provide information of benefit to native fish, wildlife, plants, and their habitats or cultural resources. Scientific findings gained through these projects could provide important information regarding life-history needs of species and species groups as well as identify or refine management actions to achieve natural or cultural resource management objectives in refuge management plans (especially CCPs). Reducing uncertainty regarding wildlife and habitat responses to refuge management actions undertaken in order to achieve desired outcomes (objectives) is essential for adaptive management in accordance with 522 DM 1 (Adaptive Management USDI 2008 and Williams et al. 2009).

Potentially, some project's methods could impact or conflict with Unit-specific natural or cultural resources, priority, wildlife-dependent public uses, other high-priority research, or Unit management programs. In such cases, in order for the project to be determined compatible, it would need to be clearly demonstrated that the project's scientific findings would contribute to Unit management and that the project could not be conducted off-Unit. The investigator(s) would need to identify methods/strategies in advance to minimize or eliminate potential impacts and conflicts. If unacceptable impacts, including long-term and cumulative impacts, could not be avoided, then the project would not be determined compatible. Research projects that represent public or private economic use of the natural resources of any national wildlife refuge (e.g., bioprospecting) in accordance with 16 U.S.C. 715s, must contribute to the achievement of the national wildlife refuge purposes or the National Wildlife Refuge System mission to be compatible (50 C.F.R. 29.1).

Impacts would be project- and site-specific, where they would vary depending upon nature and scope of the fieldwork. Data collection techniques would generally have minimal animal mortality or disturbance, habitat destruction, no introduction of contaminants, or no introduction of

nonindigenous species. In contrast, projects involving the collection of biotic samples (plants or animals) or requiring intensive ground-based data or sample collection would have short-term impacts. To reduce impacts, the minimum number of samples (e.g., water, soils, vegetative litter, plants, macroinvertebrates, vertebrates) would be collected for identification and/or experimentation and statistical analysis. Where possible, researchers would coordinate and share collections to reduce sampling needed for multiple projects. For example, if one investigator collects fish for a diet study and another research examines otoliths, then it may be possible to accomplish sampling for both projects with one collection effort.

Investigator(s) obtaining required State or Territorial and Federal collecting permits would also ensure minimal impacts to fish, wildlife, plants, and their habitats. If, after incorporating the above strategies, a project would still result in long-term or cumulative effects, it would not be found compatible. A section 7 consultation under the Endangered Species Act (16 U.S.C. 1531–1544, 87 Stat. 884, as amended Public Law 93-205) would be required for activities that may affect a federally listed species and/or critical habitat. Only projects which have no effect or would result in not likely to adversely affect determinations would be considered compatible.

Spread of invasive plants and/or pathogens is possible from ground disturbance and/or transportation of project equipment and personnel, but it would be minimized or eliminated by requiring proper cleaning of investigator equipment and clothing as well as quarantine methods, where necessary. If after all practical measures are taken and unacceptable spread of invasive species is anticipated to occur, then the project would be found not compatible without a restoration or mitigation plan.

There also could be localized and temporary effects from vegetation trampling, collecting of soil and plant samples, or trapping and handling of wildlife. Impacts may also occur from infrastructure necessary to support a project (e.g., permanent transects or plot markers, exclosure devices, monitoring equipment, solar panels to power unattended monitoring equipment). Some level of disturbance is expected with these projects, especially if investigator(s) enter areas closed to the public and collect samples or handle wildlife. However, wildlife disturbance (including altered behavior) would usually be localized and temporary in nature. Where long-term or cumulative unacceptable effects cannot be avoided, the project would not be found compatible. Project proposals would be reviewed by Unit staff and others, as needed, to assess the potential impacts (short-term, long-term, and cumulative) relative to benefits of the investigation to Unit management issues and understanding of natural systems.

At least 6 months before initiation of fieldwork (unless an exception is made by prior approval of the refuge manager), project investigator(s) must submit a detailed proposal using the format provided in Attachment 1. Project proposals would be reviewed by Unit staff and others, as needed, to assess the potential impacts (short-term, long-term, and cumulative) relative to benefits of the investigation to Unit management issues and understanding of natural systems. This assessment would form the primary basis for allowing or denying a specific project. Projects which result in unacceptable Unit impacts would not be found compatible. If allowed and found compatible after approval, all projects also would be assessed during implementation to ensure impacts and conflicts remain within acceptable levels.

If the proposal is approved, then the Unit manager would issue an SUP(s) with required stipulations (terms and conditions) of the project to avoid and/or minimize potential impacts to Unit resources as well as conflicts with other public-use activities and Unit field management operations. After

approval, projects also are monitored during implementation to ensure impacts and conflicts remain within acceptable levels based upon documented stipulations.

The combination of stipulations identified above and conditions included in any SUP(s) would ensure that proposed projects contribute to the enhancement, protection, conservation, and management of native wildlife populations and their habitats on the Unit. As a result, these projects would help fulfill Unit purpose(s), contribute to the mission of the Refuge System, and maintain the biological integrity, diversity, and environmental health of the Unit.

Projects which are not covered by the CCP (objectives under Goal 4 [Gather scientific information (inventories, monitoring, and research) but are necessary to support adaptive management decisions]) would require additional NEPA documentation.

The management direction of the Black River Unit is guided by the protection of biological diversity and enhancement and management of a valuable wetland ecosystem for the benefit of anadromous salmonid production, migratory birds, and other wetland-dependent wildlife (USFWS 1996). The Unit has developed the following six goals as part of its comprehensive conservation planning process.

1. Protect, maintain, and enhance aquatic habitats characteristic of the upper Black River Watershed while maintaining historical characteristics of the north Puget Trough Lowlands for the benefit of native fish, amphibians, migratory birds, and a diverse assemblage of other native species.
2. Protect and maintain upland habitats characteristic of the upper Black River watershed.
3. Contribute to the protection and long-term environmental health of the greater Black River watershed and ecosystem.
4. Gather scientific information (inventories, monitoring, and research) necessary to support adaptive management decisions.
5. Provide quality opportunities for visitors to experience a diversity of wildlife and habitats to enhance their understanding and appreciation of the Unit's natural resources and foster a connection with nature.
6. Support and develop an active volunteer program and partnerships to assist in providing quality visitor services programs and outreach.

High priority research, survey, and scientific collection projects would directly support Unit goal number 4. It is likely that most proposed research, survey, or scientific collection projects would also support one or more of Unit goal numbers 1, 2, 3, and 5, but each would need to be evaluated separately. Projects that are determined supportive of Unit goals and the Refuge System mission have a greater chance of being found appropriate, determined compatible, and authorized for implementation.

Fish, Wildlife, Plants, and Their Habitats

Impacts would be project- and site-specific, and would vary depending upon the nature and scope of the fieldwork. Data collection techniques would generally have minimal animal mortality or

disturbance, habitat destruction, no introduction of contaminants, and no introduction of nonindigenous species. In contrast, projects involving the collection of biotic samples (plants or animals) or requiring intensive ground-based data or sample collection would at least have short-term, localized impacts.

The Black River is a tributary to the Chehalis River which drains to the Pacific Ocean through Grays Harbor. The slow-moving Black River and surrounding wetlands form the most intact lowland river system remaining in western Washington. The Unit includes upland forest, riparian forest, grassland, various wetland types, including shrub swamp and rare sphagnum bog, and aquatic systems.

The river, tributaries, wetlands, grasslands, shrub swamps, and forests support a diversity of resident and migratory wildlife species. Wildlife species of special management concern at the Unit include salmonids such as steelhead trout (*Oncorhynchus mykiss*), coastal cutthroat trout (*Oncorhynchus clarki clarki*), coho salmon (*Oncorhynchus kisutch*), and Chinook salmon (*Oncorhynchus tshawytscha*), which use Black River and its tributaries for migration, spawning, and rearing. Many species of frogs, salamanders, and newts are found in the mosaic of wetlands. River otter (*Lutra canadensis*), mink (*Mustela vison*), muskrat (*Ondatra zibethicus*), and beaver (*Castor canadensis*) can be seen in Black River; a herd of Roosevelt elk (*Cervus elaphus roosevelti*) graze in Unit grasslands. Ducks, geese, and grebes; rails, bitterns, herons; raptors; and neotropical songbirds occur throughout the Unit.

Unit management focuses on protecting, restoring, and maintaining quality habitats—especially freshwater streams, bogs and emergent marshes, and upland grasslands—for a diversity of native wildlife and plant species, including those that are rare and declining. The Unit provides valuable habitat for an endemic, State-sensitive species, the Olympic mud minnow (*Novumbra hubbsi*) and the State-endangered and federally threatened species Oregon spotted frog (*Rana pretiosa*). The frog is known to occur in three subbasins in the State, and in two locations on the Unit. It is suspected that the Unit may support rare bog-adapted insects, federally endangered water howellia (*Howellia aquatilis*) and possibly the federally threatened streaked horned lark (*Eremophila alpestris*).

Invasive species of actual or potential concern include reed canarygrass (*Phalaris arundinacea*), purple loosestrife (*Lythrum salicaria*), knotweed (*Polygonum species*), yellow flag iris (*Iris pseudacorus*), Scotch broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus armeniacus*), holly (*Ilex spp.*), New Zealand mudsnail (*Potamopyrgus antipodarum*), feral cat (*Felis catus*), bullfrog (*Rana catesbeiana*), and various warm water fish species.

Disturbance would likely be one of the most common wildlife effects caused by research, surveys, and scientific collections. Human disturbance has differential effects on wildlife and is dependent upon, among other variables, the species involved and its age; the time of year; the breeding cycle stage (if applicable); the surrounding environment; whether the activity involves vehicles; the intensity, speed, noise, nature, and frequency of the disturbing activity; and the directness of approach to an animal (Blanc et al. 2006; Goss-Custard and Verboven 1993; Holmes et al. 2005; Hammitt and Cole 1998; Kirby et al. 1993; Knight and Cole 1995a; Knight and Cole 1995b; Lafferty 2001a). Disturbance can cause animals stress and alter their normal behavior; cause them to stop feeding; cause abandonment of nests and young; and allow predators access to nests/young, reduce parental attention to young, and otherwise impact survival of individual birds, eggs, nestlings, or broods (Burger and Gochfeld 1991; Haysmith and Hunt 1995; Lafferty 2001b). The effects of disturbance on individual animals are likely additive.

Naylor et al. (2009) examined the effects of four types of off-road recreational disturbance (all-terrain vehicle riding, mountain biking, hiking, and horseback riding) on North American elk (*Cervus elaphus*) in northeast Oregon. They found that all types of disturbance studied affected elk behavior. Hiking generally caused an increase in the time elk traveled, especially in the morning; resulted in a decrease in resting time; and had no effect on time spent feeding. Ciuti et al. (2012) studied the effects of various human disturbances (e.g., hiking, biking, horseback riding, hunting, fishing, riding all-terrain vehicles, general vehicle traffic, and roads) in various landscapes with different management programs in southwest Alberta. They also found that hiking caused elk travel time to increase and that an increase in the number of hikers caused an increase in travel behavior in elk. They noted that, where hunting is not allowed, elk can exhibit habituation (e.g., reduced vigilance behavior) to some types or levels of human disturbance. Behavioral responses of tule elk (*Cervus elaphus nannodes*) to off-trail hikers and off-shore boats were investigated by Becker et al. (2012) at Point Reyes National Seashore, California. They learned that elk exhibiting rutting behavior and those in the presence of off-trail hikers displayed the most disturbance behaviors (i.e., head up, stand, move off, run, or alarm cry). Elk were more sensitive to human disturbance when herd sizes were smaller (<15 animals).

The distances of researchers from wildlife subjects and the numbers of researchers involved are important disturbance variables. Holmes et al. (2007) found that vigilance behavior of Gentoo penguins (*Pygoscelis papua*) increased as the numbers of observers increased. A study of visitors to a colony of kittiwakes (*Rissa tridactyla*) and guillemots (*Uria aalge*) revealed that nesting success was influenced by the distance observers were from the birds (positively correlated) and the number of observers involved (negatively correlated) (Beale and Monaghan 2004). Breeding birds are especially sensitive to human disturbance (Trulio 2005; Hammitt and Cole 1998). In a study of the effects of trail users (walkers, joggers, bicyclists, and in-line skaters) on shorebirds in San Francisco Bay, Trulio and Sokale (2008) found there was no difference in shorebird use between sites without trail use and those sites with low numbers of trail users. However, after a certain point on high use days, increasing numbers of trail users resulted in reduced numbers of foraging shorebirds. In a study of sanderlings (*Calidris alba*) on a California beach, Thomas (5-2000) found that the number, proximity, and activity of recreationists all affected foraging time by the birds. The presence of off-leash dogs was especially disturbing.

A variety of factors affect flushing and flushing distances among waterbirds, including the species involved; the activity in which the birds are engaged (e.g., foraging versus nesting); prey density and nutritional requirements for feeding birds; flock size (large flocks may be more easily disturbed); whether the species is hunted; and the type, size, speed, and noise of disturbance (e.g., dogs versus humans, cycling versus walking, or approaching birds by walking versus in a motorized boat) (Goss-Custard and Verboven 1993; Lafferty 2001b; Rodgers and Smith 1997; Rodgers 1991; Smit and Visser 1993). Flushing of birds or even raising their alert levels (which usually occurs at a greater distance than that for flushing) creates stress and requires animals to expend energy that otherwise would be invested in essential life history activities such as foraging, migration, predator avoidance, mating, nesting, and brood-rearing.

Trulio (May 2005) reviewed numerous studies of the effects of recreational and other human uses on wildlife, especially waterbirds. Reviewed studies found that similar to the effects of recreationists, researchers can often have a number of adverse effects on wildlife and can contribute to nest abandonment, increased depredation, reduction of nests near disturbed areas, lower productivity, and increased flight. These effects may vary based on the species studied, the stage in the breeding cycle when disturbance occurs, the presence of predators in the area, and other factors. Tremblay and

Ellison (1979) studied the effects on reproductive success of researchers entering black-crowned night heron (*Nycticorax nycticorax*) colonies in the St. Lawrence Estuary, Canada. They found that effects varied significantly based on when in the breeding cycle researchers entered colonies. Entering just prior to or during laying of eggs caused inhibition of laying, abandonment of nests, and predation or abandonment of eggs. Entry into the colonies following egg laying had much less impact. More frequent researcher disturbance had greater effects on reproductive success than less frequent visits. In some situations, researchers' actions caused mortality of young birds. In studies of tricolored herons (*Egretta tricolor*), Frederick and Collopy (1989) found that when researchers visited the nesting colonies after courtship and early egg laying, there were no differences in reproductive success between sites visited frequently versus those visited infrequently. Parsons and Burger (1982) examined the effects of research handling on behavior of black-crowned night heron (*Nycticorax nycticorax*) nestlings in Massachusetts. Nestlings that were not handled exhibited escape behavior when disturbed. Nestlings that were regularly handled displayed increasingly defensive behavior, did not move from their nests, and appeared to have habituated somewhat to the disturbance. Handling did not affect growth of the nestlings. All adult birds flew away when researchers entered the colonies.

In a near-shore study with Xantus's murrelets (*Synthliboramphus hypoleucus*), Newman et al. (2005) found that biochemical and cellular indicators of stress were adversely affected by research activities, including capture, handling, and radio-marking. Wright et al. (2007) found that land-based researchers flushed large numbers of California brown pelicans (*Pelecanus occidentalis*) in studies at a seabird colony on the lower Columbia River. A study of the effects of varying frequencies of research activities within black skimmer (*Rynchops niger*) nesting subcolonies by Safina and Burger (1983) found that pre-laying adults left disturbed subcolonies; some nesting pairs deserted nests early in incubation; and nest density, late nesting, hatching success, and fledgling success were all adversely affected by this disturbance. Robert and Ralph (1975) assessed biological effects of researchers entering a nesting colony of western gulls (*Larus occidentalis*) and found that hatching failure was positively correlated with the frequency of disturbance and that effects were greater during the early stage of the breeding cycle. Colwell et al. (1988) studied the effects of blood sampling of shorebirds on breeding grounds in Minnesota, Manitoba, and Saskatchewan. They found that blood sampling had no effect on return of birds the following year, that it had varying effects on clutch desertion (based on when in the reproductive cycle the birds were captured, whether both parents were sampled, and whether the species was biparental or uniparental), and that a small percentage of birds (0-3 percent) died or sustained debilitating injuries.

Wildlife disturbance can be a special concern with wildlife observation and photography (Cline et al. 2007; DeLong 2002; Knight and Cole 1995). Observers and photographers often want to enhance their view or photograph by encroaching closer and closer to their subject. This can cause increased stress in wildlife and eventually lead to flushing. If a bird is nesting or brood rearing, disturbance can cause temporary or permanent nest desertion. Even if only temporary, eggs and nestlings can face survival challenges associated with temperature extremes and predation.

Studies have had mixed results regarding potential habituation of birds and some other taxa to human disturbance. Wildlife are often less disturbed by routine human activities that repeatedly occur along defined routes (e.g., trails, roads, or water channels), especially frequent disturbance that does not involve direct contact or other threat, compared with those activities that occur irregularly and outside predictable paths/channels (Blanc et al. 2006; Holmes et al. 2007; Knight and Cole 1995b; Smit and Visser 1993). Some species can habituate to the presence of humans who stay in the same general location and remain relatively still (Goss-Custard and Verboven 1993; Smit and Visser

1993). In an elk study in southwestern Alberta, Ciuti et al. (2012) found that, where hunting is not allowed, elk can exhibit habituation (e.g., reduced vigilance behavior) to some types or levels of human disturbance. Habituation to some types and levels (intensity and frequency) of human disturbance appears to vary among species, within species, between resident and migratory populations, and potentially between inexperienced and experienced breeders. This makes it difficult to forecast habituation in actual field situations.

In addition to travel by foot or vehicle, field research can involve transport of project infrastructure, equipment, and supplies, such as permanent transects or plot markers, and exclosure devices. Access to and work at study sites could result in localized and temporary effects including trampling of native plants, erosion, collecting of soil and plant samples, and trapping and handling of fish and wildlife. Longer-term effects could potentially be caused by introduction or spread of exotic species, including invertebrates, plants, and invasive species, or pathogens. All of these impacts could adversely affect native fish, wildlife, plants, and their habitats. The degree of actual effects upon important life history parameters such as foraging, predator avoidance, reproduction, and survival of individuals, and on diversity and abundance of native species (community health), depends on specific circumstances. These potential effects could be minimized or eliminated by requiring proper cleaning of investigator equipment and clothing and possibly restoration or mitigation plans, where appropriate (see attached). The general stipulations attached hereto, project-specific stipulations, and permit conditions are expected to greatly reduce the potential impacts of research, surveys, and scientific collections on Unit fish, wildlife, plants, and their habitats.

Public Use

If research was conducted at one of the new visitor facilities, it is possible that it could result in some crowding, especially with school groups. If field research was conducted in Unit habitats near one of these new facilities, it could result in flushing of birds and other wildlife, or cause some animals to move farther afield. This would reduce the quality of experience for observers and photographers. Such conflicts would be expected to be infrequent and temporary.

General and project-specific stipulations and permit conditions regarding the locations and scheduling of research would be used to greatly minimize the likelihood that such activities would impair wildlife-dependent uses. The exception could be research and surveys specifically focused on public use. In such cases, approved study protocols would help ensure that such projects would not significantly reduce the quality of wildlife-dependent public uses.

Cultural Resources and Values

To date, few cultural resource surveys have been conducted on the Unit. There are no recorded archaeological sites, but some buildings and associated structures are of historic value. It is unlikely that research at the Unit would affect cultural resources. However, if such projects involved construction of new facilities, the Service would undertake appropriate surveys and engage in consultations consistent with requirements of the National Historic Preservation Act (16 U.S.C. 470) prior to project approval. Additionally, if the research, surveys, or scientific collections specifically focused on cultural resources, such projects could require additional permits and approvals, potentially including a permit under the Archaeological Resources Protection Act (ARPA, 16 U.S.C. 470aa–470mm). Stipulations and conditions associated with Unit SUPs or ARPA permits would help ensure that research-related adverse effects upon cultural resources were avoided, minimized, and/or mitigated, as appropriate.

Public Review and Comment:

This CD was available for public review and comment in the draft CCP/EA.

Determination: (check one below)

☐ Use is Not Compatible

☒ Use is Compatible with following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Investigator(s), researchers, and support staff will follow all Unit-specific regulations that specify access and travel on the Unit.
2. Projects will adhere to scientifically defensible protocols for data collection, where available and applicable.
3. Permission to use the Unit for research, surveys, or scientific collections will be officially authorized through issuance of an SUP.
4. To acquire an SUP, at least 6 months before initiation of fieldwork, a researcher(s) will be required to submit a detailed project proposal and request an SUP. Among other things, proposals need to adhere to scientifically defensible protocols for data collection, where available and applicable.
5. Project proposals are reviewed by Unit staff and others, as needed. This review will assess, relative to Unit management issues and understanding of natural systems, the potential impacts (short-term, long-term, and cumulative) relative to the benefits of the investigation. This assessment forms the primary basis for determining whether or not the project could be approved.
6. All SUPs will have a definite termination date in accordance with 5 RM 17.11. Annual or other short-term SUPs are preferred; however, some permits may be allowed for a longer period, if needed, to allow completion of the project.

7. SUP renewals are subject to refuge manager review and approval based on timely submission of and content in progress reports, compliance with SUP stipulations, and required permits. Continuation of existing projects requires approval by the refuge manager.
8. SUPs cover uses by a specified individual or organization and could not be assigned or sub-permitted to others.
9. Researchers must possess all required local, State, and Federal permits and approvals for collections and other activities of their proposed projects.
10. SUPs will include maps clearly depicting the areas researchers will be authorized to access and use, including the Unit entry point(s). Permittees will be prohibited from straying outside the project areas depicted on maps.
11. A section 7 consultation under the Endangered Species Act is required for all projects and activities that may affect a federally listed species and/or critical habitat. Projects which will have “no effect” or will result in a “not likely to adversely affect” determination will be considered for potential approval.
12. Researchers are required to secure approval from the Service prior to use of any pesticide (including uses of herbicides, fungicides, and insecticides) on the Unit. This involves researchers submitting to the refuge manager a completed Pesticide Use Proposal (PUP) for each proposed pesticide use. Any researcher-applicator will be required to have a current State pesticide application license and endorsement for the applicable habitat. These PUPs need to be submitted at least 90 days prior to the proposed use of the pesticide to allow adequate time for evaluation and processing.
13. To minimize the introduction and/or spread of exotic plants or animals, diseases, or other pests, sampling equipment as well as researchers’ clothing and vehicles (e.g., ATVs, boats) will need to be thoroughly cleaned (free of dirt, seeds, and other plant material) before being used on the Unit.
 - a. Researchers/investigators are required to disinfect waders by following specific protocols provided by the Unit. Disinfection is required prior to entry into any Unit wetland and when crossing between wetlands.
14. Researchers are prohibited from constructing new or maintaining existing structures, creating new or expanding exiting trails, or removing vegetation to facilitate travel on the Unit without specific, prior written approval of the refuge manager (for the purpose of these stipulations, the refuge manager is the project leader of the Nisqually National Wildlife Refuge Complex).
15. Any flagging used needs to be biodegradable.
16. Consistent with Service policy regarding management of nonhazardous solid waste on refuges (USFWS 2001), permittees will be prohibited from littering, dumping refuse, abandoning equipment or materials, or otherwise discarding any items on the Unit.

17. To reduce impacts, the minimum number of samples (e.g., water, soils, vegetative litter, plants, macroinvertebrates, vertebrates, and artifacts) will be collected for identification and/or experimentation and statistical analysis.
 - a. Where possible, researchers would be required to coordinate and share collections. This could reduce sampling needed for multiple projects and any associated mortality and disturbance. For example, if one investigator collected fish for a diet study and another researcher was examining otoliths, then it could be possible to accomplish sampling for both projects with one collection effort.
18. Researchers and their colleagues would be prohibited from collecting, removing, disturbing, or otherwise adversely impacting any prehistoric/archaeological or historic artifacts, cultural resources, abiotic or biological specimens or samples, or mementos from the Unit unless stated in the SUP.
 - a. In the event such resources were inadvertently disturbed in the course of conducting otherwise permitted activities, the disturbing activity would need to be immediately discontinued, and the refuge manager would need to be notified within 24 hours.
19. If unacceptable impacts to natural resources or conflicts arise or are documented by the Unit staff, then the refuge manager can suspend, modify conditions of, or terminate an ongoing project already permitted by SUP(s) on the Unit.
20. Upon completion of the project or annually (at the discretion of the refuge manager), researchers would be required to remove all equipment and physical markers (unless required for long-term projects) and restore sites to the refuge manager's satisfaction. SUPs would specify conditions for removal and clean up.
21. At any time, Unit staff may accompany investigator(s) in the field.
22. Progress reports are required at least annually for multiple-year projects. The minimum required elements for a progress report will be provided to investigator(s).
23. Final project reports would be due 1 year after completion of the project.
 - a. Researchers would be required to provide Unit staff with the following:
 - i. An early opportunity(ies) to review and comment on draft manuscripts well before their submittal to a scientific journal for consideration for publication;
 - ii. Copies (reprints) of all publications resulting from a project permitted on the Unit; and
 - iii. At the conclusion of the project, raw data in a format negotiated with Unit staff.
24. All samples collected on Unit lands are the property of the Service even while in the possession of the investigator(s). Any future work with previously collected samples not clearly identified in the project proposal will require submission of a subsequent proposal for review and approval. In addition, a new SUP will be required for additional project work. For

samples or specimens to be stored at other facilities (e.g., museums), a memorandum of understanding will be necessary.

25. In all written and oral presentations resulting from projects on the Unit, researchers would be required to appropriately cite and acknowledge the U.S. Fish and Wildlife Service, National Wildlife Refuge System, Billy Frank Jr. Nisqually NWR, and Unit staff and other Service personnel who supported or contributed to the project.
26. The Unit would monitor compliance with the stipulations and SUP conditions, habitat quantity and quality, wildlife use and productivity, water quality, cultural resources, Unit facilities, other Unit public uses, and other relevant endpoints to determine if stipulations associated with research, surveys, and scientific collections were resulting in expected and desirable outcomes. In consultation with researchers, the Unit would apply adaptive management principles to modify stipulations or adjust objectives, as necessary, to achieve desirable results. In the event that modified stipulations or adjusted objectives did not adequately address the situation, the refuge manager could temporarily or permanently withdraw official permission to continue research, surveys, or scientific collections on the Unit. Permission could also be withdrawn for other legitimate reasons. Permits could be revoked with 30 days or less written notice.
27. The Unit would reserve the right to add to or otherwise modify the stipulations listed herein in order to ensure the continued compatibility of this use. New or modified stipulations would be instituted as a result of ongoing or new studies; new legal, regulatory, or policy requirements; significant changes to the Unit environment or status of native fish, wildlife, plants, or their habitats; as a result of mutual agreement with researchers; or for other legitimate reason. Researchers would be advised of new or significantly modified stipulations at least 90 days prior to their becoming effective.

Justification:

Almost all research, scientific collecting, and surveys on refuge lands are inherently valuable to the Service because they would expand scientific information available for resource management decisions about fish, wildlife, plants, their habitats, cultural resources, and/or public use.

In addition, only projects which directly or indirectly contribute to the enhancement, protection, use, preservation, and management of refuge wildlife populations and their habitats generally would be authorized on Unit lands. In many cases, if it were not for the Unit staff providing access to Unit lands and waters along with some support, the project would not occur and less scientific information would be available to the Service to aid in managing and conserving the Unit resources. By allowing the use to occur under the stipulations described above, it is anticipated that wildlife species which could be disturbed during the use would find sufficient food resources and resting places so their abundance and use would not be measurably lessened on the Unit. Additionally, it is anticipated that monitoring, as needed, would prevent unacceptable or irreversible impacts to fish, wildlife, plants, and their habitats. As a result, these projects would not materially interfere with or detract from fulfilling Unit purpose(s) (including wilderness); contributing to the mission of the NWRs; and maintaining the biological integrity, diversity, and environmental health of the Unit.

Compatibility Standard

Authorizing research, surveys, and scientific collections is directly supportive of one of the Unit's goals, but these activities could cause some wildlife disturbance and other effects. In order to be allowed on the Unit, these uses would need to be determined compatible. By allowing these uses to occur under the stipulations described above, it is anticipated that wildlife which were disturbed would find sufficient food resources and resting places so their abundance and use would not be measurably lessened on the Unit. Additionally, it is anticipated that monitoring, as needed, would prevent unacceptable or irreversible impacts to fish, wildlife, plants, their habitats, cultural resources, and public use. For the several reasons stated above and consistent with the stipulations described herein, this use would not materially interfere with or detract from maintenance of the Unit's biological integrity, diversity, and environmental health; fulfillment of the Refuge's purposes; or the Refuge System's mission.

Mandatory 10- or 15-Year Re-evaluation Date: (provide month and year for "allowed" uses only)

_____ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

_____ Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Unit Use Decision: (check one below)

___ Categorical Exclusion without Environmental Action Statement

___ Categorical Exclusion and Environmental Action Statement

X Environmental Assessment and Finding of No Significant Impact

___ Environmental Impact Statement and Record of Decision

This CD was developed and issued concurrently with the draft CCP/EA for Grays Harbor NWR and the Black River Unit of Billy Frank Jr. Nisqually NWR.

Compatibility Determination for Research, Surveys, and Scientific Collections at the Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge:

Determination

Prepared by:

Kenneth J. Lee 3/9/2017
(Signature) (Date)

Approved by Project Leader,
Billy Frank Jr. Nisqually
National Wildlife Refuge
Complex:

Gymin Nakai 3-09-2017
(Signature) (Date)

Concurrence

Refuge Supervisor:

Sylvia J. Peltier 3/9/17
(Signature) (Date)

Regional Chief, National
Wildlife Refuge System,
Pacific Region:

Kevin J. Forster 3/9/17
(Signature) (Date)

FORMAT FOR PROPOSALS TO CONDUCT RESEARCH OR LONG-TERM MONITORING ON NATIONAL WILDLIFE REFUGES

A Special Use Permit (SUP) is required to conduct research and/or long-term monitoring on refuge lands. To receive a SUP, a detailed project proposal using the following format must be submitted to the Refuge Manager approximately 6 months prior to the start of the project.

Title:

Principal Investigator(s):

Provide the name(s) and affiliation(s) of all principal investigator(s) that will be responsible for implementation of the research and/or long-term monitoring described in the proposal. In addition, provide a brief description or attach vitae of expertise for principal investigator(s) germane to work described in the proposal.

Background and Justification:

In a narrative format, describe the following as applicable:

- *The resource management issue (e.g., decline in Pisonia rainforest) and/or knowledge gap regarding ecological function that currently exists with any available background information.*
- *Benefit of project findings (e.g., management implications) to resources associated with refuge.*
- *Potential consequences if the conservation issue and/or knowledge gap regarding ecological function is not addressed.*

Objectives:

Provide detailed objective(s) for the proposed project.

Methods and Materials:

Provide a detailed description of the methods and materials associated with field and laboratory work (if applicable) to be conducted for the project. Methods should include the following:

- *study area(s);*
- *number of samples;*
- *sampling dates and locations;*
- *sampling techniques; and*
- *data analyses including **statistical methods** and **significance levels**.*

Previously published methods should be cited without explanation; whereas, new or modified techniques should be described in detail. Include number of personnel as well as all facilities and equipment (e.g., vehicles, boats, structures, markers) required to collect samples/data. Provide a clear description of the relationships among study objectives, field methods, and statistical analyses.

Permits:

Identify all State or Territorial and Federal permits required if applicable.

Potential Impacts to Refuge Resources:

Describe potential impacts to threatened or endangered species as well as other refuge plants, wildlife, and fish species that could result from the implementation of project activities on the refuge. Consider the cumulative impacts associated with this project.

Animal Welfare Plan:

If appropriate, attach a copy of the Institutional Animal Care and Use review and/or animal welfare plans that are required by the principle investigator's affiliation.

Partnerships and Funding Sources:

List other participating institutions, agencies, organizations, or individuals as well as the nature and magnitude of their cooperative involvement (e.g., funding, equipment, personnel).

Project Schedule:

Provide estimated initiation and completion dates for field sampling, laboratory work, data analyses, and report/manuscript preparation. If the project is divided into phases to be accomplished separately provide separate initiation and completion dates for each phase.

Reports and Raw Data:

Establish a schedule for annual progress and final reports; include adequate time for peer review of the final report/manuscript. Draft reports/manuscripts should be submitted to the Refuge Manager for review prior to submission for consideration of publication. At the conclusion of a research study (manuscripts accepted for publication), an electronic copy of the data (e.g., GIS vegetation layers, animal species composition and numbers, genetics) should be provided to the Refuge Manager. For long-term monitoring projects, the Service also requires raw data for management and planning purposes for the refuge(s).

Publications:

Describe the ultimate disposition of study results as publications in scientific journals, presentation at professional symposiums, or final reports.

Disposition of Samples:

If the project entails the collection of biotic and/or abiotic (e.g., sediment) samples, then describe their storage. Although the samples may be in the possession of scientists for the purposes of

conducting the project in accordance with the SUP, the Service retains ownership of all samples collected on refuge lands. If the samples will be used for subsequent research activities that are not described within the original proposal, a new proposal must be submitted to the Refuge Manager to obtain a SUP before initiation of the follow-up project. After conclusion of the research activities, consult with the Refuge Manager regarding the final disposition of the samples. If specimens will be curated at a museum, then prepare a MOU using the format provided in Attachment 3.

ANNUAL PROGRESS REPORTS FOR REFUGE RESEARCH AND LONG-TERM MONITORING PROJECTS

Study title:

Fiscal year:

Progress:

In a narrative format, summarize the work that was completed on the study including the number and types of samples collected and/or data analyses.

Important findings:

In narrative format, generally describe any conclusions and/or management recommendations that may be drawn from the work completed to date.

Describe problems encountered:

In narrative format, describe any problems that were encountered during the year and their effects upon the study.

Proposed resolution to problems:

For each problem encountered, describe the actions that have been taken to remediate it.

Preparer:

Date prepared:

MEMORANDUM OF UNDERSTANDING

FOR CURATORIAL SERVICES

BETWEEN THE

(Name of the Federal agency)

AND THE

(Name of the Repository)

This Memorandum of Understanding is entered into this **(day)** day of **(month and year)**, between the United States of America, acting by and through the **(name of the Federal agency)**, hereinafter called the Depositor, and the **(name of the Repository)**, hereinafter called the Repository, in the State/Territory of **(name of the State/Territory)**.

The Parties do witnesseth that

WHEREAS, the Depositor has the responsibility under Federal law to preserve for future use certain collections of paleontological specimens and/or biological samples as well as associated records, herein called the Collection, listed in Attachment A which is attached hereto and made a part hereof, and is desirous of obtaining curatorial services; and

WHEREAS, the Repository is desirous of obtaining, housing and maintaining the Collection, and recognizes the benefits which will accrue to it, the public and scientific interests by housing and maintaining the Collection for study and other educational purposes; and

WHEREAS, the Parties hereto recognize the Federal Government's continued ownership and control over the Collection and any other U.S. Government-owned personal property, listed in Attachment B which is attached hereto and made a part hereof, provided to the Repository, and the Federal Government's responsibility to ensure that the Collection is suitably managed and preserved for the public good; and

WHEREAS, the Parties hereto recognize the mutual benefits to be derived by having the Collection suitably housed and maintained by the Repository;

NOW THEREFORE, the Parties do mutually agree as follows:

1. The Repository shall:

- a. Provide for the professional care and management of the Collection from the **(names of the resources)** sites, assigned **(list site numbers)** site numbers. The collections were recovered in connection with the **(name of the Federal or federally-authorized project)** project, located in **(name of the nearest city or town)**, **(name of the county, if applicable)** county, in the State/Territory of **(name of the State/Territory)**-

- b. Assign as the Curator, the Collections Manager and the Conservator having responsibility for the work under this Memorandum, persons who are qualified museum professionals and whose expertise is appropriate to the nature and content of the Collection.
- c. Begin all work on or about **(month, date and year)** and continue for a period of **(number of years)** years or until sooner terminated or revoked in accordance with the terms set forth herein.
- d. Provide and maintain a repository facility having requisite equipment, space and adequate safeguards for the physical security and controlled environment for the Collection and any other U.S. Government-owned personal property in the possession of the Repository.
- e. Not in any way adversely alter or deface any of the Collection except as may be absolutely necessary in the course of stabilization, conservation, scientific study, analysis and research. Any activity that will involve the intentional destruction of any of the Collection must be approved in advance and in writing by the Depositor.
- f. Annually inspect the facilities, the Collection and any other U.S. Government-owned personal property. Every **(number of years)** years inventory the Collection and any other U.S. Government-owned personal property. Perform only those conservation treatments as are absolutely necessary to ensure the physical stability and integrity of the Collection, and report the results of all inventories, inspections and treatments to the Depositor.
- g. Within five (5) days of discovery, report all instances of *and* circumstances surrounding loss of, deterioration and damage to, or destruction of the Collection and any other U.S. Government-owned personal property to the Depositor, and those actions taken to stabilize the Collection and to correct any deficiencies in the physical plant or operating procedures that may have contributed to the loss, deterioration, damage or destruction. Any actions that will involve the repair and restoration of *any of* the Collection and any other U.S. Government-owned personal property must be approved in advance and in writing by the Depositor.
- h. Review and approve or deny requests for access to or short-term loan of the Collection (or a part thereof) for scientific and educational uses. In addition, refer requests for consumptive uses of the Collection (or a part thereof) to the Depositor for approval or denial.
- i. with possession of any of the Collection or any other U.S. Government-owned personal property in any manner to any third party either directly or indirectly without the prior written permission of the Depositor, and redirect any such request to the Depositor for response. In addition, not take any action whereby any of the Collection or any other U.S. Government-owned personal property shall or may be encumbered, seized, taken in execution, sold, attached, lost, stolen, destroyed or damaged.

2. The Depositor shall:

- a. On or about **(month, date and year)**, deliver or cause to be delivered to the Repository the Collection, as described in Attachment A, and any other U.S. Government-owned personal property, as described in Attachment B.

- b. Assign as the Depositor's Representative having full authority with regard to this Memorandum, a person who meets pertinent professional qualifications.
 - c. Every (**number of years**) years, jointly with the Repository's designated representative, have the Depositor's Representative inspect and inventory the Collection and any other U.S. Government-owned personal property, and inspect the repository facility.
 - d. Review and approve or deny requests for consumptively using the Collection (or a part thereof).
3. Removal of all or any portion of the Collection from the premises of the Repository for scientific or educational purposes; any conditions for handling, packaging and transporting the Collection; and other conditions that may be specified by the Repository to prevent breakage, deterioration and contamination.
 4. The Collection or portions thereof may be exhibited, photographed or otherwise reproduced and studied in accordance with the terms and conditions stipulated in Attachment C to this Memorandum. All exhibits, reproductions and studies shall credit the Depositor, and read as follows: "Courtesy of the (**name of the Federal agency**)."
 5. The Repository shall maintain complete and accurate records of the Collection and any other U.S. Government-owned personal property, including information on the study, use, loan and location of said Collection which has been removed from the premises of the Repository.
 6. Upon execution by both parties, this Memorandum of Understanding shall be effective on this (**day**) day of (**month and year**), and shall remain in effect for (**number of years**) years, at which time it will be reviewed, revised, as necessary, and reaffirmed or terminated. This Memorandum may be revised or extended by mutual consent of both parties, or by issuance of a written amendment signed and dated by both parties. Either party may terminate this Not mortgage, pledge, assign, repatriate, transfer, exchange, give, sublet, discard or part Memorandum by providing 90 days written notice. Upon termination, the Repository shall return such Collection and any other U.S. Government-owned personal property to the destination directed by the Depositor and in such manner to preclude breakage, loss, deterioration and contamination during handling, packaging and shipping, and in accordance with other conditions specified in writing by the Depositor. If the Repository terminates, or is in default of, this Memorandum, the Repository shall fund the packaging and transportation costs. If the Depositor terminates this Memorandum, the Depositor shall fund the packaging and transportation costs.
 7. Title to the Collection being cared for and maintained under this Memorandum lies with the Federal Government.

IN WITNESS WHEREOF, the Parties hereto have executed this Memorandum.

Signed: (signature of the Federal Agency Official)

**Date:
(date)**

Signed: (signature of the Repository Official)

**Date:
(date)**

Attachment 3A: Inventory of the Collection

Attachment 3B: Inventory of any other U.S. Government-owned Personal Property

Attachment 3C: Terms and Conditions Required by the Depositor

High-Priority Research, Surveys, and Scientific Projects

Following are examples of high-priority research, survey, and scientific project topics for the Black River Unit. They are not listed in priority order.

- Enhance understanding of Oregon spotted frogs, including habitat use, movements, breeding and rearing locations and requirements, and breeding success. Establish baseline inventory and mapping of oviposition sites and monitor annually.
- Inventory, map, and assess health of bogs and associated biota, including plants and insects.
- Enhance understanding of ecology of bogs and other abiotic and biotic systems within proposed research natural area.
- Enhance understanding of hydrology of Black River and its tributaries, including effects of water control at Black Lake, and the effects of reduced magnitude and frequency of high-flow events.
- Assess water quality and quantity in Black River and its tributaries. Identify surface and groundwater withdrawals, impacts from sedimentation, sources and volumes/concentrations of nutrient inputs and effects of these nutrients on water quality; aquatic, marsh, and riparian plant growth (including invasive species); and amphibians.
- Inventory, map, and assess status, areal extent, and effects of exotic, especially invasive species, and determine the most effective methods to remove or otherwise manage such species, including in a riverine environment (including reed canarygrass and bullfrogs).
- Enhance understanding of the habitat and wildlife effects of various management practices, including grazing, haying, and mowing.
- Develop baseline inventory of plant and animal groups on Unit, including small mammals; fish; reptiles and amphibians; insects and pollinators; wetland plants; submerged aquatics; and rare, declining, listed, and Federal and State priority species or species groups.
- Inventory and assess use of Black River and its tributaries by fish, including anadromous and exotic species.
- Design and implement an appropriate climate-change monitoring program for the Unit. Assess effects of climate change on Unit habitats and wildlife.

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Compatibility Determination

Use: Grazing, Haying, and Mowing.

Unit Name: Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge, Thurston County, Washington

Establishing and Acquisition Authorities:

Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715–715r)

Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a–742m)

Refuge Purposes:

... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds (16 U.S.C. 715-715r).

... 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 (Refuge System or NWRs) Mission:

“The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans” (National Wildlife Refuge System Administration Act of 1966 as amended, 16 U.S.C. 668dd–668ee).

Description of Use(s):

This compatibility determination (CD) addresses grazing, haying, and mowing in the Black River Unit (Unit) of Billy Frank Jr. Nisqually National Wildlife Refuge (Refuge). As used herein, grazing involves domestic livestock feeding on native or nonnative vegetation. Grazing can include trailing and watering of livestock. Species of livestock potentially used for grazing on the Unit include cattle (*Bos primigenius*) and goats (*Capra aegagrus hircus*) or horses (*Equus ferus caballus*).

On multiple-use public lands (e.g., those managed by the U.S. Forest Service or U.S. Bureau of Land Management), grazing is one of several management purposes. However, on almost all national wildlife refuges, including on this Unit, grazing is not a purpose and would instead be used as a management tool to achieve conservation purposes, such as enhancement of wildlife habitat values or control of invasive plants.

Haying involves the cutting or mowing, baling, and curing of vegetation for livestock fodder. Mowing involves open field cutting, but not removal of vegetation. Haying and mowing on the Unit would also be for purposes like those just mentioned. Grazing, haying, and mowing to provide for

livestock, to keep open areas of grass, and to control invasive plant species occurred on a number of parcels prior to these lands becoming part of the Refuge System.

There have been grazing, haying, and mowing programs on U.S. Fish and Wildlife Service-owned parcels since 2001. At present, one or more of these habitat management practices occurs on approximately 165 acres of either upland dry, nonnative grasslands; seasonally flooded, nonnative grasslands; and some emergent wetlands. These practices are conducted consistent with cooperative land management agreements (CLMAs) which are authorized under Federal regulations (50 C.F.R. 29.2).

It is anticipated that the program would initially include approximately 165 acres, but the total number of acres treated could increase or decrease seasonally, annually, or otherwise depending on Unit habitat management needs and the addition of new lands to the Unit. If all the currently owned upland dry, nonnative grasslands; seasonally flooded, nonnative grasslands; and emergent marshes were treated using these management techniques, it would be nearly 300 acres.

Grazing and mowing are proposed for more than 82 acres of the Unit's seasonally flooded, nonnative grasslands. Additional acres may be included as parcels are added to the Unit. This habitat supports migratory and marsh birds, many amphibian species, Oregon spotted frog (*Rana pretiosa*), and other wildlife species. Management is especially challenged by the widespread presence of invasive reed canarygrass (*Phalaris arundinacea*).

Grazing, haying, and mowing are also proposed for more than 35 acres of emergent marshes. This habitat supports migratory and marsh birds, amphibians, other wildlife species, and potentially supports water howellia (*Howellia aquatilis*). Emergent marsh is very important for the Oregon spotted frog. Its management is challenged by the widespread presence of invasive reed canarygrass.

Grazing, haying, and mowing are also proposed for more than 163 acres of upland dry, nonnative grasslands. It is possible some of these grasslands may have been maintained through prescribed burning by Native Americans. The purposes of employing grazing, haying, and mowing practices would be to maintain and enhance a mosaic of open and short, early successional grasslands and forbs (2 to 12 inches in height), an occasional large, cavity-producing tree (e.g., big leaf maple [*Acer macrophyllum*] or Garry oak [*Quercus garryana*]), and borders of native shrubs. This habitat supports Roosevelt elk (*Cervus elaphus roosevelti*); black-tailed deer (*Odocoileus hemionus columbianus*); bats; small mammals; western meadowlark (*Sturnella neglecta*) and killdeer plover (*Charadrius vociferus*); raptors such as American kestrel (*Falco sparverius*), hawks, and owls; American wigeon (*Anas americana*) and geese; cavity-nesting birds; pollinators such as hummingbirds, butterflies, and moths; and possibly federally threatened streaked horned lark (*Eremophila alpestris strigata*). Invasive plants of concern in upland grasslands include Himalayan and evergreen blackberries (*Rubus armeniacus* and *Rubus acinatus*), Scotch broom (*Cytisus scoparius*), common burdock (*Arctium minus*), common teasel (*Dipsacus fullonum*), and Canada and bull thistle (*Cirsium arvense* and *Cirsium vulgare*).

Haying or mowing would be conducted seasonally, generally from late April or early May through October. Grazing, as a tool, could be used year-round as needed to control invasive plants and provide appropriate habitat structure for wildlife, especially for Oregon spotted frog. The herbivores could be temporarily removed or rotated out of specific areas as needed. These practices would often be implemented along with an array of other habitat management techniques, such as placement of

barrier cloth, hand cutting, fertilizing, prescribed fire, herbicide treatment, planting, seeding, and water control.

These activities are considered specialized uses under U.S. Fish and Wildlife Service (Service) policy (USFWS 1986). Federal regulations consider grazing and haying to be economic uses (May we allow economic uses on national wildlife refuges? 50 C.F.R. 29.1). Grazing, haying, and mowing on the Unit would be authorized through special use permits (SUPs), cooperative farming agreements, CLMAs, contracts, or similar agreements. Before being allowed on the Unit, these uses would first need to be found appropriate (USFWS 2006) and then be determined compatible (USFWS 2000).

This CD was developed and made publicly available concurrently with the draft comprehensive conservation plan (CCP) and environmental assessment (EA) for Grays Harbor NWR and Black River Unit of Billy Frank Jr. Nisqually NWR. Much of the information and some of the analyses contained in this CD are addressed in detail in the CCP/EA.

Availability of Resources:

The Service seeks to recover its costs associated with administration of specialized uses and/or charge a fee equal to the fair market value of the benefit received by the user (see 5 RM 17).

Applicable administrative costs include both direct and indirect costs, such as:

- Costs associated with construction, repair, operation, and maintenance of associated facilities;
- Salaries and associated employee expenses related to evaluation of the proposed use (including appropriateness finding, compatibility determination, and compliance with applicable laws, regulations, and policies such as the National Environmental Policy Act [42 U.S.C. 4321–4347], Endangered Species Act [16 U.S.C. 1531–1544], and National Historic Preservation Act [16 U.S.C. 470]) and development of the grazing permit or agreement;
- Salaries and associated employee expenses related to monitoring of this use to ensure that permit/agreement requirements are followed and that the use remains compatible. This includes evaluation of the effects of grazing, haying, and mowing on the Unit's natural and cultural resources, and compatible, especially wildlife-dependent, public use;
- Use-related supplies, equipment, and travel;
- An applicable portion of Unit overhead costs.

At the discretion of the Service, grazing permittees could be required to install temporary or construct permanent grazing-related facilities. Grazing fees and/or CLMA in-kind requirements would be adjusted accordingly. Following is an estimate of one-time costs associated with implementation of the proposed grazing program.

Table B-4. Costs to Administer and Manage Grazing, Haying, and Mowing.

Projects	One-time Costs	Recurring Costs per/year
Administration and oversight of grazing, haying, and mowing		5,000
Monitoring		1,000
Maintenance		3,000
Total Costs		9,000

Fee revenues collected would not be retained by the Refuge. Instead, these monies would be deposited into the U.S. Treasury Department's National Wildlife Refuge Fund. Monies from this fund are used for redistribution to refuges to help offset the costs of administering specialized uses (Expenses for Sales) and for payments in lieu of taxes to counties or other local governments (under the Refuge Revenue Sharing Act [16. U.S.C. 715s]).

Alternately, instead of charging a permittee a fee for grazing, haying, or mowing on the Unit, the Service and permittee could enter into a CLMA. This would allow the permittee to provide share-in-kind services to the Unit that, depending on their value, could reduce or eliminate their grazing, haying, or mowing fee. Because mowing would not generate a marketable commodity for the permittee, the Service could either contract for this work or include mowing as one of the share-in-kind services to be provided by the permittee as part of a grazing and/or haying CLMA. Repair or maintenance of fences or gates or other similar work could also be included in a CLMA.

The Nisqually National Wildlife Refuge Complex's annual operations budget will support the annual costs (staff) associated with the proposed grazing, haying, and mowing program on the Unit.

Anticipated Impacts of the Use(s):

Unit Goals and NWRS Mission

The management direction of the Black River Unit is guided by the protection of biological diversity and enhancement and management of a valuable wetland ecosystem for the benefit of anadromous salmonid production, migratory birds, and other wetland-dependent wildlife (USFWS 1996). The Unit has developed the following six goals as part of its comprehensive conservation planning process.

1. Protect, maintain, and enhance aquatic habitats characteristic of the upper Black River Watershed while maintaining historical characteristics of the north Puget Trough Lowlands for the benefit of native fish, amphibians, migratory birds, and a diverse assemblage of other native species.
2. Protect and maintain upland habitats characteristic of the upper Black River watershed.
3. Contribute to the protection and long-term environmental health of the greater Black River watershed and ecosystem.

4. Gather scientific information (inventories, monitoring, and research) necessary to support adaptive management decisions.
5. Provide quality opportunities for visitors to experience a diversity of wildlife and habitats to enhance their understanding and appreciation of the Unit's natural resources and foster a connection with nature.
6. Support and develop an active volunteer program and partnerships to assist in providing quality visitor services programs and outreach.

Properly managed grazing, haying, and mowing would directly support Unit goal numbers 1, 2, 3, and 4.

Fish, Wildlife, Plants, and Their Habitats

The Black River is a tributary to the Chehalis River which drains to the Pacific Ocean through Grays Harbor. The slow-moving Black River and surrounding wetlands form the most intact lowland river system remaining in western Washington. The Unit includes upland forest, riparian forest, grassland, various wetland types, including shrub swamp and rare sphagnum bog, and aquatic systems.

The river, tributaries, wetlands, grasslands, shrub swamps, and forests support a diversity of resident and migratory wildlife species. Wildlife species of special management concern at the Unit include salmonids such as steelhead trout (*Oncorhynchus mykiss*), coastal cutthroat trout (*Oncorhynchus clarki clarki*), coho salmon (*Oncorhynchus kisutch*), and Chinook salmon (*Oncorhynchus tshawytscha*), which use Black River and its tributaries for migration, spawning, and rearing. Many species of frog, salamander, and newt are found in the mosaic of wetlands. River otter (*Lutra canadensis*), mink (*Mustela vison*), muskrat (*Ondatra zibethicus*), and beaver (*Castor canadensis*) can be seen in Black River; a herd of Roosevelt elk (*Cervus elaphus roosevelti*) graze in Unit grasslands. Ducks, geese, and grebes; rails, bitterns, herons; raptors; and neotropical songbirds occur throughout the Unit.

Unit management focuses on protecting, restoring, and maintaining quality habitats—especially freshwater streams, bogs and emergent marshes, and upland grasslands—for a diversity of native wildlife and plant species, including those that are rare and declining. The Unit provides valuable habitat for an endemic, State-sensitive species, the Olympic mud minnow (*Novumbra hubbsi*) and the State-endangered and federally threatened species Oregon spotted frog (*Rana pretiosa*). The frog is known to occur in three subbasins in the State, and in two locations on the Unit. It is suspected that the Unit may support rare bog-adapted insects, federally endangered water howellia (*Howellia aquatilis*) and possibly the federally threatened streaked horned lark (*Eremophila alpestris*).

Invasive species of actual or potential concern include reed canarygrass (*Phalaris arundinacea*), purple loosestrife (*Lythrum salicaria*), knotweed (*Polygonum species*), yellow-flag iris (*Iris pseudacorus*), Scotch broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus armeniacus*), holly (*Ilex spp.*), New Zealand mudsnail (*Potamopyrgus antipodarum*), feral cat (*Felis catus*), bullfrog (*Rana catesbeiana*), and various warm water fish species.

Livestock grazing, haying, and mowing can be valuable techniques to manage grassland and marsh habitats. In the absence of livestock grazing, haying, mowing, or fire, or with insufficient grazing and browsing by wild herbivores, pasture and marsh grasses can grow tall and rank, and can accumulate

substantial thatch. This reduces the values of these habitats for grazing and browsing animals, small animal movements and escape, ground-nesting birds, amphibian breeding and egg placement, juvenile movement, and can create a competitive advantage for invasive plants. Properly managed livestock grazing can diversify grassland habitats (e.g., by reducing vegetation height, removing standing herbage to increase the availability of succulent forbs, and increasing the diversity of insect prey) to benefit certain ground-nesting songbirds, waterfowl, gallinaceous birds, rodents, and rabbits. It can increase the use of grasslands by foraging and loafing cranes and geese and can increase the palatability of forage on elk winter ranges. It can reduce the density and extent of invasive weeds and potentially allow a more diverse and palatable assemblage of native species to thrive and provide forage and cover for wildlife. It can help create the plant successional stage appropriate for target wildlife species (Drawe et al. 2006; Fenster 2006; Johnson-Nistler and Knight 2006; Krausman et al. 2009; Mini and LeValley 2006; Stoneberg 2006). Grazing and haying can remove thatch, and grazing, haying, and mowing can all increase native plant vigor, stimulate new native plant growth, improve habitat and vegetation structure for native amphibians, reduce encroachment of woody plants, and help reduce the presence of invasive plant species.

However, unless properly managed, these habitat management practices can cause a variety of undesirable effects. Kirby et al. (1992), Krausman et al. (2009), and the U.S. Environmental Protection Agency (USEPA 1994) reviewed numerous studies that evaluated the environmental effects, including the effects upon fish, wildlife, plants, and their habitats, of grazing. When stocking rates are too high or rotation among pastures is not frequent enough, livestock can overgraze pastures causing long-term damage to vegetation and soils. When grazing increases, vegetation diversity decreases, and heavy, long-term, continuous grazing is detrimental to almost all wildlife populations. Livestock can also graze pastures unevenly, can create less-dense vegetation in some areas, increasing the exposure of ground-nesting breeding birds and their eggs to predation, and can graze down and reduce recruitment of desirable riparian shrubs and trees, adversely affecting wildlife use of these valuable habitat components. Livestock (in drier areas than western Washington) are drawn to water and grazing in adjacent riparian and wetland areas can cause vegetation trampling, soil compaction, erosion, and an increase in stream temperature due to loss of plant cover and shading. Areas surrounding water troughs and salt blocks, corrals, and loading ramps can be denuded by trampling and experience soil compaction. Heavy livestock grazing or grazing on wet or unstable soils or in streams can lead to stream bank damage, siltation from erosion of shorelines or through stirring up stream-bottom sediments, and nutrient loading due to livestock defecating or urinating into the water or on adjacent lands where it is washed into the water. These effects would all impact water quality and could adversely affect fish and amphibians. They can also cause down-cutting of stream channels and lowering of water tables. Livestock can also facilitate introduction of alien, including invasive, species (e.g., through seeds carried in hair, on vehicles and farm machinery, and in feces) and disease (e.g., brucellosis). Livestock fencing can hinder movements by some wildlife species.

Cattle grazing can also affect deer and elk through competition for forage. Cattle primarily graze grass, a preferred elk food, until mid to late summer when grass can become scarcer, and then cattle may increase their intake of browse, a preferred food of deer that is especially important during the winter. Whether to avoid forage competition or for other reasons, some studies have found that deer and elk avoid grazing cattle and grazed range in some situations, although other studies suggest possible habituation in other situations (Chaikina 2006; Drawe et al. 2006).

Haying or mowing can also impact wildlife and their habitats. If haying or mowing occurs during the nesting season (primarily April 1 to July 15), the nests, eggs, and young of ground-nesting birds can

be injured or lost. Haying removes vegetation and nutrients from managed fields and long-term haying can require the application of fertilizer to compensate for lost nutrients. If grass is mowed when it is too high or too thick, the result can be an undesirably thick layer of long clippings lying on top of the cut grass.

Grazing, haying, and mowing-related activities (e.g., transporting livestock or haying/mowing equipment, moving water and salt, fence and gate maintenance and repair, monitoring) would be potential sources of wildlife disturbance. Human disturbance has differential effects on wildlife and is dependent upon, among other variables, the species involved and its age; the time of year; the breeding cycle stage (if applicable); the surrounding environment; whether the activity involves vehicles; the intensity, speed, noise, nature, and frequency of the disturbing activity; and the directness of approach to an animal (Blanc et al. 2006; Goss-Custard and Verboven 1993; Holmes et al. 2005; Hammitt and Cole 1998; Kirby et al. 1993; Knight and Cole 1995a; Knight and Cole, 1995b; Lafferty 2001a). Disturbance can cause animals stress and alter their normal behavior; cause them to stop feeding; cause abandonment of nests and young; and allow predators access to nests and young, reduce parental attention to young, and otherwise impact survival of individual birds, eggs, nestlings, or broods (Burger and Gochfeld, 1991; Haysmith and Hunt, 1995; Lafferty, 2001b). The effects of disturbance on individual animals are likely additive.

Naylor et al. (2009) examined the effects of four types of off-road recreational disturbance (all-terrain vehicle riding, mountain biking, hiking, and horseback riding) on North American elk (*Cervus elaphus*) in northeast Oregon. They found that all types of disturbance studied affected elk behavior. Hiking generally caused an increase in the time elk traveled, especially in the morning; resulted in a decrease in resting time; and had no effect on time spent feeding. Ciuti et al. (2012) studied the effects of various human disturbances (e.g., hiking, biking, horseback riding, hunting, fishing, riding all-terrain vehicles, general vehicle traffic, and roads) in various landscapes with different management programs in southwest Alberta. They also found that hiking caused elk travel time to increase and that an increase in the number of hikers caused an increase in travel behavior in elk. Behavioral responses of tule elk (*Cervus elaphus nannodes*) to off-trail hikers and off-shore boats were investigated by Becker et al. (2012) at Point Reyes National Seashore, California. They learned that elk exhibiting rutting behavior and those in the presence of off-trail hikers displayed the most disturbance behaviors (i.e., head up, stand, move off, run, or alarm cry). Elk were more sensitive to human disturbance when herd sizes were smaller (<15 animals).

Studies have had mixed results regarding potential habituation of birds and some other taxa to human disturbance. Wildlife are often less disturbed by routine human activities that repeatedly occur along defined routes (e.g., trails, roads, or water channels), especially frequent disturbance that does not involve direct contact or other threat, compared with those activities that occur irregularly and outside predictable paths/channels (Blanc et al. 2006; Burger 1998; Holmes et al. 2007; Knight and Cole 1995b; Smit and Visser 1993). Some species can habituate to the presence of humans who stay in the same general location and remain relatively still (Goss-Custard and Verboven 1993; Smit and Visser 1993). Habituation to some types and levels (intensity and frequency) of human disturbance appears to vary among species, within species, between resident and migratory populations, and potentially between inexperienced and experienced breeders. This makes it difficult to forecast habituation in actual field situations.

Disturbance levels would be expected to be highest when the livestock program was initially established, when turn-outs or round-ups occurred, and when haying and mowing were conducted. These potential disturbances would be infrequent and short-lived. In the absence of human and other

activity, wildlife might acclimate to the presence of grazing livestock. There could be differential effects to ground-nesting birds. Livestock could destroy nests or eggs, or injure or kill young birds by stepping on them. It is unclear whether such birds would appropriately alter their nesting habits in the presence of livestock or how great of a problem this could be. This would be addressed through the monitoring program.

Properly managed grazing, haying, and mowing would be expected to increase the value of Unit grasslands and marshes for grazing and ground-nesting species of wildlife. When combined with other management techniques (e.g., planting, seeding, prescribed fire, and herbicides) careful use of prescribed grazing, haying, and mowing would help set back succession and enhance the mix of native versus nonnative species in the Unit's savannah-like habitats. Because they lack the proper soils, these grasslands are not prairies. However, proper management of these savannah-like areas could create habitats to support a diversity of native wildlife, including prairie-species such as Roosevelt elk; black-tailed deer; bats; small mammals; western meadowlark and killdeer plover; raptors such as American kestrel and owls; American wigeon and geese; cavity-nesting birds; pollinators such as hummingbirds, butterflies, and moths; and possibly streaked horned lark.

These management practices could also be used to increase the interspersed water and plants in overgrown wetlands or those choked with invasive species. An example would be the grazing or mowing of dense stands of reed canarygrass to reduce their height and density and open up areas to re-create habitat that allows for animal movement into and out of breeding and egg laying habitats, rearing habitats, foraging areas, and much improved sanctuary sites for Oregon spotted frogs. Other benefitting species would include other amphibians, small aquatic mammals, migratory and resident waterfowl and marsh birds, and potentially water howellia.

The Service would implement management practices to reduce the adverse and encourage the beneficial effects of grazing. These include slow movement of heavy equipment, possibly using single-wire electric fencing, cross-fencing, pasture rotations, seasonal grazing and other rotational grazing systems, desired animal unit months (grazing intensity), and in-pasture placement of salt blocks and water troughs to deter livestock from riparian areas and to spread out and target grazing pressure. Because of different physical and biological characteristics, different vegetation responses to these proposed habitat management techniques, and different management objectives, it is probable that the grazing, haying, and mowing programs in the grasslands will differ from those employed in the marshes.

Public Use

The presence of grazing livestock, fencing, corrals, loading ramps, and perhaps dung and associated insects could adversely affect the quality of experience for some of the future visitors who come to the Unit for wildlife observation, photography, or interpretation. Workers conducting grazing, haying, or mowing programs could flush wildlife from treatment sites and reduce or enhance their observation or photography by Unit visitors. Activities associated with these management programs would not be ongoing and these effects would be infrequent. As noted above, it is expected that the larger effect of these proposed uses would be an improvement of upland and seasonally flooded grasslands and marsh habitats and an increase in abundance and/or diversity of wildlife using these habitats. This would enhance observation and photography opportunities.

Cultural Resources and Values

To date, few cultural resource surveys have been conducted on the Unit. There are no recorded archaeological sites, but some buildings and associated structures are of historic value. By themselves, grazing, haying, mowing, and temporary grazing facilities would not be expected to have adverse effects on cultural resources. However, if more permanent grazing facilities were constructed, they could impact cultural resources. Prior to construction of any new facilities, the Service would undertake appropriate surveys and engage in consultations consistent with requirements of the National Historic Preservation Act (16 U.S.C. 470). This process would result in avoiding, minimizing, and/or mitigating any potential effects.

Public Review and Comment:

This CD was available for public review and comment in the draft CCP/EA.

Determination: (check one below)

☐ Use is Not Compatible

☒ Use is Compatible with following Stipulations

Stipulations Necessary to Ensure Compatibility:

General

1. In addition to the stipulations listed here, the general permit conditions and requirements, and the special permit conditions, permittees and their employees will be required to comply with Refuge System-related and other applicable laws, regulations, and policies including “Prohibited Acts” listed in the Code of Federal Regulations (50 C.F.R. 27).
2. Permission to graze, hay, or mow on the Unit will be officially authorized through issuance of an SUP, cooperative farming agreement, CLMA, contract, or other agreement. Permits or agreements will include a plan that described what was to be done, conditions associated with this work, and the intended outcome. Permits or agreements will generally be issued on an annual basis, with a renewal option for up to a total of 5 years. Annual renewals will depend on compliance with these stipulations and conditions of any permit or agreement and the results of monitoring data demonstrating the value of the grazing program for target habitats and wildlife. Consistent with Service policy (5 RM 17), fees for permits or agreements will reflect fair market values. Permittees will be prohibited from transferring, assigning, or sub-permitting their Unit grazing authorizations.
3. Grazing, haying, and mowing management tools will be designed to protect sensitive habitats, wildlife species, and cultural resources while still securing needed treatments to enhance grasslands, marshes, and retard invasive plants. Rotational grazing or other systems will be used to avoid over-grazing treatment sites. As needed, specific areas will be avoided through fencing or other means. Off-stream water supplies will be provided to avoid grazing-related impacts to stream banks, erosion, sedimentation, and water pollution. In order to minimize or avoid impacts to ground-nesting birds, haying and mowing will be scheduled to occur outside the nesting season, after July 15. Specific plans tied to each permit/agreement will be developed for each site and each management practice and include timing and

location of grazing, haying, or mowing; treatment objectives (e.g., vegetation height and evenness of grazing, grazing stocking densities), types of livestock permitted, access locations, restrictions on use of pesticides (including herbicides and insecticides) and predator management, and authorized personnel and equipment. Specific conditions may vary annually or seasonally due to differences in objectives, habitat conditions, or weather.

4. Permittees will work out details with the Unit regarding transporting livestock, moving them, and removing them from the Unit; for erecting, maintaining, moving, and removing all needed structures, including fences, gates, cattle guards, corrals, and loading ramps; and for satisfying livestock water and salt needs, consistent with the grazing plan. Grazers will be required to maintain accurate written records on livestock numbers in each treatment area and turn-in, turn-out dates, and provide those records to the refuge manager upon request. Permittees could be required to use single-wire electric fences. With the exception of livestock fences, associated gates, watering troughs, and other grazing related structures specifically described in the grazing plan (see below), grazers will be prohibited from constructing new or maintaining existing structures on the Unit without specific, prior written approval of the refuge manager.
5. Permittees will be required to move heavy equipment (including large trucks and trailers) slowly and carefully while on the Unit. Prior to arrival on the Unit, permittees will be required to clean equipment of nonnative plant and animal matter. Subject to inspection of treatment sites for weed species, permittees may be required to provide livestock with certified weed-free feed for 48 hours prior to arrival at the Unit.
6. The Unit will be open for access and use by permittees daily, year-round, from sunrise to sunset. Special permission to access or use the Unit outside these hours could be authorized by the refuge manager on a case-by-case basis. Permittees will be required to restrict their activities and access on the Unit to their permit areas, the access roads depicted on the attached map, and other areas open to the general public.
7. Grazed pastures will be fenced and gated or animals will need to be otherwise adequately confined or constrained. Grazing permittees will be responsible for ensuring that gates were closed and livestock were not allowed to roam across the Unit or onto neighboring lands outside the pasture fences. Grazers will be responsible for locating and removing livestock that had strayed from fenced pastures within 24 hours of notification by Unit staff. Grazers will be responsible for surveying fences and gates to identify breaks or other problems, and for making needed repairs in a timely fashion. Livestock will need to be removed from the treatment area or Unit within 48 hours of a request from the refuge manager.
8. Grazers may desire the use of pesticides for control of pest plants or diseases and pests of livestock. Prior to application, use of all pesticides (including uses of herbicides, fungicides, and insecticides) will require Service approval. This will involve grazers submitting to the refuge manager a completed Pesticide Use Proposal (PUP) for each proposed pesticide use. These PUPs will need to be submitted at least 90 days prior to proposed use of the pesticide to allow adequate time for evaluation and processing. All pesticides will need to be applied by qualified applicators and consistent with pesticide label restrictions or as modified by a special needs restriction approved by the U.S. Environmental Protection Agency.

9. Approved PUPs will authorize pesticide application for a period of 1 year. If the Service developed and secured approval of an Integrated Pest Management (IPM) Plan for the Unit, the PUPs addressed therein will be valid for 3 years.
10. Application of fertilizers or soil enhancements will require prior approval from the refuge manager.
11. Desirable trees in savannah-like habitats will be protected from potential grazing, haying, or mowing impacts through use of tree collars, fencing, or other techniques.
12. Grazing permittees will be allowed to bring dogs or other guard animals (e.g., llamas) onto the Unit if they were needed to manage livestock (e.g., rounding up, loading, or unloading livestock). However, in order to avoid harassment, disease, and/or death of native wildlife or transport of exotic or invasive plant parts, insects, or other undesirable species, the use of dogs will be limited to grazing pastures and associated loading and unloading areas, and to rounding up trespass livestock, as necessary. Permittees will be prohibited from bringing any other types of pets onto the Unit. The exceptions will be legitimate, leashed guide animals.
13. Consistent with applicable Federal regulations (see Introduction of plants and animals, 50 C.F.R. 27.52), permittees will be prohibited from introducing plants, animals, or invertebrates onto the Unit without specific, prior written approval of the refuge manager. This will not include domestic livestock participating in a permitted grazing program.
14. In the absence of specific, prior written approval of the refuge manager, permittees and their employees will be prohibited from disturbing, collecting, or removing any archaeological or historic artifacts, abiotic or biological specimens or samples, or mementos from the Unit.
15. Consistent with Service policy regarding management of nonhazardous solid waste on refuges (USFWS 2001), permittees will be prohibited from littering, dumping refuse, abandoning equipment or materials, or otherwise discarding any items on the Unit.
16. Permittees will be required to hold the United States Government harmless from any damages or injury to the permittee, their employees, or members of the general public in areas and facilities accessed via the terms of their permit.
17. The Unit will establish a program to monitor compliance with the stipulations enumerated herein and conditions associated with grazing-, haying-, or mowing-related permits, contracts, or agreements.
18. No changes could be made to any of these stipulations without specific, prior written approval of the refuge manager.

Justification:

Grazing, haying, and mowing are not wildlife-dependent general public uses; however, when properly managed, these habitat management practices will be expected to increase the value of Unit grasslands and marshes for a diversity of wildlife species, including grazing animals, small mammals, bats, ground-nesting birds, raptors, marsh birds, waterbirds, waterfowl, amphibians, and potentially rare species like Oregon spotted frog, streaked horned lark, and water howellia. Grazing, haying, and mowing will help set back succession and enhance the mix of native versus nonnative

species in the Unit's savannah-like habitats. In marshes, these management practices will increase interspersions of water and plants in overgrown wetlands or those choked with invasive species, and enhance breeding and sanctuary areas. Thus, allowing haying, mowing, and grazing on the Unit is found to be in support of the purposes for establishment of the Unit and the mission of the Refuge System.

Compatibility Standard

The Service will use permits or agreements to authorize grazing, haying, or mowing on the Unit. These permits or agreements will include a plan that described what was to be done, conditions associated with this work, and the intended outcome. Examples of conditions include protection of sensitive habitats, wildlife species, cultural resources, and private property through use of fencing or other constraints, tree collars, and providing off-stream water supplies and possibly salt blocks for livestock; use of seasonal and rotational grazing or other systems, and limitations on stocking densities to avoid over grazing treatment sites; restrictions on use of pesticides, fertilizers, and predator management; and scheduling haying and mowing after the nesting season for ground-nesting birds. When combined with the stipulations included herein, these permit conditions will be expected to significantly reduce potential adverse effects and enhance beneficial effects of these habitat management practices.

The Unit will monitor wildlife and habitat disturbance, and other potential impacts to determine if these stipulations and conditions were resulting in expected and desirable outcomes. The Unit will apply adaptive management principles to modify stipulations or adjust objectives, as necessary, to achieve desirable results (USDI 2008 and Williams et al., 2009).

The Unit will reserve the right to add to or otherwise modify the stipulations listed herein in order to ensure the continued compatibility of these uses. New or modified stipulations could be instituted as a result of new information generated by ongoing or new studies; new legal, regulatory, or policy requirements; significant changes to the Unit environment or status of native fish, wildlife, plants, or their habitats; or for other legitimate reasons. Visitors will be appropriately advised of any such changes.

The Unit will also reserve the right to terminate permission for these uses if individuals were violating Unit rules or regulations; if unacceptable impacts were occurring to native fish, wildlife, plants, or their habitats, cultural resources or Unit facilities, or other Unit visitors; or for other legitimate reasons.

In order to be allowed on the Unit, grazing, haying, and mowing will need to be determined compatible. By allowing these uses to occur under the stipulations described above, it is anticipated that wildlife which were disturbed will find sufficient food resources and resting places so their abundance and use will not be measurably lessened on the Unit. Additionally, it is anticipated that monitoring, as needed, will prevent unacceptable or irreversible impacts to fish, wildlife, plants, and their habitats; other public uses; cultural resources; Unit facilities; and private lands. For the several reasons stated above and consistent with the stipulations described herein, this use will not materially interfere with or detract from maintenance of the Unit's biological integrity, diversity, and environmental health; fulfillment of the Refuge's purposes; or the Refuge System's mission.

Mandatory 10- or 15-Year Re-evaluation Date: (provide month and year for “allowed” uses only)

_____ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

_____ Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Unit 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

☐ Environmental Impact Statement and Record of Decision

This CD was developed and issued concurrently with the draft CCP/EA for Grays Harbor NWR and the Black River Unit of Billy Frank Jr. Nisqually NWR.

Compatibility Determination for Grazing, Haying, and Mowing at the Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge.

Determination

Prepared by:

(Signature) *Kenneth J. De* 3/9/2017
(Date)

Approved by Project Leader,
Billy Frank Jr. Nisqually
National Wildlife Refuge
Complex:

(Signature) *Supervisor of Nisqually* 3.09.2017
(Date)

Concurrence

Refuge Supervisor:

(Signature) *Juliana DeLeon* 3/9/17
(Date)

Regional Chief, National
Wildlife Refuge System,
Pacific Region:

(Signature) *Kevin Stoege* 3/9/17
(Date)

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Appendix C. Implementation

C.1 Introduction

Implementation of the comprehensive conservation plan (CCP) will require increased funding, which will be sought from a variety of sources including Congressional allocations and public and private partnerships and grants. There are no guarantees that additional Federal funds will be made available to implement any of these projects. Activities and projects identified will be implemented as funds become available.

The CCP proposes several projects to be implemented over the next 15 years. Some of these projects will be included in the Refuge Operational Needs System (RONS) and accomplished by permanent and temporary staffing, volunteers, and partnerships. Operational management includes staffing; maintenance; and managing public use, cultural resources, biology, administration, and habitat/wildlife restoration and maintenance management programs, both on- and off-Refuge.

The Service Asset Maintenance and Management System (SAMMS) tracks deferred maintenance projects such roads and parking areas and any existing structures. All funding for these types of projects is from Congress, and the SAMMS database is used to prioritize and track the projects nationwide.

The Black River Unit does not have an independent budget. It is part of the Billy Frank Jr. Nisqually NWR and its funding is combined with the Nisqually NWR Complex budget. Funding is spent on Black River Unit as prioritized projects and needs arise.

New public use facility construction and prioritized staffing needs will be identified in the RONS database and will be necessary to implement the CCP to meet goals and objectives.

Currently, a backlog of maintenance needs, including building removal from recently acquired lands, exists for the Black River Unit. In 2015, the deferred maintenance backlog for the Black River Unit was \$913,229, with more projects likely added as new lands are purchased within the Unit acquisition boundary. The SAMMS database documents and tracks repairs, replacements, and maintenance of existing facilities and equipment. Funding will be sought for these projects through a variety of sources, and smaller projects will be implemented as funding allows.

In lieu of property taxes, the Unit annual revenue sharing payments associated with the Black River Unit will continue. Payments to Thurston County for the Black River Unit and portions of the main unit of Billy Frank Jr. Nisqually NWR within the county have averaged \$15,721 annually from Fiscal Years 2011 to 2013. The U.S. Congress each year determines what percent of funds will be appropriated for all appraised Federal lands. Counties are not restricted in the use of these funds.

Biological assessments and monitoring activities will be conducted on as many projects as funding allows to document wildlife populations and changes across time, habitat conditions, and responses to management practices. Actual monitoring and evaluation procedures will be detailed in an Inventory and Monitoring Plan. General scientific activities are discussed in Chapter 2 under Goal 4, which addresses the collection of biological information (inventories, monitoring, feasibility studies, assessments, and research) to support adaptive management decisions.

The Black River Unit is in an acquisition stage of development with 1,577 acres of land purchased out of 3,873 total acres within the approved boundary. The Unit will continue to work with willing landowners to acquire lands within the approved boundary. Funding to purchase these parcels from private landowners, NGOs, other agencies, or corporations is available through funding of the U.S. Congress. Easements will also be utilized to further land conservation.

C.1.1 Spending Priorities

Priorities are designated in Table C-1 and C-2 for one-time and ongoing (recurring) projects (strategies) identified under the CCP. Priorities are designated as High (H), Medium (M), or Low (L). The rankings were determined according to the following criteria:

- A high-ranked project/strategy is ongoing, needed immediately, or should be considered in the near future to successfully manage habitat and/or public use activities on refuges. It should directly support Unit purposes, a wildlife-dependent priority public use, and/or restore a threatened or endangered species or rare/unique habitat.
- A medium-ranked project/strategy is of a lesser degree of urgency, but also directly maintains and restores a threatened, endangered, or Service trust species, rare/unique habitat, supports Unit purposes, or is a wildlife-dependent priority public use.
- A low-ranked project/strategy maintains restored habitat or species and/or addresses a wildlife-dependent priority public use activity that is not widely sought out by the public.

C.2 Costs to Implement CCP

Projects listed below were drawn from the goals, objectives, and strategies and will be implemented over the next 15 years as funding and staffing allows. The following sections detail both one-time and operational/maintenance (or recurring) costs for various projects as described within the CCP.

The following tables primarily document projects with a physically visible, trackable, “on-the-ground” component, such as facility development, habitat restoration, research, and monitoring and surveys. The scope and costs for administrative activities, such as the development and implementation of cooperative documents (e.g., memoranda of understanding, agreements), reporting, and establishment or maintenance of partnerships are difficult to estimate in advance and thus are not accounted for in the tables below.

To implement the CCP, funding is needed for new or expanded public uses and facilities, increased habitat management and restoration activities, new habitat assessment and monitoring, and staffing to complete the additional management direction activities.

C.2.1 One-Time and Operational (Recurring) Costs to Implement the CCP

One-time Costs

One-time costs reflect initial start-up costs associated with a project. These are projects that can be completed in 3 years or less and may include the cost of temporary or term salaries associated with a short-term project.

Funds for one-time costs will be sought through increases in the Nisqually NWR Complex base funding, special project funds, and grants. Projects listed below in Table C-1 show one-time start-up and implementation costs, such as those associated with building and facility needs, including removal of old structures and buildings, public use facilities, new signs including interpretive signs, road/trail improvements, and contracting for a service or construction. One-time costs are also associated with projects such as specific habitat restoration, species or habitat inventories, surveys and assessments, and initial invasive plant and animal control. In many cases new research projects, because of their relatively high initial establishment cost, are considered one-time projects and include costs of contracting services or hiring a temporary staff position for the short-term project. Some project costs are taken from RONS or SAMMS proposals; others are not yet in any project database and their costs have been estimated, particularly if the scope of the project is unknown at this time due to lack of baseline data.

Table C-1. Black River Unit One-Time Costs (in thousands) for Habitat Management, Restoration or Enhancement, Biological Assessments (Baseline Inventories, Surveys, and Monitoring), Research, Visitor Services-Related, and Facility Projects Actions.

Project Description	Priority	Current Management	Future Management
Habitat Management, Restoration, or Enhancement			
Remove derelict structures from Unit parcels	High	5	350
Enhance emergent marsh habitat for Oregon spotted frog by managing reed canarygrass	High	2	75
Evaluate and enhance seasonally ponded areas and improve water management capabilities as needed through installation of water control structures, ditch or culvert removal, and improvements to water level management capabilities.	Medium	0	75
Use standard enhancement techniques (riparian plantings, IPM techniques, placement of large woody debris, etc.) as appropriate to improve tributary channel conditions.	Medium	0	30
Evaluate potential for translocation of rare species as appropriate, including marsh sandwort and water howellia, implement recovery actions if warranted	Medium	0	60
Plant 3–5 big leaf maples and/or Garry oaks where appropriate on approximately 50-acre blocks to provide habitat for cavity-nesting birds and enhance grassland habitat diversity to benefit appropriate species. Protect solitary or interspersed big leaf maple or Garry oak trees	Medium	0	20

Project Description	Priority	Current Management	Future Management
within nonnative grasslands by placing tree collars, fencing saplings, and similar habitat enhancement measures			
Subtotal (thousands)		7	610
Biological Assessments (Baseline Inventories, Surveys, and Monitoring)			
Develop and implement a biological Inventory and Monitoring Plan	Medium	0	15
Develop a Water Resources Inventory and Assessment (WRIA)	Medium	0	25
Assess currently owned tracts for species use, habitat suitability, rare and declining species, nonnative species, assess habitats for restoration or enhancement needs, and enter into GIS	High	2	125
Evaluate endemic Olympic mudminnow distribution, needs, and habitat quality in the Unit	Medium	0	35
Inventory and classify all known and unknown bog locations, conduct baseline surveys, and survey for bog specific rare plants or animals	High	0	20
Subtotal (thousands)		2	220
Research			
Research Oregon spotted frog habitat use, water dependency, movement, predation, and survivorship, especially associated with habitat enhancement techniques	High	0	65
Research status and long-term conditions of bog habitat stability, species health, and determine bog risks and needs	Medium	0	35
Subtotal (thousands)		0	100
Visitor Services-Related			
Determine options for Unit access to potential Gate-Belmore Trail	Low	0	15
Establish a volunteer program with training to help with a variety of Unit activities	Medium	0	25

Project Description	Priority	Current Management	Future Management
Subtotal (thousands)		0	40
Facilities			
Design and install a small vehicle pull-off area with a small viewing deck and interpretive and regulatory signs on west side of Endicott Road for wildlife viewing	High	0	85
Design and install a small parking area on the east side of Endicott Road along with a short trail to viewing deck and interpretive panels	Medium	0	75
Partner with Thurston County to design and construct boating access at 123 rd Avenue	High	0	90
Subtotal (thousands)		0	250
Total of all one-time project costs		9	1220

Annual Operational and Maintenance (Recurring) Costs

Operational and recurring maintenance costs reflect Unit spending of the congressionally allocated base funds to Nisqually NWR Complex each year. A portion of the base funds are spent on Grays Harbor NWR and a portion are spent on the Black River Unit. These operational and maintenance costs are also known as recurring costs and are usually associated with day-to-day operations, projects that last longer than 3 years, and permanent staff salaries.

The recurring maintenance program funding need over the next 15 years is defined as funds needed to repair or replace existing buildings, equipment, and facilities. This also includes preventive maintenance; cyclic maintenance; repairs; replacement of parts, components, or items of equipment; adjustments, lubrication, and cleaning (nonjanitorial) of equipment; painting; resurfacing; rehabilitation; special safety inspections; and other actions to assure continuing service, prevent breakdown, and maintain value.

Recurring maintenance also includes maintaining public use, administrative, storage, and shop buildings and facilities. Through normal use and weather conditions, buildings and facilities need annual maintenance and repairs. Maintenance of habitat, from the recurring threat of invasive plants and animals, succession, and protection of threatened, endangered, or candidate species is an annual occurrence.

Maintenance costs include the maintenance backlog needs that have come due but are as yet unfunded in Alternative 1, whereas Alternative 2 reflects future recurring operational and maintenance costs associated with a specific new project or facility (that was included in one-time costs).

Table C-2 for displays projected annual operating costs to implement strategies under the CCP and includes such things as salary and operational expenditures, including travel, training, supplies, utilities, and maintenance costs. It also includes administrative support for all programs and projects as well as permanent and seasonal staff needed year after year to accomplish each project; these staffing costs are not isolated in this table but are included as part of the entire project cost.

Some project costs are taken from RONS or SAMMS proposals; others are not yet in any project database and their costs have been estimated, particularly if the scope of the project is unknown due to lack of baseline data.

Table C-2. Black River Unit Operational/Maintenance (Recurring) Costs (in thousands).

Activity Description	Current Management	Future Management
Habitat management, restoration, or enhancement: Remove, control, and prevent new establishment of invasive plants and treat infestations with IPM techniques; continue to determine best methods to control reed canarygrass, especially for Oregon spotted frog habitat needs; maintain dry, short-grass habitat in early successional stage with specific enhancements; partially fund AmeriCorps WCC crew to assist with land management	35	145
Biological assessment (baseline inventory, survey, and monitoring): Annual Oregon spotted frog egg surveys; assessments of habitat quality and native species; periodic bog surveys; invasive species location surveys, treatment efficacy assessments, and GIS mapping; monitor biodiversity trends; provide administrative material support for all biological activities	15	95
Research: Facilitate and cooperate in specific research projects to benefit Unit resources	5	15
Visitor services: Educating visitors to wildlife resources, manage a new volunteer program; patrol and enforce regulations	0	100
Facilities: Continue efforts to remove excess structures on Unit lands; make repairs to Unit infrastructure and equipment; and maintain interpretive and regulatory signs, partially fund AmeriCorps WCC crew to assist with all needs.	20	75
Total Recurring Costs	75	430

C.2.2 Staffing

The current (2014) staff at the Nisqually NWR Complex split their time to work on Billy Frank Jr. Nisqually NWR, which includes the Black River Unit, and Grays Harbor NWR as projects, funding, and time allows (Table C-3). The future staffing to implement the programs detailed within the CCP are shown for the Black River Unit in Table C-4. Currently about 85 percent of current Complex staff time is expended on Billy Frank Jr. Nisqually NWR, about 5 percent of staff time is expended on Grays Harbor NWR, and 10 percent of the time is spent on the Black River Unit.

Table C-3. Current Staffing at Nisqually NWR Complex which comprises Billy Frank Jr. Nisqually NWR, including the Black River Unit, and Grays Harbor NWR.

Current Positions at Nisqually NWR Complex	Status	Grade
Project Leader	PFT	GS-0485-13
Deputy Project Leader	PFT	GS-0485-12
Wildlife Biologist	PFT	GS-0486-11
Visitor Services Manager	PFT	GS-0026-11
Park Ranger (Vol. Program Specialist)	PFT	GS-025-07
Maintenance Worker	PFT	WG-4749-08
Administrator Officer	PFT	GS-0341-09
AmeriCorps/Nisqually	TEMP	
AmeriCorps/WCC Crew (5 members and Crew Leader)	TEMP	

Table C-4. Future Additional Staffing for selected management direction at Billy Frank Jr. Nisqually NWR, including the Black River Unit.

Future Positions for the Black River Unit	Status	GS and Grade
Refuge Operations Specialist	PFT	GS-485-07/09
Biological Technician	PFT	GS-404-05/07
Maintenance Worker	PFT	WG-4749-8

PFT: Permanent Full Time

GS: General Schedule Federal Employee

WG: Wage Grade Federal Employee

AmeriCorps Programs:

The AmeriCorps program engages citizens in intensive community service work including environmental protection and education. It also partially sponsors the Washington Conservation

Corps (WCC) which is a sub-agency of the Washington Department of Ecology. WCC employs young adults in an outreach program to protect and enhance Washington's natural resources. Annually, Nisqually NWR Complex cost-shares with WCC for a full-time six-person field crew. Nisqually NWR Complex's share of the funding comes from the stations' operational budget. These young adults work at Billy Frank Jr. Nisqually and Grays Harbor Refuges and the Black River Unit on environmental protection and maintenance projects. The crew is an integral staff component completing many projects at all three locations. Without the WCC crew, much needed work would not be accomplished.

Volunteer Program:

The Black River Unit does not currently have a volunteer program. However, the volunteer program is a strategy in Chapter 2, Goal 5 and is included in Tables C-1 and C-3.

C.2.3 Budget Summary

Table C-5 summarizes the data from Tables C-2 and C-4 and displays the overall funding needed for Black River Unit to implement the CCP.

Table C-5. Budget Summary (One-time projects and annual recurring operational/maintenance funding) needs for Black River Unit as identified in the CCP (in thousands).

Budget Category	Current Management		Future Management	
	One-time cost	Annual recurring cost	One-time cost	Annual recurring cost
Habitat management, restoration, or enhancement	7	35	610	145
Biological assessments (inventory, survey, and monitoring)	2	15	220	95
Research	0	5	100	15
Visitor services and environmental education	0	0	40	100
Facilities	0	20	250	75
Totals	9	75	1220	430

C.3 Partnership Opportunities

Partnerships are an important component of the implementation of this CCP and are reflected in the goals, objectives, and strategies identified in Chapter 2. Current and past partners include Federal and State agencies, Tribes, NGOs, schools, volunteers, and individuals.

Coordinated partnership efforts will focus on environmental education, habitat management, fish and wildlife monitoring, habitat restoration, land protection, and quality wildlife-dependent recreation. Refuge Complex staff will work to strengthen existing partnerships and will actively look for new partnerships to assist in achieving the goals, objectives, and strategies in this CCP.

C.3.1 Black River Unit

Current and past partners include Washington Department of Ecology, Washington Department of Fish and Wildlife, Washington Department of Natural Resources, Chehalis Basin Partnership, Chehalis Basin Weed Partnership, Thurston County Noxious Weed Agency, Thurston County, Thurston Conservation District, Chehalis River Cooperative Weed Management working group, Washington's Oregon Spotted Frog working group, Capitol Land Trust, Port Blakely Tree Farm, The Nature Conservancy, Black Hills Audubon Society, U.S. Department of Agriculture's Natural Resource Conservation Service, and U.S. Fish and Wildlife Service Washington State Office.

Partnerships like these increase our effectiveness, knowledge, and community support, as well as reduce Unit operating costs. Presently, there is a six-person field crew funded partially through our partners, supporting the WCC conservation crew's work at the Black River Unit. Additionally, partners assist in providing funding or matching funds for federal grants.

C.4 References

U.S. Fish and Wildlife Service. 2012. Nisqually NWR Complex RAPP Report.

Appendix D. Wilderness

D.1. Background

D.1.1 Policy and Direction for Wilderness Reviews

U.S. Fish and Wildlife Service policy (Part 602 FW 3.4 C. (1) (c)) requires that wilderness reviews be completed as part of the CCP process. This review includes the reevaluation of refuge lands existing during the initial 10-year review period of The Wilderness Act of 1964, as amended (16 U.S.C. 1131-1136) (Wilderness Act), as well as new lands and waters added to the Refuge System since 1974. A preliminary inventory of the wilderness resources is to be conducted during pre-acquisition planning for new or expanded refuges (341 FW 2.4 B, Land Acquisition Planning). Refuge System policy on Wilderness Stewardship (610 FW 1-5) includes guidance for conducting wilderness reviews (610 FW 4, Wilderness Review and Evaluation).

A wilderness review is the process of determining whether the Service should recommend Refuge System lands and waters to Congress for wilderness designation. The wilderness review process consists of three phases: wilderness inventory, wilderness study, and wilderness recommendation.

Wilderness Inventory

The inventory is a broad look at a refuge to identify lands and waters that meet the minimum criteria for wilderness: size, naturalness, and outstanding opportunities for solitude or primitive and unconfined types of recreation. All areas meeting the criteria are preliminarily classified as Wilderness Study Areas (WSAs). If WSAs are identified, the review proceeds to the study phase.

Wilderness Study

The study evaluates all values (ecological, recreational, cultural), resources (wildlife, water, vegetation, minerals, soils), and uses (management and public) within the WSA. The findings of the study determine whether or not we will recommend the area for designation as wilderness.

We evaluate at least an “All Wilderness Alternative” and a “No-Wilderness Alternative” for each WSA to compare the benefits and impacts of managing the area as wilderness as opposed to managing the area under an alternate set of goals, objectives, and strategies that do not involve wilderness designation. We may also develop “Partial Wilderness Alternatives” that evaluate the benefits and impacts of managing portions of a WSA as wilderness. In the alternatives, we evaluate the following:

- the benefits and impacts to wilderness values and other resources
- how each alternative will achieve the purposes of the Wilderness Act and the National Wilderness Preservation System (NWPS)
- how each alternative will affect achievement of the refuge purpose(s) and contribution toward achieving the Refuge System mission
- how each alternative will affect maintaining and, where appropriate, restoring biological integrity, diversity, and environmental health at various landscape scales
- other legal and policy mandates
- whether a WSA can be effectively managed as wilderness by considering the effects of existing private rights, land status and service jurisdiction, refuge management activities and

refuge uses, and the need for or possibility of eliminating prohibited uses listed in the Wilderness Act, Section 4(c).

Wilderness Recommendation

If the wilderness study demonstrates that a WSA meets the requirements for inclusion in the NWPS, a wilderness study report should be written that presents the results of the wilderness review, accompanied by a Legislative Environmental Impact Statement (LEIS). The wilderness study report and LEIS that support wilderness designation are then transmitted through the Secretary of the Interior to the President of United States, and ultimately to the United States Congress for action. Refuge lands recommended for wilderness consideration by the wilderness study report will retain their WSA status and be managed as "... wilderness according to the management direction in the final CCP until Congress makes a decision on the area or we amended the CCP to modify or remove the wilderness recommendation" (610 FW 4.22B). When a WSA is revised or eliminated, or when there is a revision in "wilderness stewardship direction, we include appropriate interagency and tribal coordination, public involvement, and documentation of compliance with NEPA" (610 FW 3.13).

The following constitutes the inventory phase of the wilderness review for the Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge.

D.1.2 Wilderness Inventory

Criteria for Evaluating Lands for Possible Inclusion in the National Wilderness Preservation System

The Wilderness Act provides the following description of wilderness:

A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act as an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions...

The following criteria for identifying areas as wilderness are outlined in Section 2(c) of the Wilderness Act and are further expanded upon in Refuge System policy (610 FW 4). The first three criteria are evaluated during the inventory phase; the fourth criterion is evaluated during the study phase.

1. Generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable
2. Has outstanding opportunities for solitude or a primitive and unconfined type of recreation
3. Has at least five thousand acres of land or is of a sufficient size as to make practicable its preservation and use in an unimpaired condition
4. May also contain ecological, geological, or other features of scientific, educational, scenic, or historic value

Criterion 3 is further defined in Section 3(c) of the Wilderness Act as (1) a roadless area of 5,000 contiguous acres or more, or (2) a roadless island. Roadless is defined as the absence of improved

roads suitable and maintained for public travel by means of 4-wheeled, motorized vehicles that are intended for highway use.

D.1.3 Process of Analysis

The following evaluation process was used in identifying the suitability of refuge units for wilderness designation:

- Determination of refuge unit sizes
- Assessment of the units' capacity to provide opportunities for solitude or primitive and unconfined recreation
- Assessment of "naturalness" of refuge units

More detail on the actual factors considered and used for each assessment step follows.

Unit Size: Roadless areas meet the size criteria if any one of the following standards apply:

- An area with over 5,000 contiguous acres solely in Service ownership
- A roadless island of any size. A roadless island is defined as an area surrounded by permanent waters or an area that is markedly distinguished from the surrounding lands by topographical or ecological features
- An area of less than 5,000 contiguous Federal acres that is of sufficient size as to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management.
- An area of less than 5,000 contiguous Federal acres that is contiguous with a designated wilderness, recommended wilderness, or area under wilderness review by another Federal wilderness managing agency such as the Forest Service, National Park Service, or Bureau of Land Management

Outstanding Solitude or Primitive or Unconfined Recreation:

A designated wilderness area must provide outstanding opportunities for solitude or a primitive and unconfined type of recreation. Possession of only one of these outstanding opportunities is sufficient for an area to qualify as wilderness, and it is not necessary for one of these outstanding opportunities to be available on every acre. Furthermore, an area does not have to be open to public use and access to qualify under these criteria.

Opportunities for solitude refers to the ability of a visitor to be alone and secluded from other visitors in the area. Primitive and unconfined recreation means nonmotorized, dispersed outdoor recreation activities that are compatible and do not require developed facilities or mechanical transport. Primitive recreation activities may provide opportunities to experience challenge and risk, self-reliance, and adventure.

Naturalness and Wildness: the area generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable.

This criterion must be evaluated in the context of current natural conditions and societal values and expectations without compromising the original intent of the Wilderness Act. It is well recognized that there are few areas remaining on the planet that could be truly classified as primeval or pristine, with even fewer, if any, existing in the conterminous United States. Likewise, few areas exist that do not exhibit some impact from anthropogenic influences, be it noise, light, or air pollution; water quality or hydrological manipulations; past and current land management practices; roads or trails, suppression of wildfires; invasions by nonnative species of plants and animals; or public uses. While allowing for the near-complete pervasiveness of modern society on the landscape, the spirit of the Wilderness Act is to protect lands that still retain the wilderness qualities of being: (1) natural, (2) untrammeled, (3) undeveloped. These three qualities are cornerstones of wilderness character. For areas proposed or designated as wilderness, wilderness character must be monitored to determine baseline conditions and thereafter be periodically monitored to assess the condition of these wilderness qualities. Proposed and designated wilderness areas by law and policy are required to maintain wilderness character through management and/or restoration in perpetuity.

Defining the first two qualities (natural and untrammeled) requires knowledge and understanding of the ecological systems which are being evaluated as potential wilderness. Ecological systems are comprised of three primary attributes: composition, structure, and function. Composition is the components that make up an ecosystem, such as the habitat types, native species of plants and animals, and abiotic (physical and chemical) features. These contribute to the diversity of the area. Structure is the spatial arrangement of the components that contribute to the complexity of the area. Composition and structure are evaluated to determine the naturalness of the area. Function is the processes that result from the interaction of the various components both temporally and spatially, and the disturbance processes that shape the landscape. These processes include, but are not limited to, predator-prey relationships, insect and disease outbreaks, nutrient and water cycles, decomposition, fire, windstorms, flooding, and both general and cyclic weather patterns. Ecological functions are evaluated to determine the wildness or untrammeled quality of the area.

The third quality assessment is whether an area is undeveloped. Undeveloped refers to the absence of permanent structures such as roads, buildings, dams, fences, and other man-made alterations to the landscape. Exceptions can be made for historic structures or structures required for safety or health considerations, providing they are made of natural materials and relatively unobtrusive on the landscape.

General guidelines used for evaluating areas for wilderness potential during this wilderness inventory process include:

1. The area should provide a variety of habitat types and associated abiotic features, as well as a nearly complete complement of native plants and wildlife indicative of those habitat types. Nonnative and invasive species should comprise a negligible portion of the landscape.
2. The area should be spatially complex (vertically and/or horizontally) and exhibit all levels of vegetation structure typical of the habitat type, have an interspersed of these habitats, and provide avenues for plant and wildlife dispersal.

3. The area should retain the basic natural functions that define and shape the associated habitats, including but not limited to, flooding regimes, fire cycles, unaltered hydrology and flowage regimes, and basic predator-prey relationships, including herbivory patterns.
4. Due to their size, islands may not meet the habitat guidelines in 1 and 2 above. Islands should, however, exhibit the natural cover type with which they evolved and they should continue to be shaped and modified by natural processes. Islands should be further analyzed during the study portion of the review if they provide habitat for a significant portion of a population, or key life cycle requirements for any resources of concern or listed species.
5. Potential wilderness areas should be relatively free of permanent structures or man-made alterations. Areas may be elevated to the study phase if existing structures or alterations can be removed or remediated within a reasonable timeframe and prior to wilderness recommendation to the Secretary of the Interior.

Supplemental Values—the Wilderness Act states that an area of wilderness may contain ecological, geological, or other features of scientific, educational, scenic, or historical value. Supplemental values of the area are optional, but the degree to which their presence enhances the area’s suitability for wilderness designation should be considered. The evaluation should be based on an assessment of the estimated abundance or importance of each of the features.

D.2. Inventory Summary and Conclusion

Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge is not recommended for further study for inclusion in the Wilderness System because it does not meet the above criteria. This Unit’s total acquisition boundary contains approximately 3,900 acres, with 1,581 acres currently managed (see Table 1-1 in Chapter 1). The size of this Unit is insufficient to make practicable its preservation and use as wilderness. The Unit also has considerable evidence of past human use, does not have outstanding opportunities for solitude or primitive recreation, and is not a roadless island.

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Appendix E. Biological Resources of Concern

E.1 Resources of Concern

Table E-1. Comprehensive List of Biological Resources of Concern

Species/Habitat	Refuge Purpose	BIDEH ^a	CCP Priority RoC w/ Focal Species	ESA ^b	Washington Listed ^b	USFWS BCC ^e	USFWS BMC ^f	WDFW PHS ^c	Partners in Flight ^{d, m}	Landbirds of Or and WA ⁿ	WA State Wildlife Plan ^g	US Shorebird Plan –PNW ^{h 2}	N.A. Waterbird Conservation Plan ⁱ	Pacific Flyway Management Plans ^j	NA Waterfowl Management Plan ^k	WA Natural Heritage Plan ⁱ
Mammals																
Pacific Townsend's big-eared bat*	✓			SoC ¹	SC ¹			✓			✓					S3 ³
Little brown bat	✓			SoC ¹	SM ¹						✓					S5 ³
Yuma bat	✓			SoC ¹	SM ¹						✓					S5 ³
Bats roosting concentrations	✓	✓		SoC ¹	SM ¹			2 ⁵			✓					
Black bear	✓							✓								S5 ³
Black-tailed deer	✓							3 ⁵								S5 ³
Roosevelt elk	✓							3 ⁵			✓					S5 ³
River otter	✓	✓									✓					S4 ³
Mink	✓	✓														S5 ³
Muskrat	✓		✓													S5 ³
Birds																
Pied-billed grebe	✓	✓					✓	2 ⁵					N-H/B-H ⁴			S4B/S5 N ³
Double-crested cormorant *	✓							2 ⁵			✓		NAR ⁴			S4B/S N5 ³
American bittern	✓	✓					✓						N-H/B-H ⁴			S4B/S3 N ³
Great blue heron	✓				SM ¹			2 ⁵			✓		NAR ⁴			S4B/S5 N ³
Green heron	✓	✓											B-L ⁴			S5B ³
Cackling goose	✓						✓	2,3 ⁵			✓			✓	N-H ⁴	SNRB/SNRN ³
Pacific Canada goose	✓						✓	2,3 ⁵			✓			✓	N-MH/B-H ⁴	S5B/S5N ³
Wood duck	✓						✓	2,3 ⁵			✓				B-M ⁴	S4B ³
American wigeon	✓						✓	2,3 ⁵			✓				N-H ⁴	S5N ³
Mallard	✓		✓				✓	2,3 ⁵			✓				N-MH/B-M ⁴	S5B/S5 N ³
Blue-winged teal*	✓						✓	2,3 ⁵							B-MH ⁴	S5B ³
Cinnamon teal*	✓						✓	2,3 ⁵		DS ⁷					B-MH ⁴	S5B ³
Northern shoveler	✓						✓	2,3 ⁵							N-MH/B-ML ⁴	S4B/S3 N ³
Northern pintail	✓						✓	2,3 ⁵			✓				N-H/B-ML ⁴	S3B/S4 N ³

Species/Habitat	Refuge Purpose	BIDEH ^a	CCP Priority RoC w/ Focal Species	ESA ^b	Washington Listed ^b	USFWS BCC ^e	USFWS BMC ^f	WDFW PHS ^e	Partners in Flight ^{d, m}	Landbirds of Or and WA ⁿ	WA State Wildlife Plan ^g	US Shorebird Plan –PNW ^{h, 2}	N.A. Waterbird Conservation Plan ⁱ	Pacific Flyway Management Plans ^j	NA Waterfowl Management Plan ^k	WA Natural Heritage Plan ⁱ
Green-winged teal	✓						✓	2,3 ⁵							N-ML/B-MH ⁴	S4B/S3N ³
Ringed-neck duck	✓						✓	2,3 ⁵							N-ML/B-ML ⁴	S3N ³
Hooded merganser	✓							2,3 ⁵							UNKN	S4B/S3N ³
Waterfowl concentrations	✓	✓	✓					2,3 ⁵			✓					N ³
Bald eagle	✓			SoC ¹	SS ¹	✓	✓ ⁺ F	✓			✓					S4B/S4N ³
Northern harrier	✓								✓							S4B/S4N ³
Sharp-shinned hawk*	✓								✓							S4N ³
Cooper's hawk*	✓								BIla ⁶							S4N ³
Red-tailed hawk	✓								✓							S5B/S5N ³
American kestrel	✓	✓	✓						✓	DS ⁷	✓					S4B/SN ⁵
Virginia rail	✓	✓					✓						N-M/B-M ⁴			S3N/S4B ³
Sora	✓	✓					✓						N-H ⁴			S4B ³
American coot	✓	✓					✓	2 ⁵					N-L ⁴			S4B/S4N ³
Killdeer	✓								✓	DS ⁷	✓	4 ²				S4B/S4N ³
Greater yellowlegs	✓	✓	✓					2 ⁵			✓	4 ²				S5N ³
Wilson's snipe	✓	✓					✓	2 ⁵			✓	4 ²				S4B ³
Band-tailed pigeon	✓						✓	3 ⁵	BI/NI ⁶	DS ⁷	✓			✓		S4B ³
Mourning dove	✓	✓				✓	✓	3 ⁵	✓	DS ⁷						S4B/S4N ³
Barn owl	✓								✓							S4B/S4N ³
Western screech owl*	✓								BIla ⁶		✓					S4B/S4N ³
Short eared owl*	✓							✓								
Migrant passerines & landbirds	✓	✓														
Vaux's swift*	✓	✓			SC ¹				BIla ⁶	DS ⁷	✓					S3B ³
Rufous hummingbird	✓	✓				✓	✓		BI ⁶	DS ⁷	✓					S4B ³
Belted kingfisher	✓	✓							✓	DS ⁷						unkn
Red-breasted sapsucker	✓	✓							BIla/NIla ⁶							S4B/SN ⁵

Species/Habitat	Refuge Purpose	BIDEH ^a	CCP Priority RoC w/ Focal Species	ESA ^b	Washington Listed ^b	USFWS BCC ^e	USFWS BMC ^f	WDFW PHS ^e	Partners in Flight ^{d, m}	Landbirds of Or and WA ⁿ	WA State Wildlife Plan ^g	US Shorebird Plan –PNW ^{h, 2}	N.A. Waterbird Conservation Plan ⁱ	Pacific Flyway Management Plans ^j	NA Waterfowl Management Plan ^k	WA Natural Heritage Plan ⁱ
Downy woodpecker	✓								✓		✓					S4B/S5 N ³
Hairy woodpecker*	✓															
Northern flicker	✓	✓								DS ⁷						unkn
Pileated woodpecker	✓	✓			SC ¹			1 ⁵	✓		✓					S4B/S4 N ³
Willow flycatcher	✓	✓	✓	SoC ¹		✓		✓	BI ⁶	DS ⁷	✓					S4B ³
Pacific-slope flycatcher	✓								BI ⁶	DS ⁷	✓					S4B ³
Western Wood-pewee	✓								✓	DS ⁷						S5B ³
Purple martin*	✓	✓			SC ¹			1 ⁵	✓		✓					S3B ³
Tree swallow	✓	✓							✓							S5B ³
Barn swallow	✓								✓	DS ⁷						S4S5B ³
Black-capped chickadee	✓		✓						✓							S5B/S5 N ³
Chestnut-backed chickadee	✓	✓	✓						BI ⁶ /NI ⁶	DS ⁷						S5B/S5 N ³
Bushtit	✓								NI ⁶	DS ⁷						
Marsh wren	✓	✓	✓						BI ⁶		✓					S5B ³
Winter wren	✓								✓							S5B/S5 N ³
Bewick's wren*								✓								
Golden-crowned kinglet	✓	✓							BI ⁶							S4S5B ³
Swainson's thrush	✓	✓	✓						✓	DS ⁷	✓					S5B ³
Varied thrush	✓	✓	✓						BI ⁶							S5B/S5 N ³
Steller's jay	✓								✓							S5B ³
Orange-crowned warbler	✓	✓							✓	DS ⁷						S5B ³
Yellow warbler	✓	✓							✓		✓					S4B ³
Black-throated gray warbler	✓	✓							BI ⁶							S5B ³
Townsend's warbler*	✓	✓							BI ⁶ /NI ⁶							S5B/ S4N ³
MacGillivray's warbler*	✓	✓							✓	DS ⁷	✓					S5B ³
Common yellowthroat	✓	✓														S5B ³
Wilson's warbler	✓	✓							BI ⁶	DS ⁷	✓					S5B ³
Spotted towhee	✓	✓							BI ⁶							S5B/S5 N ³
Golden-crowned sparrow	✓								✓							S5B ³

Species/Habitat	Refuge Purpose	BIDEH ^a	CCP Priority RoC w/ Focal Species	ESA ^b	Washington Listed ^b	USFWS BCC ^e	USFWS BMC ^f	WDFW PHS ^e	Partners in Flight ^{d, m}	Landbirds of Or and WA ⁿ	WA State Wildlife Plan ^g	US Shorebird Plan –PNW ^{h, 2}	N.A. Waterbird Conservation Plan ⁱ	Pacific Flyway Management Plans ^j	NA Waterfowl Management Plan ^k	WA Natural Heritage Plan ⁱ
Song sparrow	✓								✓	DS ⁷						S4B/ S5N ³
Savannah sparrow	✓	✓	✓						✓	DS ⁷						S5B ³
Black-headed grosbeak	✓	✓							BIla ⁶	DS ⁷						S5B ³
Western meadowlark*	✓	✓							✓	DS ⁷						S4S5B/ S4N ³
Purple finch	✓					✓			BIla ⁶	DS ⁷						S5B/ S5N ³
American goldfinch	✓								✓	DS ⁷						S5B/ S5N ³
Fish																
Olympic mudminnow	✓	✓	✓		SS			✓			✓					S2B/ SN ³
Chinook salmon	✓	✓			SC ¹			1 ⁵			✓					S3B/ S4N ³
Coho salmon	✓	✓						✓			✓					S3 ³
Steelhead	✓			T	SC ¹			1 ⁵			✓					S5 ³
Coastal cutthroat trout*	✓	✓	✓	SoC ¹				✓			✓					S4 ³
Pacific lamprey	✓			SoC ¹				✓			✓					S3/S4 ³
Amphibians & Reptiles																
Northwestern salamander	✓	✓	✓													S5 ³
Long-toed salamander	✓															S5 ³
Rough-skinned newt	✓															S5 ³
Pacific tree frog	✓	✓	✓													S5 ³
Red-legged frog	✓	✓	✓	SoC ¹	SC ¹											S4 ³
Oregon spotted frog	✓	✓	✓	T ¹	E ¹			✓								S1 ³
Northern alligator lizard	✓															S5 ³
Western terrestrial garter snake	✓															S5 ³
Northwestern garter snake	✓															S5 ³
Invertebrates																
Oregon floater					SM ¹						✓					S3 ³
Freshwater mussels		✓						✓								
Freshwater sponges		✓														unkn
Crayfish, native		✓														unkn
Beller's ground beetle*		✓		SoC ¹	SC ¹											S3/ NNR ³
Hatch's click beetle*		✓		SoC ¹	SC ¹											S1

Species/Habitat	Refuge Purpose	BIDEH ^a	CCP Priority RoC w/ Focal Species	ESA ^b	Washington Listed ^b	USFWS BCC ^e	USFWS BMC ^f	WDFW PHS ^e	Partners in Flight ^{d, m}	Landbirds of Or and WA ⁿ	WA State Wildlife Plan ^g	US Shorebird Plan –PNW ^{h, 2}	N.A. Waterbird Conservation Plan ⁱ	Pacific Flyway Management Plans ^j	NA Waterfowl Management Plan ^k	WA Natural Heritage Plan ⁱ
Pacific clubtail Dragonfly		✓									✓					S1/N4 ³
Plants																
Water howellia*		✓		T ¹	T ¹			1 ⁵								unkn
Bristley sedge		✓														unkn
Sphagnum moss (bog)		✓	✓													unkn
Labrador Tea (bog)		✓	✓													unkn
Habitats																
River channel	✓	✓	✓		PRH	✓		✓	✓							
Tributary channel	✓	✓	✓		PRH			✓								
North Pacific bog and fen	✓	✓	✓													
Freshwater emergent marsh	✓	✓	✓		PRH	✓		✓	✓							
Seasonally flooded nonnative grassland	✓	✓	✓		PRH											
North Pacific shrub swamp	✓	✓	✓		PRH	✓		✓	✓							
North Pacific lowland riparian forest and shrubland	✓	✓	✓		PRH	✓		✓	✓							
North Pacific maritime dry-mesic Douglas-fir and western hemlock forest	✓	✓	✓					✓								
Dry nonnative grassland	✓	✓	✓													

* = Not documented on Refuge. Species occupies habitat adjacent to Refuge or potential suitable habitat exists on Refuge.

¹ T = Threatened; E = Endangered; FC = Federal candidate; SoC = Refuge species of concern; SC = State candidate; SS = State sensitive; Sm = State Monitor

² Regional score. Category codes: 5 = Highly imperiled; 4 = High concern; 3 = Moderate concern; 2 = Low concern; 1 = No risk

³ S1 = Critically imperiled; S2 = Imperiled; S3 = Rare, uncommon; S4 = Apparently secure; S5 = Demonstrably secure; SX = Apparently extirpated, SH = Historical occurrences, but still expected to occur. B = Breeding, N = Non-breeding, SN = Regularly occurring, non-breeding, SR = Reported but without persuasive documentation

⁴ B = Breeding, N = Non-breeding; H = High concern or need, M = Moderate concern or need, L = Low concern or need, NAR = Not currently at risk, TBA = To be assessed, ✓ = included in plan

⁵ 1 = State-listed and candidate species, 2 = Vulnerable aggregations, 3 = Species of recreational, commercial, and/or Tribal importance

⁶ B = Breeding, N = Non-breeding; I = High continental importance, II = High regional priority, IIa = High regional concern, IIb = High regional responsibility, IIc = High regional threats

⁷ DS = Declining species

✓ = Species is relevant to Refuge management and on the appropriate document(s).

✓+F = Species is a Bird of Management Concern as well as a Focal Species (Chapter 5)

^a U.S. Fish and Wildlife Service 2001 (BIDEH)

^b U.S. Fish and Wildlife Service 2012; National Oceanic and Atmospheric Administration 2012, 2011; Washington Department of Fish and Wildlife 2012; and Washington Department of Natural Resources 2012 .

^c Washington Department of Fish and Wildlife 2008 & 2012 (State Priority species and habitats)

^d Rich et al. 2004 (Partners In Flight – Landbirds)

^e U.S. Fish and Wildlife Service 2008 (FWS Birds of Conservation Concern)

^f U.S. Fish and Wildlife Service 2011 (FWS Birds of Management Concern and Focal Species)

^g Washington Department of Fish and Wildlife 2005 (State Wildlife Comprehensive Conservation Strategy)

^h Drut and Buchanan 2000 (North Pacific Coast Shorebird Plan)

ⁱ Kushlan et al. 2002 (NA Waterbird Plan)

^j Pacific Flyway Council 1983-2007

^k North American Waterfowl Management Plan 2004

^l Washington Department of Natural Resources 2005 and 2007 (Natural Heritage Plan)

^m Rosenberg 2004 (PIF BCR – WA Level)

ⁿ Altman 2005 (Conservation Priorities for Landbirds of OR and WA)

Table E-2. Table BIDEH: Natural Plant Communities at the Black River Unit: Characteristics, Natural Processes Involved in Sustaining Community and Limiting Factors.

Habitat & Plant Communities that Represent Existing BIDEH	Population/Habitat Attributes (Age class, structure, seral stage, species composition)	Natural Processes Responsible for these Conditions	Limiting Factors and Threats
River Channel and some Tributary Channels with Mud Bottoms	- Habitat is confined to the channel portions of the Black River and its tributaries - Habitat also includes a small ribbon of bank habitat along the channel - Water flow is exceedingly slow - Water depth ranges about 3–15 feet deep in the main channel (depth possibly from dredging) - Water tends to be stained brown from tannic acid - Thick growth of submersed, native species such as water starwort, native milfoil species, duckweed, American waterweed, mosquito fern, and emergent plants such as spatterdock, smartweeds, and water pennywort <i>Potential conservation species: Olympic mudminnow and cutthroat trout. Additionally, Oregon spotted frog, pied-billed grebe, purple martin, tree and barn swallows, belted kingfisher, coho and Chinook salmon, freshwater sponges, bat species</i>	- Moderate to high annual rainfall levels (~60"/yr) in winter - Almost annual winter flooding	- Altered hydrologic regime including reduced water in the system from diversion ditches and excessive water well withdrawals - Older logging practices allowed soil movement into river channel and silt to build up - Loss of naturally occurring flood events (due to altered hydrologic regime) allows silt to build up and loss of cobble bottom - Low water flow speed creates low dissolved oxygen levels - Nonnative, invasive plant species including reed canarygrass, purple loosestrife, and yellow flag iris are changing the plant community and choking water flow - Nearby threats not yet known to be in the system, such as New Zealand mud snail, hydrilla, Eurasian watermilfoil, parrotfeather, fanwort, etc.

Habitat & Plant Communities that Represent Existing BIDEH	Population/Habitat Attributes (Age class, structure, seral stage, species composition)	Natural Processes Responsible for these Conditions	Limiting Factors and Threats
Tributary Channels with Cobble Bottoms	• Tributaries run clear and shallow • Some elevational incline provides water movement • Cobble substrate • Higher oxygen content water from riffles than is found in the river channel • Cooler water temperatures than river channel • Riparian overstory provides shade and particulate matter • Heavy woody debris accumulation from natural sources <i>Potential Conservation Species: Coho salmon, and native crayfish spp. Additionally, cutthroat trout, invertebrates, freshwater mussels, bat species.</i>	• Moderate to high annual rainfall levels (~60"/yr) in winter • Unpolluted and undisturbed water sources • Intact riparian habitat in headwaters • Springs near headwaters	• Altered hydrologic regime • Nonnative, invasive plant species specifically reed canarygrass is changing the associated riparian plant community • Threats not yet known to be in the system such as New Zealand mud snail, hydrilla, Eurasian watermilfoil, parrotfeather, fanwort, etc.
Bog	• Bogs are dictated by sphagnum peat soil presence • Peat soils are dominated by sphagnum and/or with living <i>Sphagnum spp.</i> over the soil surface • Peat soils of different types retain water and provide a natural filtration • Bogs are domed in structure and rely on rain to provide moisture • Bog species may include sphagnum, native bog cranberry, sundew, white beak-rush, Labrador tea, western bog laurel, and shore pine <i>Potential conservation species: Bog specialist species such as Beller's ground beetle and Hatch's click beetle. Possibly Queen Charlotte's copper butterfly, bristly sedge, sphagnum moss, Labrador tea, bog orchids, and possibly Pacific clubtailed dragonfly</i>	• Isolated from surface water flow • Fed primarily by precipitation and are generally restricted to areas in which precipitation exceeds evapotranspiration • Unpolluted and undisturbed water sources • Low pH and low nutrient levels in soils and water • Organic material accumulates faster than it decomposes • No fire disturbance	• Disturbance of any kind especially hydrologic changes, water loss or changes in water sources and timing • Loss of appropriate ground water levels • High nutrient, polluted, contaminated, or alkaline waters seeping or draining in from surrounding development or land use. • Invasive, nonnative plants will change plant community function and dynamics • Fire

Habitat & Plant Communities that Represent Existing BIDEH	Population/Habitat Attributes (Age class, structure, seral stage, species composition)	Natural Processes Responsible for these Conditions	Limiting Factors and Threats
Shrub Swamp	• Deciduous, tall shrublands dominate a wet, muddy substrate that is seasonally flooded • Occurs adjacent to the river or in lowland oxbows • Soils are poorly drained, fine-textured, organic muck • This shrub swamp grows so densely it could be described as impenetrable • Woody plants that developed from clear cutting include Oregon ash, Pacific crabapple, willows, red-osier dogwood, ninebark, and spirea • Other plants include skunk cabbage, touch-me-not, cleavers, bog violet, hedge nettle, water parsley, sedges, and horsetails • Oregon ash snags may reflect sustained flood conditions that cause larger growing shrubs to die <i>Potential conservation species: Willow flycatcher, Olympic mudminnow, and mink. Additionally, red-legged frog, Pacific tree frog, green heron, tree and barn swallows, purple martin, and spring migratory passerines, possibly Pacific clubtailed dragonfly</i>	• Seasonal flood conditions or periodic ponding or root zone saturation during the growing season • Consistent source of shallow freshwater is essential • Beaver and dam structures	• Loss of seasonally occurring, surface covering, flood waters • Water diversion, hydrologic changes • Former landowner logging helped to convert forested wetland or swamp to shrub swamp conditions • Fragmentation • Invasive, nonnative plants
Riparian	• Occurs further upland from the river • Is in low-elevation, alluvial floodplains • This habitat was most likely logged years ago and has grown back with Oregon ash as the dominate tree along with ninebark, Pacific crabapple, black hawthorn and snow berry. Over time, big leaf maple, red alder, black cottonwood mixed with conifers will become the overstory with Sitka willow, Pacific willow, red-osier dogwood as the midstory <i>Potential resources of concern: yellow warbler, Swainson's thrush, Pacific tree frog. Additionally migratory passerines such as orange-crowned, black-throated gray, MacGillivray's, and Wilson's warblers, black-headed grosbeak, rufus hummingbird, purple martin, tree swallow, willow and Pacific-slope flycatchers, golden-crowned kinglet, and red-breasted sapsucker, northern flicker, pileated woodpecker,</i>	• Flooding and the plant succession that occurs after major flooding events	• Off-Refuge water diversion and withdrawal prevents natural flooding events • Fragmentation • Excess nutrient or contaminant runoff from agriculture or development • Invasive plant species

Habitat & Plant Communities that Represent Existing BIDEH	Population/Habitat Attributes (Age class, structure, seral stage, species composition)	Natural Processes Responsible for these Conditions	Limiting Factors and Threats
Emergent Marsh	• Freshwater marshes are dominated by emergent herbaceous species in depressions such as abandoned river channels, isolated swales, ponds and land depressions • Regular plant components include a wide variety of sedges, rushes, spike rushes, slough sedge, bristly sedge, cattails, bur-reed, tickseed, water hemlock, water parsley, yellowcress, monkeyflower, and skunk cabbage • Vegetation varies from <4" to 20" in height • Open patches of mud exposure • A small portion of the emergent marsh may include wet prairie and associated species. Inventory and monitoring is needed to verify this over time <i>Potential conservation species: Oregon spotted frog, northwestern salamander, and marsh wren. Additionally, Pacific tree frog, red-legged frog, American bittern, sora, Wilson's snipe, tree and barn swallows, common yellowthroat, purple martin, and possibly water howilla or bristly sedge, possibly Pacific clubtailed dragonfly</i>	• Semi-permanently flooded between 4"- 3' depths • Periodic ponding or saturation of the root zone during the growing season • Undrained hydric soils (muck or mineral) with high-nutrient water at or above the surface for the growing season • Consistent source of freshwater is essential • Land depressions that hold water where surface water lingers creating shallow wetlands	• Hydrologic regime alteration, water Quality issues (i.e. temperature and sedimentation), increased nutrients, and passage barriers • Invasive, nonnative plant reed canarygrass has changed the native plant distribution and wildlife population in these areas • System wide water loss reduces surface water and critical shallow water habitats

Habitat & Plant Communities that Represent Existing BIDEH	Population/Habitat Attributes (Age class, structure, seral stage, species composition)	Natural Processes Responsible for these Conditions	Limiting Factors and Threats
Seasonally Flooded, Nonnative Grasslands	• Generally are former emergent marsh, possibly wet prairies that are now dominated by invasive RCG • RCG was planted in former private lands as a pasture grass in moist areas to provide livestock forage and it thrives • Adequate surface and river water availability throughout the seasons for maintaining wetland habitats and sustaining wildlife populations <i>Potential conservation species: red-legged frog, mallard, and greater yellowlegs, Oregon spotted frog, American bittern, sora, muskrat, American kestrel, Wilson's snipe, killdeer, possibly water howilla, or bristly sedge</i>	• Saturated to moist soils year round • Low elevation areas, open with little woody growth, and generally are proximal to the aquatic bed or tributaries	• Invasive and nonnative plant species such as RCG displace and outcompete native plant communities • Area subjected to almost annual flood (rising water) conditions resulting in 5 inches to 4 feet of standing water depth. Flood conditions may last as long as 3-4 months • RCG changes plant community structure and negatively affects wildlife species diversity • Lack of frequent fire (~ 3-4 year intervals), during dry season • Polluted or contaminated waters and possibly soils
Dry Nonnative Grassland	• Are residual agricultural pasturelands of nonnative grass and perennials such as timothy, quackgrass, fescues, foxtail, orchardgrass, ryegrass, velvetgrass, alfalfa, etc. • Nonnative pasture grasses planted in former private upland areas <i>Potential conservation species: Savannah sparrow and American kestrel. Additionally, western meadowlark, western bluebird, lazuli bunting, tree and barn swallows, purple martin, killdeer, and mourning dove.</i>	• Low nutrient, gravelly, glacial outwash soils • Cool summers, wet winters	• Scot's broom, wild chervil, poison hemlock, burdock, Himalayan blackberry, and other upland invasive plants • Fire suppression • Forest encroachment
Mixed Forest	• Most areas on the Refuge are early to mid-successional stage stands recovering from logging. • Tree species generally include Douglas-fir and big leaf maple with young western hemlock and western red cedar growing in. • Mid-story plants include vine maple, red-osier dogwood, and osoberry. Understory with sword fern, salal, dull Oregon grape, trailing blackberry, twinflower, and vanilla leaf <i>Potential resources of concern: black-capped and chestnut-backed chickadees and varied thrush. Additionally, Steller's jay, rufous hummingbird, red-breasted sapsucker, northern flicker, pileated woodpecker, varied thrush, Vaux's swift, purple martin, tree swallow, golden-crowned kinglet, Wilson's, Townsend's, and MacGillivray's warblers, Pacific tree frog</i>	• Mild, moist climate • 35-100 inches of winter rain • Well-drained mesic to dry soils • Mosaic structure from fire	• Habitat fragmentation • Invasive species

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Appendix F. Statement of Compliance

**STATEMENT OF COMPLIANCE
for implementation of the
Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge, Thurston County,
Washington
Comprehensive Conservation Plan**

The following executive orders and legislative acts have been reviewed as they apply to implementation of the Black River Unit (Unit) of Billy Frank Jr. Nisqually National Wildlife Refuge (Refuge, NWR)) Comprehensive Conservation Plan (CCP).

National Environmental Policy Act (1969), as Amended (42 U.S.C. § 4321 et seq.)

The planning process has been conducted in accordance with National Environmental Policy Act (NEPA) implementing procedures, with U.S. Department of the Interior and U.S. Fish and Wildlife Service (Service) procedures, and in coordination with the affected public. The requirements of NEPA (42 U.S. Code [U.S.C.] §4321 et seq.) and its implementing regulations in 40 Code of Federal Regulations (C.F.R.) 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 CCP, analysis of the likely effects of each alternative, and public involvement throughout the planning process. The start of the scoping period was announced through a *Federal Register* notice, news releases to local newspapers, the Service’s refuge planning website, and a planning update. The draft CCP/environmental assessment (EA) was released for a 31-day public comment period. The affected public was notified of the availability of the document through a *Federal Register* notice, news releases to local newspapers, the Service’s refuge planning website, and a planning update. Copies of the draft CCP/EA and/or planning updates were distributed to an extensive mailing list. In addition, the Service participated in a variety of public outreach efforts throughout the planning process (see Appendix J).

The CCP is programmatic in many respects, and specific details of certain projects and actions cannot be determined until a later date depending on funding and implementation schedules. Certain projects or actions may require additional NEPA compliance.

National Historic Preservation Act (1966), as Amended (16 U.S.C. § 470 et seq.)

The management of the archaeological and cultural resources of the Unit will comply with the regulations of Section 106 of the National Historic Preservation Act. Historic properties will be maintained and repaired as funding becomes available. Maintenance and improvement of historic resources will result in positive impacts to cultural resources; however, determining whether a particular action has the potential to affect cultural resources is an ongoing process that occurs as step-down and site-specific project plans are developed. Should additional historic properties be identified or acquired in the future, the Service will comply with the National Historic Preservation Act if any management actions have the potential to affect any these properties.

Executive Order 12372. Intergovernmental Review

Coordination and consultation with affected Tribal, local and State governments, other Federal agencies, and the landowners has been completed through personal contact by Refuge staff, supervisors, and/or inclusion of the appropriate entities on the CCP mailing list.

Executive Order 13175. Consultation and Coordination with Indian Tribal Governments

As required under the Secretary of the Interior Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal Tribal Responsibilities, and the Endangered Species Act), the Refuge acknowledges the responsibilities to communicate meaningfully with federally recognized Tribes on a government-to-government basis. This responsibility includes working directly with Tribes in developing programs for healthy ecosystems, remaining sensitive to Indian culture, and making information available to Tribes.

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 disproportionately high and adverse human health or environmental effects were identified for minority or low-income populations, Indian tribes, or anyone else.

Wilderness Preservation Act of 1964 (16 U.S.C. § 1131 et seq.)

The Service has evaluated the suitability of the Unit for wilderness designation through the inventory phase according to the guidelines of the Wilderness Review process as described in 610 FW 4. In this inventory, no areas on the Black River Unit were found to meet the minimum wilderness criteria for size, naturalness, or outstanding opportunities for solitude and primitive/unconfined recreation (see Appendix D for additional details).

Architectural Barriers Act of 1968, as Amended (42 U.S.C. § 4151 et seq.)

The Architectural Barriers Act requires access to Federal facilities for people with disabilities. The implementation of actions related to access are found in Chapter 2 of the CCP will be designed, constructed, and maintained to insure whenever possible that physically handicapped persons will have ready access to, and use of, such facilities.

National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (16 U.S.C. 668dd–668ee)

This Act requires the Service to develop and implement a CCP for each refuge. This CCP identifies and describes Refuge purposes; the vision and goals for the Unit; fish, wildlife, and plant populations and related habitats on the Unit; archaeological and cultural values of the Unit; issues that may affect populations and habitats of fish, wildlife, and plants; actions necessary to restore and improve biological diversity on the Unit; and opportunities for wildlife-dependent recreation, as required by the Act.

During the CCP process, the refuge manager evaluated all existing and proposed uses at the Unit. Priority wildlife-dependent uses (hunting, fishing, wildlife observation and photography, environmental education and interpretation) are considered automatically appropriate under Service policy and thus exempt from appropriate uses review. Compatibility determinations have been prepared for all uses found appropriate (see Appendices A and B).

Executive Order 13186. Responsibilities of Federal Agencies to Protect Migratory Birds

This Order directs agencies to take certain actions to further implement the Migratory Bird Treaty Act. A provision of the Order directs Federal agencies to consider the impacts of their activities, especially in reference to birds on the Service's list of Birds of Conservation Concern. It also directs agencies to incorporate conservation recommendations and objectives in the North American Waterbird Conservation Plan and bird conservation plans developed by Partners in Flight into agency planning as described in Chapter 1. The effects to and Unit migratory birds' habitats, public use activities, and cultural resources actions were assessed within the draft CCP/EA.

Endangered Species Act (1973), as Amended (16 U.S.C. § 1531 et seq.)

This Act provides for the conservation of threatened and endangered species of fish, wildlife, and plants by Federal action and by encouraging the establishment of State programs. Documentation is required under section 7 of the Act. Refuge policy requires the refuge manager to document issues that affect or may affect endangered species before initiating projects. Consultation on specific projects will be conducted prior to implementation to avoid any adverse impacts to these species and their habitats.

Coastal Zone Management Act, as Amended (16 U.S.C. § 1451 et seq.)

Section 307(c)(1) of the Coastal Zone Management Act of 1972 (CZMA), 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 implementation of the Black River Unit CCP is consistent with CZMA.

Executive Order 11990. Protection of Wetlands

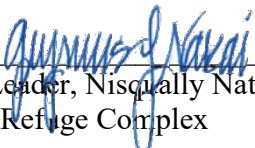
The CCP is consistent with Executive Order 11990 because CCP implementation would protect any existing wetlands.

Integrated Pest Management. 517 DM 1 and 7 RM 14

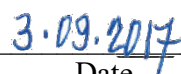
In accordance with 517 DM 1 and 7 RM 14, an integrated pest management (IPM) approach has been adopted to eradicate, control, or contain pest and invasive species on the Unit. In accordance with 517 DM 1, only pesticides registered with the U.S. Environmental Protection Agency (USEPA) in full compliance with the Federal Insecticide, Fungicide, and Rodenticide Act and as provided in regulations, orders, or permits issued by USEPA may be applied on lands and waters under Refuge System jurisdiction (see Appendix G).

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 floodplains." The CCP is consistent with Executive Order 11988 because the Black River Unit CCP implementation would maintain and enhance habitats located within floodplains on the Unit, which will minimize flood impacts and continue to contribute to the natural and beneficial fish and wildlife resource values unique to the area.



Project Leader, Nisqually National
Wildlife Refuge Complex



Date

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Appendix G. Integrated Pest Management

G.1 Background

Integrated Pest Management (IPM) is an interdisciplinary approach utilizing methods to prevent, eliminate, contain, and/or control pest species in concert with other management activities on refuge lands and waters to achieve wildlife and habitat management goals and objectives. IPM is also a scientifically based, adaptive management process where available scientific information and best professional judgment of the refuge staff as well as other resource experts would be used to identify and implement appropriate management strategies that can be modified and/or changed over time to ensure effective, site-specific management of pest species to achieve desired outcomes. In accordance with 43 CFR 46.145, adaptive management would be particularly relevant where long-term impacts may be uncertain and future monitoring would be needed to make adjustments in subsequent implementation decisions. After a tolerable pest population (threshold) is determined considering achievement of refuge resource objectives and the ecology of pest species, one or more methods, or combinations thereof, would be selected that are feasible, efficacious, and most protective of non-target resources, including native species (fish, wildlife, and plants), and Service personnel, Service authorized agents, volunteers, and the public. Staff time and available funding would be considered when determining feasibility/practicality of various treatments.

IPM techniques to address pests are presented as CCP strategies (see Section 2.0 of this CCP/EA) in an adaptive management context to achieve refuge resource objectives. In order to satisfy requirements for IPM planning as identified in the Director's Memo (dated September 9, 2004) entitled *Integrated Pest Management Plans and Pesticide Use Proposals: Updates, Guidance, and an Online Database*, the following elements of an IPM program have been incorporated into this draft CCP/EA:

- Habitat and/or wildlife objectives that identify pest species and appropriate thresholds to indicate the need for and successful implementation of IPM techniques
- Monitoring before and/or after treatment to assess progress toward achieving objectives including pest thresholds

Where pesticides would be necessary to address pests, this Appendix provides a structured procedure to evaluate potential effects of proposed uses involving ground-based applications to refuge biological resources and environmental quality in accordance with effects analyses presented in Section 4.0 (Environmental Consequences) of this draft CCP/EA. Only pesticide uses that likely would cause minor, temporary, or localized effects to refuge biological resources and environmental quality with appropriate BMPs, where necessary, would be allowed for use on the Refuge.

This appendix does not describe the more detailed process to evaluate potential effects associated with aerial applications of pesticides. Moreover, it does not address the effects of mosquito control with pesticides (larvicides, pupicides, or adulticides). However, the basic framework to assess potential effects to refuge biological resources and environmental quality from aerial application of pesticides or use of insecticides for mosquito management would be similar to the process described in this appendix for ground-based treatments of other pesticides.

G.2 Pest Management Laws and Policies

In accordance with Service policy 569 FW 1 (Integrated Pest Management), plant, invertebrate, and vertebrate pests on units of the National Wildlife Refuge System can be controlled to ensure balanced wildlife and fish populations in support of refuge-specific wildlife and habitat management objectives. Pest control on federal (refuge) lands and waters also is authorized under the following legal mandates:

- National Wildlife Refuge System Administration Act of 1966, as amended (16 USC 668dd-668ee)
- Plant Protection Act of 2000 (7 USC 7701 *et seq.*)
- Noxious Weed Control and Eradication Act of 2004 (7 USC 7781-7786, Subtitle E)
- Federal Insecticide, Fungicide, and Rodenticide Act of 1996 (7 USC 136-136y)
- National Invasive Species Act of 1996 (16 USC 4701)
- Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (16 USC 4701)
- Food Quality Protection Act of 1996 (7 USC 136)
- Executive Order 13148, Section 601(a)
- Executive Order 13112
- Animal Damage Control Act of 1931 (7 USC 426-426c, 46 Stat. 1468)

Pests are defined as “...living organisms that may interfere with the site-specific purposes, operations, or management objectives or that jeopardize human health or safety” from Department policy 517 DM 1 (Integrated Pest Management Policy). Similarly, 569 FW 1 defines pests as “...invasive plants and introduced or native organisms that may interfere with achieving our management goals and objectives on or off our lands, or that jeopardize human health or safety.” 517 DM 1 also defines an invasive species as “a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.” Throughout the remainder of this draft CCP/EA, the terms pest and invasive species are used interchangeably because both can prevent/impede achievement of refuge wildlife and habitat objectives and/or degrade environmental quality.

In general, control of pests (vertebrate or invertebrate) on the Refuge would conserve and protect the nation’s fish, wildlife, and plant resources as well as maintain environmental quality. From 569 FW 1, animal or plant species, which are considered pests, may be managed if the following criteria are met:

- Threat to human health and well-being or private property, the acceptable level of damage by the pest has been exceeded, or State or local government has designated the pest as noxious
- Detrimental to resource objectives as specified in a refuge resource management plan (e.g., comprehensive conservation plan, habitat management plan), if available
- Control would not conflict with attainment of resource objectives or the purposes for which the Refuge was established

The specific justifications for pest management activities on the Refuge are the following:

- Protect human health and well-being
- Prevent substantial damage to important to refuge resources
- Protect newly introduced or re-establish native species

- Control non-native (exotic) species in order to support existence for populations of native species
- Prevent damage to private property
- Provide the public with quality, compatible wildlife-dependent recreational opportunities

In accordance with Service policy 620 FW 1 (Habitat Management Plans), there are additional management directives regarding invasive species found on the Refuge:

- “We are prohibited by Executive Order, law, and policy from authorizing, funding, or carrying out actions that are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere.”
- “Manage invasive species to improve or stabilize biotic communities to minimize unacceptable change to ecosystem structure and function and prevent new and expanded infestations of invasive species. Conduct refuge habitat management activities to prevent, control, or eradicate invasive species...”

Animal species damaging/destroying federal property and/or detrimental to the management program of a refuge may be controlled as described in 50 CFR 31.14 (Official Animal Control Operations). For example, the incidental removal of beaver damaging refuge infrastructure (e.g., clogging with subsequent damaging of water control structures) and/or negatively affecting habitats (e.g., removing woody species from existing or restored riparian) managed on refuge lands may be conducted without a pest control proposal. We recognize beavers are native species and most of their activities on refuge lands represent a natural process beneficial for maintaining wetland habitats. Exotic nutria, whose denning and burrowing activities in wetland dikes causes cave-ins and breaches, can be controlled using the most effective techniques considering site-specific factors without a pest control proposal. Along with the loss of quality wetland habitats associated with breaching of impoundments, the safety of refuge staffs and public (e.g., auto tour routes) driving on structurally compromised levees and dikes can be threaten by sudden and unexpected cave-ins.

Trespass and feral animals also may be controlled on refuge lands. Based upon 50 CFR 28.43 (Destruction of Dogs and Cats), dogs and cats running at large on a national wildlife refuge and observed in the act of killing, injuring, harassing or molesting humans or wildlife may be disposed of in the interest of public safety and protection of the wildlife. Feral animals should be disposed by the most humane method(s) available and in accordance with relevant Service directives (including Executive Order 11643). Disposed wildlife specimens may be donated or loaned to public institutions. Donation or loans of resident wildlife species would only be made after securing State approval (50 CFR 30.11 [Donation and Loan of Wildlife Specimens]). Surplus wildlife specimens may be sold alive or butchered, dressed and processed subject to federal and state laws and regulations (50 CFR 30.12 [Sale of Wildlife Specimens]).

G.3 Strategies

To fully embrace IPM as identified in 569 FW 1, the following strategies, where applicable, would be carefully considered on the Refuge for each pest species.

G.3.1 Prevention

This would be the most effective and least expensive long-term management option for pests. It encompasses methods to prevent new introductions or the spread of the established pests to un-infested areas. It requires identifying potential routes of invasion to reduce the likelihood of infestation. Hazard Analysis and Critical Control Points (HACCP) planning can be used determine if current management activities on a refuge may introduce and/or spread invasive species in order to identify appropriate BMPs for prevention. See <http://www.haccp-nrm.org/> for more information about HACCP planning.

Prevention may include source reduction, using pathogen-free or weed-free seeds or fill; exclusion methods (e.g., barriers) and/or sanitation methods (e.g., wash stations) to prevent re-introductions by various mechanisms including vehicles, personnel, livestock, and horses. Because invasive species are frequently the first to establish newly disturbed sites, prevention would require a reporting mechanism for early detection of new pest occurrences with quick response to eliminate any new satellite pest populations. Prevention would require consideration of the scale and scope of land management activities that may promote pest establishment within un-infested areas or promote reproduction and spread of existing populations. Along with preventing initial introduction, prevention would involve halting the spread of existing infestations to new sites (Mullin et al. 2000). The primary reason for prevention would be to keep pest-free lands or waters from becoming infested. Executive Order 11312 emphasizes the priority for prevention with respect to managing pests.

The following would be methods to prevent the introduction and/or spread of pests on refuge lands:

- Before beginning ground-disturbing activities (e.g., disking, scraping), inventory and prioritize pest infestations in project operating areas and along access routes. Refuge staff would identify pest species on-site or within reasonably expected potential invasion vicinity. Where possible, the refuge staff would begin project activities in un-infested areas before working in pest-infested areas.
- Refuge staff would locate and use pest-free project staging areas. They would avoid or minimize travel through pest-infested areas, or restrict to those periods when spread of seed or propagules of invasive plants would be least likely.
- Refuge staff would determine the need for, and when appropriate, identify sanitation sites where equipment can be cleaned of pests. Where possible, the refuge staff would clean equipment before entering lands at on-refuge approved cleaning site(s). This practice does not pertain to vehicles traveling frequently in and out of the project area that would remain on roadways. Seeds and plant parts of pest plants would need to be collected, where practical. The refuge staff would remove mud, dirt, and plant parts from project equipment before moving it into a project area.
- Refuge staff would clean all equipment, before leaving the project site, if operating in areas infested with pests. The refuge staff would determine the need for, and when appropriate, identify sanitation sites where equipment can be cleaned.
- Refuge staffs, their authorized agents, and refuge volunteers would, where possible, inspect, remove, and properly dispose of seed and parts of invasive plants found on their clothing and equipment. Proper disposal means bagging the seeds and plant parts and then properly discarding of them (e.g., incinerating).

- Refuge staff would evaluate options, including closure, to restrict the traffic on sites with on-going restoration of desired vegetation. The refuge staff would revegetate disturbed soil (except travel ways on surfaced projects) to optimize plant establishment for each specific site. Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and weed-free mulching as necessary. The refuge staff would use native material, where appropriate and feasible. The refuge staff would use certified weed-free or weed-seed-free hay or straw where certified materials are reasonably available.
- Refuge staff would provide information, training, and appropriate pest identification materials to permit holders and recreational visitors. The refuge staff would educate them about pest identification, biology, impacts, and effective prevention measures.
- Refuge staff would require grazing permittees to utilize preventative measures for their livestock while on refuge lands.
- Refuge staff would inspect borrow material for invasive plants prior to use and transport onto and/or within refuge lands.
- Refuge staff would consider invasive plants in planning for road maintenance activities.
- Refuge staff would restrict off-road travel to designated routes.

The following would be methods to prevent the introduction and/or spread of pests into refuge waters:

- Refuge staff would inspect boats (including air boats), trailers, and other boating equipment. Where possible, the refuge staff would remove any visible plants, animals, or mud before leaving any waters or boat launching facilities. Where possible, the refuge staff would drain water from motor, live well, bilge, and transom wells while on land before leaving the site. If possible, the refuge staff would wash and dry boats, downriggers, anchors, nets, floors of boats, propellers, axles, trailers, and other boating equipment to kill pests not visible at the boat launch.
- Where feasible, the refuge staff would maintain a 100-foot buffer of aquatic pest-free clearance around boat launches and docks or quarantine areas when cleaning around culverts, canals, or irrigation sites. Where possible, the refuge staff would inspect and clean equipment before moving to new sites or one project area to another.

These prevention methods to minimize/eliminate the introduction and/or spread of pests were taken verbatim or slightly modified from Appendix E of US Forest Service (2005).

G.3.2 Mechanical/Physical Methods

These methods would remove and destroy, disrupt the growth of, or interfere with the reproduction of pest species. For plants species, these treatments can be accomplished by hand, hand tool (manual), or power tools (mechanical) and include pulling, grubbing, digging, tilling/disking, cutting, swathing, grinding, sheering, girdling, mowing, and mulching of the pest plants.

For animal species, Service employees or their authorized agents could use mechanical/physical methods (including trapping) to control pests as a refuge management activity. Based upon 50 CFR 31.2, trapping can be used on a refuge to reduce surplus wildlife populations for a “balanced conservation program” in accordance with federal or state laws and regulations. In some cases, non-lethally trapped animals would be relocated to off-refuge sites with prior approval from the state.

Each of these tools would be efficacious to some degree and applicable to specific situations. In general, mechanical controls can effectively control annual and biennial pest plants. However, to control perennial plants, the root system has to be destroyed or it would resprout and continue to grow and develop. Mechanical controls are typically not capable of destroying a perennial plant's root system. Although some mechanical tools (e.g., disking, plowing) may damage root systems, they may stimulate regrowth producing a denser plant population that may aid in the spread depending upon the target species (e.g., Canada thistle). In addition, steep terrain and soil conditions would be major factors that can limit the use of many mechanical control methods.

Some mechanical control methods (e.g., mowing), which would be used in combination with herbicides, can be a very effective technique to control perennial species. For example, mowing perennial plants followed sequentially by treating the plant regrowth with a systemic herbicide often would improve the efficacy of the herbicide compared to herbicide treatment only.

G.3.3 Cultural Methods

These methods would involve manipulating habitat to increase pest mortality by reducing its suitability to the pest. Cultural methods would include water-level manipulation, mulching, winter cover crops, changing planting dates to minimize pest impact, prescribed burning (facilitate revegetation, increase herbicide efficacy, and remove litter to assist in emergence of desirable species), flaming with propane torches, trap crops, crop rotations that would include non-susceptible crops, moisture management, addition of beneficial insect habitat, reducing clutter, proper trash disposal, planting or seeding desirable species to shade or out-compete invasive plants, applying fertilizer to enhance desirable vegetation, prescriptive grazing, and other habitat alterations.

G.3.4 Biological Control Agents

Classical biological control would involve the deliberate introduction and management of natural enemies (parasites, predators, or pathogens) to reduce pest populations. Many of the most ecologically or economically damaging pest species in the United States originated in foreign countries. These newly introduced pests, which are free from natural enemies found in their country or region of origin, may have a competitive advantage over cultivated and native species. This competitive advantage often allows introduced species to flourish, and they may cause widespread economic damage to crops or out compete and displace native vegetation. Once the introduced pest species population reaches a certain level, traditional methods of pest management may be cost prohibitive or impractical. Biological controls typically are used when these pest populations have become so widespread that eradication or effective control would be difficult or no longer practical.

Biological control has advantages as well as disadvantages. Benefits would include reducing pesticide usage, host specificity for target pests, long-term self-perpetuating control, low cost/acre, capacity for searching and locating hosts, synchronizing biological control agents to hosts' life cycles, and the unlikelihood that hosts would develop resistance to agents. Disadvantages would include the following: limited availability of agents from their native lands, the dependence of control on target species density, slow rate at which control occurs, biotype matching, the difficulty and expense of conflicts over control of the target pest, and host specificity when host populations are low.

A reduction in target species populations from biological controls is typically a slow process, and efficacy can be highly variable. It may not work well in a particular area although it does work well

in other areas. Biological control agents would require specific environmental conditions to survive over time. Some of these conditions are understood; whereas, others are only partially understood or not at all.

Biological control agents would not eradicate a target pest. When using biological control agents, residual levels of the target pest typically are expected; the agent population level or survival would be dependent upon the density of its host. After the pest population decreases, the population of the biological control agent would decrease correspondingly. This is a natural cycle. Some pest populations (e.g., invasive plants) would tend to persist for several years after a biological control agent becomes established due to seed reserves in the soil, inefficiencies in the agents search behavior, and the natural lag in population buildup of the agent.

The full range of pest groups potentially found on refuge lands and waters would include diseases, invertebrates (insects, mollusks), vertebrates, and invasive plants (the most common group). Often it is assumed that biological control would address many if not most of these pest problems. There are several well-documented success stories of biological control of invasive weed species in the Pacific Northwest including Mediterranean sage, St. Johnswort (Klamath weed) and tansy ragwort. Emerging success stories include Dalmatian toadflax, diffuse knapweed, leafy spurge, purple loosestrife and yellow star thistle. However, historically, each new introduction of a biological control agent in the United States has only about a 30% success rate (Coombs et al. 2004). Refer to Coombs et al. (2004) for the status of biological control agents for invasive plants in the Pacific Northwest.

Introduced species without desirable close relatives in the United States would generally be selected as biological controls. Natural enemies that are restricted to one or a few closely related plants in their country of origin are targeted as biological controls (Center et al. 1997, Hasan and Ayres 1990).

The refuge staff would ensure introduced agents are approved by the applicable authorities. Except for a small number of formulated biological control products registered by USEPA under FIFRA, most biological control agents are regulated by the US Department of Agriculture (USDA)-Animal Plant Health Inspection Service, Plant Protection and Quarantine (APHIS-PPQ). State departments of agriculture and, in some cases, county agricultural commissioners or weed districts, have additional approval authority.

Federal permits (USDA-APHIS-PPQ Form 526) are required to import biocontrols agents from another state. Form 526 may be obtained by writing:

USDA-APHIS-PPQ
Biological Assessment and Taxonomic Support
4700 River Road, Unit 113
Riverdale, MD 20737

Or through the internet at

<http://www.aphis.usda.gov/ppq/permits/biological/weedbio.html>

The Service strongly supports the development, and legal and responsible use of appropriate, safe, and effective biological control agents for nuisance and non-indigenous or pest species.

State and county agriculture departments may also be sources for biological control agents or they may have information about where biological control agents may be obtained. Commercial sources should have an Application and Permit to Move Live Plant Pests and Noxious Weeds (USDA-PPQ Form 226 USDA-APHIS-PPQ, Biological Assessment and Taxonomic Support, 4700 River Road, Unit 113, Riverdale, MD 20737) to release specific biological control agents in a state and/or county. Furthermore, certification regarding the biological control agent's identity (genus, specific epithet, sub-species and variety) and purity (e.g., parasite free, pathogen free, and biotic and abiotic contaminants) should be specified in purchase orders.

Biological control agents are subject to 7 RM 8 (Exotic Species Introduction and Management). In addition, the refuge staff would follow the International Code of Best Practice for Classical Biological Control of Weeds (<http://src.ucdavis.edu/exotic/exotic.htm>) as ratified by delegates to the X International Symposium on Biological Control of Weeds, Bozeman, MT, July 9, 1999. This code identifies the following:

- Release only approved biological control agents
- Use the most effective agents
- Document releases
- Monitor for impact to the target pest, non-target species and the environment

Biological control agents formulated as pesticide products and registered by the USEPA (e.g., *Bti*) are also subject to PUP review and approval (see below).

A record of all releases would be maintained with date(s), location(s), and environmental conditions of the release site(s); the identity, quantity, and condition of the biological control agents released; and other relevant data and comments such as weather conditions. Systematic monitoring to determine the establishment and effectiveness of the release is also recommended.

NEPA documents regarding biological and other environmental effects of biological control agents prepared by another federal agency, where the scope is relevant to evaluation of releases on refuge lands, would be reviewed. Possible source agencies for such NEPA documents include the Bureau of Land Management, US Forest Service, National Park Service, US Department of Agriculture-Animal and Plant Health Inspection Service, and the military services. It might be appropriate to incorporate by reference parts or all of existing document(s) from the review. Incorporating by reference (43 CFR 46.135) is a technique used to avoid redundancies in analysis. It also can reduce the bulk of a Service NEPA document, which only must identify the documents that are incorporated by reference. In addition, relevant portions must be summarized in the Service NEPA document to the extent necessary to provide the decision maker and public with an understanding of relevance of the referenced material to the current analysis.

G.3.5 Pesticides

The selective use of pesticides would be based upon pest ecology (including mode of reproduction), the size and distribution of its populations, site-specific conditions (e.g., soils, topography), known efficacy under similar site conditions, and the capability to utilize best management practices (BMPs) to reduce/eliminate potential effects to non-target species, sensitive habitats, and potential to contaminate surface and groundwater. All pesticide usage (pesticide, target species, application rate, and method of application) would comply with the applicable federal (FIFRA) and state regulations pertaining to pesticide use, safety, storage, disposal, and reporting. Before pesticides can be used to

eradicate, control, or contain pests on refuge lands and waters, pesticide use proposals (PUPs) would be prepared and approved in accordance with 569 FW 1. PUP records would provide a detailed, time-, site-, and target-specific description of the proposed use of pesticides on the Refuge. All PUPs would be created, approved or disapproved, and stored in the Pesticide Use Proposal System (PUPS), which is a centralized database only accessible on the Service's intranet (<https://systems.fws.gov/pups>). Only Service employees would be authorized to access PUP records for a refuge in this database.

Application equipment would be selected to provide site-specific delivery to target pests while minimizing/eliminating direct or indirect (e.g., drift) exposure to non-target areas and degradation of surface and groundwater quality. Where possible, target-specific equipment (e.g., backpack sprayer, wiper) would be used to treat target pests. Other target-specific equipment to apply pesticides would include soaked wicks or paint brushes for wiping vegetation and lances, hatchets, or syringes for direct injection into stems. Granular pesticides may be applied using seeders or other specialized dispensers. In contrast, aerial spraying (e.g., fixed wing or helicopter) would only be used where access is difficult (remoteness) and/or the size/distribution of infestations precludes practical use of ground-based methods.

Because repeated use of one pesticide may allow resistant organisms to survive and reproduce, multiple pesticides with variable modes of action would be considered for treatments on refuge lands and waters. This is especially important if multiple applications within years and/or over a growing season likely would be necessary for habitat maintenance and restoration activities to achieve resource objectives. Integrated chemical and non-chemical controls also are highly effective, where practical, because pesticide-resistant organisms can be removed from the site.

Cost may not be the primary factor in selecting a pesticide for use on a refuge. If the least expensive pesticide would potentially harm natural resources or people, then a different product would be selected, if available. The most efficacious pesticide available with the least potential to degrade environment quality (soils, surface water, and groundwater) as well as least potential effect to native species and communities of fish, wildlife, plants, and their habitats would be acceptable for use on refuge lands in the context of an IPM approach.

G.3.6 Habitat Restoration/Maintenance

Restoration and/or proper maintenance of refuge habitats associated with achieving wildlife and habitat objectives would be essential for long-term prevention, eradication, or control (at or below threshold levels) of pests. Promoting desirable plant communities through the manipulation of species composition, plant density, and growth rate is an essential component of invasive plant management (Masters et al. 1996, Masters and Shelly 2001, Brooks et al. 2004). The following three components of succession could be manipulated through habitat maintenance and restoration: site availability, species availability, and species performance (Cox and Anderson 2004). Although a single method (e.g., herbicide treatment) may eliminate or suppress pest species in the short term, the resulting gaps and bare soil create niches that are conducive to further invasion by the species and/or other invasive plants. On degraded sites where desirable species are absent or in low abundance, revegetation with native/desirable grasses, forbs, and legumes may be necessary to direct and accelerate plant community recovery, and achieve site-specific objectives in a reasonable time frame. The selection of appropriate species for revegetation would be dependent on a number of factors including resource objectives and site-specific, abiotic factors (e.g., soil texture,

precipitation/temperature regimes, and shade conditions). Seed availability and cost, ease of establishment, seed production, and competitive ability also would be important considerations.

G.4 Priorities for Treatments

For many refuges, the magnitude (number, distribution, and sizes of infestations) of pest problems is too extensive and beyond the available capital resources to effectively address during any single field season. To manage pests in the Refuge, it would be essential to prioritize treatment of infestations. Highest priority treatments would be focused on early detection and rapid response to eliminate infestations of new pests, if possible. This would be especially important for aggressive pests potentially impacting species, species groups, communities, and/or habitats associated refuge purpose(s), NWRS resources of concern (federally listed species, migratory birds, selected marine mammals, and interjurisdictional fish), and native species for maintaining/restoring biological integrity, diversity, and environmental health.

The next priority would be treating established pests that appear in one or more previously un-infested areas. Moody and Mack (1988) demonstrated through modeling that small, new outbreaks of invasive plants eventually would infest an area larger than the established, source population. They also found that control efforts focusing on the large, main infestation rather than the new, small satellites reduced the chances of overall success. The lowest priority would be treating large infestations (sometimes monotypic stands) of well-established pests. In this case, initial efforts would focus upon containment of the perimeter followed by work to control/eradicate the established infested area. If containment and/or control of a large infestation is not effective, then efforts would focus upon halting pest reproduction or managing source populations. Maxwell et al. (2009) found treating fewer populations that are sources represents an effective long-term strategy to reduce of total number of invasive populations and decreasing meta-population growth rates.

Although state-listed noxious weeds would always of high priority for management, other pest species known to cause substantial ecological impact would also be considered. For example, cheatgrass may not be listed by a state as noxious, but it can greatly alter fire regimes in shrub steppe habitats resulting in large monotypic stands that displace native bunch grasses, forbs, and shrubs. Pest control would likely require a multi-year commitment from the refuge staff. Essential to the long-term success of pest management would be pre- and post-treatment monitoring, assessment of the successes and failures of treatments, and development of new approaches when proposed methods do not achieve desired outcomes.

G.5 Best Management Practices (BMPs)

BMPs can minimize or eliminate possible effects associated with pesticide usage to non-target species and/or sensitive habitats as well as degradation of water quality from drift, surface runoff, or leaching. Based upon the Department of Interior Pesticide Use Policy (517 DM 1) and the Service Integrated Pest Management policy (569 FW 1), the use of applicable BMPs (where feasible) also would likely ensure that pesticide uses may not adversely affect federally listed species and/or their critical habitats through determinations made using the process described in 50 CFR part 402.

The following are BMPs pertaining to mixing/handling and applying pesticides for all ground-based treatments of pesticides, which would be considered and utilized, where feasible, based upon target- and site-specific factors and time-specific environmental conditions. Although not listed below, the

most important BMP to eliminate/reduce potential impacts to non-target resources would be an IPM approach to prevent, control, eradicate, and contain pests.

G.5.1 Pesticide Handling and Mixing

- As a precaution against spilling, spray tanks would not be left unattended during filling.
- All pesticide containers would be triple rinsed and the rinsate would be used as water in the sprayer tank and applied to treatment areas.
- All pesticide spray equipment would be properly cleaned. Where possible, rinsate would be used as part of the make-up water in the sprayer tank and applied to treatment areas.
- The refuge staff would triple rinse and recycle (where feasible) pesticide containers.
- All unused pesticides would be properly discarded at a local “safe send” collection.
- Pesticides and pesticide containers would be lawfully stored, handled, and disposed of in accordance with the label and in a manner safeguarding human health, fish, and wildlife and prevent soil and water contaminant.
- The refuge staff would consider the water quality parameters (e.g., pH, hardness) that are important to ensure greatest efficacy where specified on the pesticide label.
- All pesticide spills would be addressed immediately using procedures identified in the refuge spill response plan.

G.5.2 Applying Pesticides

- Pesticide treatments would only be conducted by or under the supervision of Service personnel and non-Service applicators with the appropriate, state or BLM certification to safely and effectively conduct these activities on refuge lands and waters.
- The refuge staff would comply with all federal, state, and local pesticide use laws and regulations as well as Departmental, Service, and NWRS pesticide-related policies. For example, the refuge staff would use application equipment and apply rates for the specific pest(s) identified on the pesticide label as required under FIFRA.
- Before each treatment season and prior to mixing or applying any product for the first time each season, all applicators would review the labels, MSDSs, and Pesticide Use Proposal (PUPs) for each pesticide, determining the target pest, appropriate mix rate(s), PPE, and other requirements listed on the pesticide label.
- A 1-foot no-spray buffer from the water’s edge would be used, where applicable and where it does not detrimentally influence effective control of pest species.
- Use low-impact herbicide application techniques (e.g., spot treatment, cut stump, oil basal, Thinvert system applications) rather than broadcast foliar applications (e.g., boom sprayer, other larger tank wand applications), where practical.
- Use low-volume rather than high-volume foliar applications where low-impact methods above are not feasible or practical, to maximize herbicide effectiveness and ensure correct and uniform application rates.
- Applicators would use and adjust spray equipment to apply the coarsest droplet size spectrum with optimal coverage of the target species while reducing drift.
- Applicators would use the largest droplet size that results in uniform coverage.
- Applicators would use drift reduction technologies such as low-drift nozzles, where possible.
- Where possible, spraying would occur during low (average <7 mph and preferably 3 to 5 mph) and consistent direction wind conditions with moderate temperatures (typically <85°F).

- Where possible, applicators would avoid spraying during inversion conditions (often associated with calm and very low wind conditions) that can cause large-scale herbicide drift to non-target areas.
- Equipment would be calibrated regularly to ensure that the proper rate of pesticide is applied to the target area or species.
- Spray applications would be made at the lowest height for uniform coverage of target pests to minimize/eliminate potential drift.
- If windy conditions frequently occur during afternoons, spraying (especially boom treatments) would typically be conducted during early morning hours.
- Spray applications would not be conducted on days with >30% forecast for rain within 6 hours, except for pesticides that are rapidly rain fast (e.g., glyphosate in 1 hour) to minimize/eliminate potential runoff.
- Where possible, applicators would use drift retardant adjuvants during spray applications, especially adjacent to sensitive areas.
- Where possible, applicators would use a non-toxic dye to aid in identifying target area treated as well as potential over spray or drift. A dye can also aid in detecting equipment leaks. If a leak is discovered, the application would be stopped until repairs can be made to the sprayer.
- For pesticide uses associated with cropland and facilities management, buffers, as appropriate, would be used to protect sensitive habitats, especially wetlands and other aquatic habitats.
- When drift cannot be sufficiently reduced through altering equipment set up and application techniques, buffer zones may be identified to protect sensitive areas downwind of applications. The refuge staff would only apply adjacent to sensitive areas when the wind is blowing the opposite direction.
- Applicators would utilize scouting for early detection of pests to eliminate unnecessary pesticide applications.
- The refuge staff would consider timing of application so native plants are protected (e.g., senescence) while effectively treating invasive plants.
- Rinsate from cleaning spray equipment after application would be recaptured and reused or applied to an appropriate pest plant infestation.
- Application equipment (e.g., sprayer, ATV, tractor) would be thoroughly cleaned and PPE would be removed/disposed of on-site by applicators after treatments to eliminate the potential spread of pests to un-infested areas.
- Cleaning boots (or use rubber boots to aid in sanitation) and brush off clothing in a place where monitoring is feasible to control for new seed transportation.

G.6 Safety

G.6.1 Personal Protective Equipment

All applicators would wear the specific personal protective equipment (PPE) identified on the pesticide label. The appropriate PPE would be worn at all times during handling, mixing, and applying. PPE can include the following: disposable (e.g., Tyvek) or laundered coveralls; gloves (latex, rubber, or nitrile); rubber boots; and/or an NIOSH-approved respirator. Because exposure to concentrated product is usually greatest during mixing, extra care should be taken while preparing pesticide solutions. Persons mixing these solutions can be best protected if they wear long gloves, an apron, footwear, and a face shield.

Coveralls and other protective clothing used during an application would be laundered separately from other laundry items. Transporting, storing, handling, mixing and disposing of pesticide containers would be consistent with label requirements, USEPA and OSHA requirements, and Service policy.

If a respirator is necessary for a pesticide use, then the following requirements would be met in accordance with Service safety policy: a written Respirator Program, fit testing, physical examination (including pulmonary function and blood work for contaminants), and proper storage of the respirator.

G.6.2 Notification

The restricted entry interval (REI) is the time period required after the application at which point someone may safely enter a treated area without PPE. Refuge staff, authorized management agents of the Service, volunteers, and members of the public who could be in or near a pesticide treated area within the stated re-entry time period on the label would be notified about treatment areas. Posting would occur at any site where individuals might inadvertently become exposed to a pesticide during other activities on the Refuge. Where required by the label and/or state-specific regulations, sites would also be posted on its perimeter and at other likely locations of entry. The refuge staff would also notify appropriate private property owners of an intended application, including any private individuals who have requested notification. Special efforts would be made to contact nearby individuals who are beekeepers or who have expressed chemical sensitivities.

G.6.3 Medical Surveillance

Medical surveillance may be required for Service personnel and approved volunteers who mix, apply, and/or monitor use of pesticides (see 242 FW 7 [Pesticide Users] and 242 FW 4 [Medical Surveillance]). In accordance with 242 FW 7.12A, Service personnel would be medically monitoring if one or more of the following criteria is met: exposed or may be exposed to concentrations at or above the published permissible exposure limits or threshold limit values (see 242 FW 4); use pesticides in a manner considered “frequent pesticide use”; or use pesticides in a manner that requires a respirator (see 242 FW 14 for respirator use requirements). In 242 FW 7.7A, Frequent Pesticide Use means when a person applying pesticide handles, mixes, or applies pesticides, with a Health Hazard rating of 3 or higher, for 8 or more hours in any week or 16 or more hours in any 30-day period.” Under some circumstances, individuals may be medically monitored who use pesticides infrequently (see section 7.7), experience an acute exposure (sudden, short-term), or use pesticides with a health hazard ranking of 1 or 2. This decision would consider the individual’s health and fitness level, the pesticide’s specific health risks, and the potential risks from other pesticide-related activities. Refuge cooperators (e.g., cooperative farmers) and other authorized agents (e.g., state and county employees) would be responsible for their own medical monitoring needs and costs.

Standard examinations (at refuge expense) of appropriate refuge staff would be provided by the nearest certified occupational health and safety physician as determined by Federal Occupational Health.

G.6.4 Certification and Supervision of Pesticide Applicators

Appropriate refuge staff or approved volunteers handling, mixing, and/or applying or directly supervising others engaged in pesticide use activities would be trained and state or federally (BLM)

licensed to apply pesticides to refuge lands or waters. In accordance with 242 FW7.18A and 569 FW 1.10B, certification is required to apply restricted use pesticides based upon USEPA regulations. For safety reasons, all individuals participating in pest management activities with general use pesticides also are encouraged to attend appropriate training or acquire pesticide applicator certification. The certification requirement would be for a commercial or private applicator depending upon the state. New staff unfamiliar with proper procedures for storing, mixing, handling, applying, and disposing of herbicides and containers would receive orientation and training before handling or using any products. Documentation of training would be kept in the files at the refuge office.

G.6.5 Record Keeping

Labels and material safety data sheets

Pesticide labels and material safety data sheets (MSDSs) would be maintained at the refuge shop and laminated copies in the mixing area. These documents also would be carried by field applicators, where possible. A written reference (e.g., note pad, chalk board, dry erase board) for each tank to be mixed would be kept in the mixing area for quick reference while mixing is in progress. In addition, approved PUPs stored in the PUPS database typically contain website links (URLs) to pesticide labels and MSDSs.

Pesticide use proposals (PUPs)

A PUP would be prepared for each proposed pesticide use associated with annual pest management on refuge lands and waters. A PUP would include specific information about the proposed pesticide use including the common and chemical names of the pesticide(s), target pest species, size and location of treatment site(s), application rate(s) and method(s), and federally listed species determinations, where applicable.

In accordance with Service guidelines (Director's memo [December 12, 2007]), a refuge staff may receive up to five-year approvals for Washington Office and field reviewed proposed pesticide uses based upon meeting identified criteria including an approved IPM plan, where necessary (see <http://www.fws.gov/contaminants/Issues/IPM.cfm>). For a refuge, an IPM plan (requirements described herein) can be completed independently or in association with a CCP or a habitat management plan (HMP) if IPM strategies and potential environmental effects are adequately addressed within appropriate NEPA documentation.

PUPs would be created, approved or disapproved, and stored as records in the Pesticide Use Proposal System (PUPS), which is centralized database on the Service's intranet (<https://systems.fws.gov/pups>). Only Service employees can access PUP records in this database.

Pesticide usage

In accordance with 569 FW 1, the refuge Project Leader would be required to maintain records of all pesticides annually applied on lands or waters under refuge jurisdiction. This would encompass pesticides applied by other federal agencies, state and county governments, non-government applicators including cooperators and their pest management service providers with Service permission. For clarification, pesticide means all insecticides, insect and plant growth regulators, desiccants, herbicides, fungicides, rodenticides, acaricides, nematocides, fumigants, avicides, and piscicides.

The following usage information can be reported for approved PUPs in the PUPS database:

- Pesticide trade name(s)
- Active ingredient(s)
- Total acres treated
- Total amount of pesticides used (lbs. or gallons)
- Total amount of active ingredient(s) used (lbs.)
- Target pest(s)
- Efficacy (% control)

To determine whether treatments are efficacious (eradicating, controlling, or containing the target pest) and achieving resource objectives, habitat and/or wildlife response would be monitored both pre- and post-treatment, where possible. Considering available annual funding and staffing, appropriate monitoring data regarding characteristics (attributes) of pest infestations (e.g., area, perimeter, degree of infestation-density, % cover, density) as well as habitat and/or wildlife response to treatments may be collected and stored in a relational database (e.g., Refuge Habitat Management Database), preferably a geo-referenced data management system (e.g., Refuge Lands GIS) to facilitate data analyses and subsequent reporting. In accordance with adaptive management, data analysis and interpretation would allow treatments to be modified or changed over time, as necessary, to achieve resource objectives considering site-specific conditions in conjunction with habitat and/or wildlife responses. Monitoring could also identify short- and long-term impacts to natural resources and environmental quality associated with IPM treatments in accordance with adaptive management principles identified in 43 CFR 46.145.

G.7 Evaluating Pesticide Use Proposals

Pesticides would only be used on refuge lands for habitat management as well as croplands/facilities maintenance after approval of a PUP. In general, proposed pesticide uses on refuge lands would only be approved where there would likely be minor, temporary, or localized effects to fish and wildlife species as well as minimal potential to degrade environmental quality. Potential effects to listed and non-listed species would be evaluated with quantitative ecological risk assessments and other screening measures. Potential effects to environmental quality would be based upon pesticide characteristics of environmental fate (water solubility, soil mobility, soil persistence, and volatilization) and other quantitative screening tools. Ecological risk assessments as well as characteristics of environmental fate and potential to degrade environmental quality for pesticides would be documented in Chemical Profiles (see Section 7.5). These profiles would include threshold values for quantitative measures of ecological risk assessments and screening tools for environmental fate that represent minimal potential effects to species and environmental quality. In general, only pesticide uses with appropriate BMPs (see Section 4.0) for habitat management and cropland/facilities maintenance on refuge lands that would potentially have minor, temporary, or localized effects on refuge biological and environmental quality (threshold values not exceeded) would be approved.

G.7.1 Overview of Ecological Risk Assessment

An ecological risk assessment process would be used to evaluate potential adverse effects to biological resources as a result of a pesticide(s) proposed for use on refuge lands. It is an established quantitative and qualitative methodology for comparing and prioritizing risks of pesticides and

conveying an estimate of the potential risk for an adverse effect. This quantitative methodology provides an efficient mechanism to integrate best available scientific information regarding hazard, patterns of use (exposure), and dose-response relationships in a manner that is useful for ecological risk decision-making. It would provide an effective way to evaluate potential effects where there is missing or unavailable scientific information (data gaps) to address reasonable, foreseeable adverse effects in the field as required under 40 CFR Part 1502.22. Protocols for ecological risk assessment of pesticide uses on the refuge were developed through research and established by the US Environmental Protection Agency (2004). Assumptions for these risk assessments are presented in Section 6.2.3.

The toxicological data used in ecological risk assessments are typically results of standardized laboratory studies provided by pesticide registrants to the USEPA to meet regulatory requirements under FIFRA. These studies assess the acute (lethality) and chronic (reproductive) effects associated with short- and long-term exposure to pesticides on representative species of birds, mammals, freshwater fish, aquatic invertebrates, and terrestrial and aquatic plants. Other effects data publicly available would also be utilized for risk assessment protocols described herein. Toxicity endpoint and environmental fate data are available from a variety of resources. Some of the more useful resources can be found in Section 7.5.

Table G-1. Ecotoxicity tests used to evaluate potential effects to birds, fish, and mammals to establish toxicity endpoints for risk quotient calculations

Species Group	Exposure	Measurement endpoint
Bird	Acute	Median Lethal Concentration (LC ₅₀)
	Chronic	No Observed Effect Concentration (NOEC) or No Observed Adverse Effect Concentration (NOAEC) ¹
Fish	Acute	Median Lethal Concentration (LC ₅₀)
	Chronic	No Observed Effect Concentration (NOEC) or No Observed Adverse Effect Concentration (NOAEC) ²
Mammal	Acute	Oral Lethal Dose (LD ₅₀)
	Chronic	No Observed Effect Concentration (NOEC) or No Observed Adverse Effect Concentration (NOAEC) ³

¹Measurement endpoints typically include a variety of reproductive parameters (e.g., number of eggs, number of offspring, eggshell thickness, and number of cracked eggs).

²Measurement endpoints for early life stage/life cycle typically include embryo hatch rates, time to hatch, growth, and time to swim-up.

³Measurement endpoints include maternal toxicity, teratogenic effects or developmental anomalies, evidence of mutagenicity or genotoxicity, and interference with cellular mechanisms such as DNA synthesis and DNA repair.

G.7.2 Determining Ecological Risk to Fish and Wildlife

The potential for pesticides used on the refuge to cause direct adverse effects to fish and wildlife would be evaluated using USEPA's Ecological Risk Assessment Process (USEPA 2004). This deterministic approach, which is based upon a two-phase process involving estimation of environmental concentrations and then characterization of risk, would be used for ecological risk assessments. This method integrates exposure estimates (estimated environmental concentration [EEC] and toxicological endpoints [e.g., LC₅₀ and oral LD₅₀]) to evaluate the potential for adverse effects to species groups (birds, mammals, and fish) representative of legal mandates for managing units of the NWRS. This integration is achieved through risk quotients (RQs) calculated by dividing the EEC by acute and chronic toxicity values selected from standardized toxicological endpoints or published effect (Table G-1).

$$RQ = EEC / \text{Toxicological Endpoint}$$

The level of risk associated with direct effects of pesticide use would be characterized by comparing calculated RQs to the appropriate Level of Concern (LOC) established by US Environmental Protection Agency (1998 [Table G-2]). The LOC represents a quantitative threshold value for screening potential adverse effects to fish and wildlife resources associated with pesticide use. The following are four exposure-species group scenarios that would be used to characterize ecological risk to fish and wildlife on the Refuge: acute-listed species, acute-nonlisted species, chronic-listed species, and chronic-nonlisted species.

Acute risk would indicate the potential for mortality associated with short-term dietary exposure to pesticides immediately after an application. For characterization of acute risks, median values from LC₅₀ and LD₅₀ tests would be used as toxicological endpoints for RQ calculations. In contrast, chronic risks would indicate the potential for adverse effects associated with long-term dietary exposure to pesticides from a single application or multiple applications over time (within a season and over years). For characterization of chronic risks, the no observed concentration (NOAEC) or no observed effect concentration (NOEC) for reproduction would be used as toxicological endpoints for RQ calculations. Where available, the NOAEC would be preferred over a NOEC value.

Listed species are those federally designated as threatened, endangered, or proposed in accordance with the Endangered Species Act of 1973 (16 USC 1531-1544, 87 Stat. 884, as amended-Public Law 93-205). For listed species, potential adverse effects would be assessed at the individual level because loss of individuals from a population could detrimentally impact a species. In contrast, risks to nonlisted species would consider effects at the population level. A RQ < LOC would indicate the proposed pesticide use "may affect, not likely to adversely affect" individuals (listed species) and it would not pose an unacceptable risk for adverse effects to populations (non-listed species) for each taxonomic group (Table G-2). In contrast, an RQ > LOC would indicate a "may affect, likely to adversely affect" for listed species and it would also pose unacceptable ecological risk for adverse effects to nonlisted species.

Table G-2. Presumption of unacceptable risk for birds, fish, and mammals (USEPA 1998)

Risk Presumption		Level of Concern	
		Listed Species	Non-listed Species
Acute	Birds	0.1	0.5

Risk Presumption		Level of Concern	
		Listed Species	Non-listed Species
	Fish	0.05	0.5
	Mammals	0.1	0.5
Chronic	Birds	1.0	1.0
	Fish	1.0	1.0
	Mammals	1.0	1.0

Environmental exposure

Following release into the environment through application, pesticides would experience several different routes of environmental fate. Pesticides which would be sprayed can move through the air (e.g., particle or vapor drift) and may eventually end up in other parts of the environment such as non-target vegetation, soil, or water. Pesticides applied directly to the soil may be washed off the soil into nearby bodies of surface water (e.g., surface runoff) or may percolate through the soil to lower soil layers and groundwater (e.g., leaching) (Baker and Miller 1999, Pope et al. 1999, Butler et al. 1998, Ramsay et al. 1995, EXTOWNET 1993a). Pesticides which would be injected into the soil may also be subject to the latter two fates. The aforementioned possibilities are by no means complete, but it does indicate movement of pesticides in the environment is very complex with transfers occurring continually among different environmental compartments. In some cases, these exchanges occur not only between areas that are close together, but it also may involve transportation of pesticides over long distances (Barry 2004, Woods 2004).

Terrestrial exposure

The ECC for exposure to terrestrial wildlife would be quantified using an USEPA screening-level approach (USEPA 2004). This screening-level approach is not affected by product formulation because it evaluates pesticide active ingredient(s). This approach would vary depending upon the proposed pesticide application method: spray or granular.

Terrestrial-spray application

For spray applications, exposure would be determined using the Kenaga nomogram method (USEPA 2012, Pfleeger et al. 1996) through the USEPA's Terrestrial Residue Exposure model (T-REX) version 1.5 (USEPA 2012). To estimate the maximum (initial) pesticide residue on short grass (<20 cm tall) as a general food item category for terrestrial vertebrate species, T-REX input variables would include the following from the pesticide label: maximum pesticide application rate (pounds active ingredient [acid equivalent]/acre) and pesticide half-life (days) in soil. Although there are other food item categories (tall grasses; broadleaf plants and small insects; and fruits, pods, seeds and large insects), short grass was selected because it would yield maximum EECs (240 ppm per lb. ai/acre) for worst-case risk assessments. Short grass is not representative of forage for carnivorous

species (e.g., raptors), but it would characterize the maximum potential exposure through the diet of avian and mammalian prey items. Consequently, this approach would provide a conservative screening tool for pesticides that do not biomagnify.

For RQ calculations in T-REX, the model would require the weight of surrogate species and Mineau scaling factors (Mineau et al. 1996). Body weights of bobwhite quail and mallard are included in T-REX by default, but body weights of other organisms (Table 3) would be entered manually. The Mineau scaling factor accounts for small-bodied bird species that may be more sensitive to pesticide exposure than would be predicted only by body weight. Mineau scaling factors would be entered manually with values ranging from 1 to 1.55 that are unique to a particular pesticide or group of pesticides. If specific information to select a scaling factor is not available, then a value of 1.15 would be used as a default. Alternatively, zero would be entered if it is known that body weight does not influence toxicity of pesticide(s) being assessed. The upper bound estimate output from the T-REX Kenaga nomogram would be used as an EEC for calculation of RQs. This approach would yield a conservative estimate of ecological risk.

Table G-3. Average body weight of selected terrestrial wildlife species frequently used in research to establish toxicological endpoints (Dunning 1984)

Species	Body Weight (kg)
Mammal (15 g)	0.015
House sparrow	0.0277
Mammal (35 g)	0.035
Starling	0.0823
Red-winged blackbird	0.0526
Common grackle	0.114
Japanese quail	0.178
Bobwhite quail	0.178
Rat	0.200
Rock dove (aka pigeon)	0.542
Mammal (1,000 g)	1.000
Mallard	1.082
Ring-necked pheasant	1.135

Terrestrial – granular application

Granular pesticide formulations and pesticide-treated seed would pose a unique route of exposure for avian and mammalian species. The pesticide is applied in discrete units which birds or mammals might ingest accidentally with food items or intentionally as in the case of some bird species actively seeking and picking up gravel or grit to aid digestion or seed as a food source. Granules may also be consumed by wildlife foraging on earthworms, slugs or other soft-bodied soil organisms to which the granules may adhere.

Terrestrial wildlife RQs for granular formulations or seed treatments would be calculated by dividing the maximum milligrams of active ingredient (a.i.) exposed (e.g., EEC) on the surface of an area equal to 1 square foot by the appropriate LD50 value multiplied by the surrogate's body weight (Table G-3). An adjustment to surface area calculations would be made for broadcast, banded, and in-furrow applications. An adjustment also would be made for applications with and without incorporation of the granules. Without incorporation, it would be assumed that 100% of the granules remain on the soil surface available to foraging birds and mammals. Press wheels push granules flat with the soil surface, but they are not incorporated into the soil. If granules are incorporated in the soil during band or T-band applications or after broadcast applications, it would be assumed only 15% of the applied granules remain available to wildlife. It would be assumed that only 1% of the granules are available on the soil surface following in-furrow applications.

EECs for pesticides applied in granular form and as seed treatments would be determined considering potential ingestion rates of avian or mammalian species (e.g., 10-30% body weight/day). This would provide an estimate of maximum exposure that may occur as a result of granule or seed treatment spills such as those that commonly occur at end rows during application and planting. The availability of granules and seed treatments to terrestrial vertebrates would also be considered by calculating the loading per unit area (LD₅₀/ft²) for comparison to USEPA Level of Concerns (USEPA 1998). The T-REX version 1.5 (USEPA 2012) contains a submodel which automates Kenaga exposure calculations for granular pesticides and treated seed.

The following formulas would be used to calculate EECs depending upon the type of granular pesticide application:

- In-furrow applications assume a typical value of 1% granules, bait, or seed remain unincorporated.

$$mg\ a.i./ft.^2 = [(lbs.\ product/acre)(\% \ a.i.)(453,580\ mg/lbs)(1\% \ exposed))] / \{[(43,560\ ft.^2/acre)/(row\ spacing\ (ft.))] / (row\ spacing\ (ft.))\}$$

or

$$mg\ a.i./ft.^2 = [(lbs\ product/1,000\ ft.\ row)(\% \ a.i.)(1,000\ ft\ row)(453,580\ mg/lb.)(1\% \ exposed)]$$

$$EEC = [(mg\ a.i./ft.^2)(\% \ of\ pesticide\ biologically\ available)]$$

- Incorporated banded treatments assume that 15% of granules, bait, and seeds are unincorporated.

$$mg\ a.i./ft.^2 = [(lbs.\ product/1,000\ row\ ft.)(\% \ a.i.)(453,580\ mg/lb.)(1-\% \ incorporated)] / (1,000\ ft.)(band\ width\ (ft.))$$

$$EEC = [(mg\ a.i./ft.^2)(\% \ of\ pesticide\ biologically\ available)]$$

- Broadcast treatment without incorporation assumes 100% of granules, bait, seeds are unincorporated.

$$\text{mg a.i./ft.}^2 = [(\text{lbs. product/acre})(\% \text{ a.i.})(453,590 \text{ mg/lb.})] / (43,560 \text{ ft.}^2/\text{acre})$$

$$\text{EEC} = [(\text{mg a.i./ft.}^2)(\% \text{ of pesticide biologically available})]$$

Where:

- *% of pesticide biologically available = 100% without species specific ingestion rates*
- *Conversion for calculating mg a.i./ft.² using ounces: 453,580 mg/lb. /16 = 28,349 mg/oz.*

The following equation would be used to calculate an RQ based on the EEC calculated by one of the above equations. The EEC would be divided by the surrogate LD₅₀ toxicological endpoint multiplied by the body weight (Table G-3) of the surrogate.

$$\text{RQ} = \text{EEC} / [\text{LD}_{50} (\text{mg/kg}) * \text{body weight (kg)}]$$

As with other risk assessments, an RQ>LOC would be a presumption of unacceptable ecological risk. An RQ<LOC would be a presumption of acceptable risk with only minor, temporary, or localized effects to species.

Aquatic exposure

Exposures to aquatic habitats (e.g., wetlands, meadows, ephemeral pools, water delivery ditches) would be evaluated separately for ground-based pesticide treatments of habitats managed for fish and wildlife compared with cropland/facilities maintenance. The primary exposure pathway for aquatic organisms from any ground-based treatments likely would be particle drift during the pesticide application. However, different exposure scenarios would be necessary as a result of contrasting application equipment and techniques as well as pesticides used to control pests on agricultural lands (especially those cultivated by cooperative farmers for economic return from crop yields) and facilities maintenance (e.g., roadsides, parking lots, trails) compared with other managed habitats on the Refuge. In addition, pesticide applications may be done <25 feet of the high water mark of aquatic habitats for habitat management treatments; whereas, no-spray buffers (≥25 feet) would be used for croplands/facilities maintenance treatments.

Habitat treatments

For the worst-case exposure scenario to non-target aquatic habitats, EECs (Table 4) would be derived from Urban and Cook (1986) that assumes an intentional overspray to an entire, non-target water body (1-foot depth) from a treatment <25 feet from the high water mark using the max application rate (acid basis [see above]). However, use of BMPs for applying pesticides (see Section 4.2) would likely minimize/eliminate potential drift to non-target aquatic habitats during actual treatments. If there would be unacceptable (acute or chronic) risk to fish and wildlife with the simulated 100% overspray (RQ>LOC), then the proposed pesticide use may be disapproved or the PUP would be approved at a lower application rate to minimize/eliminate unacceptable risk to aquatic organisms (RQ=LOC).

Table G-4. Estimated Environmental Concentrations (ppb) of pesticides in aquatic habitats (1 foot depth) immediately after direct application (Urban and Cook 1986)

Lbs/acre	EEC (ppb)
0.10	36.7
0.20	73.5
0.25	91.9
0.30	110.2
0.40	147.0
0.50	183.7
0.75	275.6
1.00	367.5
1.25	459.7
1.50	551.6
1.75	643.5
2.00	735.7
2.25	827.6
2.50	919.4
3.00	1,103.5
4.00	1,471.4
5.00	1,839
6.00	2,207
7.00	2,575
8.00	2,943
9.00	3,311
10.00	3,678

Cropland/facilities maintenance treatments

Field drift studies conducted by the Spray Drift Task Force, which is a joint project of several agricultural chemical businesses, were used to develop a generic spray drift database. From this database, the AgDRIFT computer model was created to satisfy USEPA pesticide registration spray drift data requirements and as a scientific basis to evaluate off-target movement of pesticides from particle drift and assess potential effects of exposure to wildlife. Several versions of the computer model have been developed (i.e., v2.01 through v2.10). The Spray Drift Task Force AgDRIFT® model version 2.01 (SDTF 2003, AgDRIFT 2001) would be used to derive EECs resulting from drift of pesticides to refuge aquatic resources from ground-based pesticide applications >25 feet from the high water mark. The Spray Drift Task Force AgDRIFT model is publicly available at <http://www.agdrift.com>. At this website, click “AgDRIFT 2.0” and then click “Download Now” and follow the instructions to obtain the computer model.

The AgDRIFT model is composed of submodels called tiers. Tier I Ground submodel would be used to assess ground-based applications of pesticides. Tier outputs (EECs) would be calculated with AgDRIFT using the following input variables: max application rate (acid basis [see above]), low boom (20 inches), fine to medium droplet size, EPA-defined wetland, and a ≥ 25 -foot distance (buffer) from treated area to water.

Use of information on effects of biological control agents, pesticides, degradates, and adjuvants

NEPA documents regarding biological and other environmental effects of biological control agents, pesticides, degradates, and adjuvants prepared by another federal agency, where the scope would be relevant to evaluation of effects from pesticide uses on refuge lands, would be reviewed. Possible source agencies for such NEPA documents would include the Bureau of Land Management, US Forest Service, National Park Service, US Department of Agriculture-Animal and Plant Health Inspection Service, and the military services. It might be appropriate to incorporate by reference parts or all of existing document(s). Incorporating by reference (40 CFR 1502.21) is a technique used to avoid redundancies in analysis. It also would reduce the bulk of a Service NEPA document, which only would identify the documents that are incorporated by reference. In addition, relevant portions would be summarized in the Service NEPA document to the extent necessary to provide the decision maker and public with an understanding of relevance of the referenced material to the current analysis.

In accordance with the requirements set forth in 43 CFR 46.135, the Service would specifically incorporate through reference ecological risk assessments prepared by the US Forest Service (<http://www.fs.fed.us/r6/invasiveplant-eis/Risk-Assessments/Herbicides-Analyzed-InvPlant-EIS.htm>) and Bureau of Land Management (http://www.blm.gov/wo/st/en/prog/more/veg_eis.html). These risk assessments and associated documentation also are available in total with the administrative record for the Final Environmental Impact Statement entitled *Pacific Northwest Region Invasive Plant Program – Preventing and Managing Invasive Plants* (USFS 2005) and *Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic EIS* (PEIS) (BLM 2007). In accordance with 43 CFR 46.120(d), use of existing NEPA documents by supplementing, tiering to, incorporating by reference, or adopting previous NEPA environmental analyses would avoid redundancy and unnecessary paperwork.

As a basis for completing “Chemical Profiles” for approving or disapproving refuge PUPs, ecological risk assessments for the following herbicide and adjuvant uses prepared by the US Forest Service would be incorporated by reference:

- 2,4-D
- Chlorsulfuron
- Clopyralid
- Dicamba
- Glyphosate
- Imazapic
- Imazapyr
- Metsulfuron methyl
- Picloram
- Sethoxydim
- Sulfometuron methyl
- Triclopyr
- Nonylphenol polyethylate (NPE) based surfactants

As a basis for completing “Chemical Profiles” for approving or disapproving refuge PUPs, ecological risk assessments for the following herbicide uses as well as evaluation of risks associated with pesticide degradates and adjuvants prepared by the Bureau of Land Management would be incorporated by reference:

- Bromacil
- Chlorsulfuron
- Diflufenzopyr
- Diquat
- Diuron
- Fluridone
- Imazapic
- Overdrive (diflufenzopyr and dicamba)
- Sulfometuron methyl
- Tebuthiuron
- Pesticide degradates and adjuvants (*Appendix D – Evaluation of risks from degradates, polyoxyethylene-amine (POEA) and R-11, and endocrine disrupting chemicals*)

Assumptions for ecological risk assessments

There are a number of assumptions involved with the ecological risk assessment process for terrestrial and aquatic organisms associated with utilization of the US Environmental Protection Agency’s (2004) process. These assumptions may be risk neutral or may lead to an over- or under-estimation of risk from pesticide exposure depending upon site-specific conditions. The following describes these assumptions, their application to the conditions typically encountered, and whether or not they may lead to recommendations that are risk neutral, underestimate, or overestimate ecological risk from potential pesticide exposure.

- Indirect effects would not be evaluated by ecological risk assessments. These effects include the mechanisms of indirect exposure to pesticides: consuming prey items (fish, birds, or small mammals), reductions in the availability of prey items, and disturbance associated with pesticide application activities.
- Exposure to a pesticide product can be assessed based upon the active ingredient. However, exposure to a chemical mixture (pesticide formulation) may result in effects that are similar or substantially different compared to only the active ingredient. Non-target organisms may be exposed directly to the pesticide formulation or only various constituents of the formulation as they dissipate and partition in the environment. If toxicological information for both the active ingredient and formulated product are available, then data representing the greatest potential toxicity would be selected for use in the risk assessment process (USEPA 2004). As a result, this conservative approach may lead to an overestimation of risk characterization from pesticide exposure.
- Because toxicity tests with listed or candidate species or closely related species are not available, data for surrogate species would be most often used for risk assessments. Specifically, bobwhite quail and mallard duck are the most frequently used surrogates for evaluating potential toxicity to federally listed avian species. Bluegill sunfish, rainbow trout, and fathead minnow are the most common surrogates for evaluating toxicity for freshwater fishes. However, sheep's head minnow can be an appropriate surrogate marine species for coastal environments. Rats and mice are the most common surrogates for evaluating toxicity for mammals. Interspecies sensitivity is a major source of uncertainty in pesticide assessments. As a result of this uncertainty, data are selected for the most sensitive species tested within a taxonomic group (birds, fish, and mammals) given the quality of the data is acceptable. If additional toxicity data for more species of organisms in a particular group are available, the selected data would not be limited to the species previously listed as common surrogates.
- The Kenaga nomogram outputs maximum EEC values that may be used to calculate an average daily concentration over a specified interval of time, which is referred to as a time-weighted-average (TWA). The maximum EEC would be selected as the exposure input for both acute and chronic risk assessments in the screening-level evaluations. The initial or maximum EEC derived from the Kenaga nomogram represents the maximum expected instantaneous or acute exposure to a pesticide. Acute toxicity endpoints are determined using a single exposure to a known pesticide concentration typically for 48 to 96 hours. This value is assumed to represent ecological risk from acute exposure to a pesticide. On the other hand, chronic risk to pesticide exposure is a function of pesticide concentration and duration of exposure to the pesticide. An organism's response to chronic pesticide exposure may result from either the concentration of the pesticide, length of exposure, or some combination of both factors. Standardized tests for chronic toxicity typically involve exposing an organism to several different pesticide concentrations for a specified length of time (days, weeks, months, years or generations). For example, avian reproduction tests include a 10-week exposure phase. Because a single length of time is used in the test, time response data are usually not available for inclusion into risk assessments. Without time response data it is difficult to determine the concentration which elicited a toxicological response.
- Using maximum EECs for chronic risk estimates may result in an overestimate of risk, particularly for compounds that dissipate rapidly. Conversely, using TWAs for chronic risk estimates may underestimate risk if it is the concentration rather than the duration of exposure that is primarily responsible for the observed adverse effect. The maximum EEC would be used for chronic risk assessments although it may result in an overestimate of risk.

TWAs may be used for chronic risk assessments, but they would be applied judiciously considering the potential for an underestimate or overestimate of risk. For example, the number of days exposure exceeds a Level of Concern may influence the suitability of a pesticide use. The greater the number of days the EEC exceeds the Level of Concern translates into greater the ecological risk. This is a qualitative assessment, and is subject to reviewer's expertise in ecological risk assessment and tolerance for risk.

- The length of time used to calculate the TWA can have a substantial effect on the exposure estimates and there is no standard method for determining the appropriate duration for this estimate. The T-REX model assumes a 21-week exposure period, which is equivalent to avian reproductive studies designed to establish a steady-state concentration for bioaccumulative compounds. However, this does not necessarily define the true exposure duration needed to elicit a toxicological response. Pesticides, which do not bioaccumulate, may achieve a steady-state concentration earlier than 21 weeks. The duration of time for calculating TWAs would require justification and it would not exceed the duration of exposure in the chronic toxicity test (approximately 70 days for the standard avian reproduction study). An alternative to using the duration of the chronic toxicity study is to base the TWA on the application interval. In this case, increasing the application interval would suppress both the estimated peak pesticide concentration and the TWA. Another alternative to using TWAs would be to consider the number of days that a chemical is predicted to exceed the LOC.
- Pesticide dissipation is assumed to be first-order in the absence of data suggesting alternative dissipation patterns such as bi-phasic. Field dissipation data would generally be the most pertinent for assessing exposure in terrestrial species that forage on vegetation. However, these data are often not available and it can be misleading particularly if the compound is prone to "wash-off." Soil half-life is the most common degradation data available. Dissipation or degradation data that would reflect the environmental conditions typical of refuge lands would be utilized, if available.
- For species found in the water column, it would be assumed that the greatest bioavailable fraction of the pesticide active ingredient in surface waters is freely dissolved in the water column.
- Actual habitat requirements of any particular terrestrial species are not considered, and it is assumed that species exclusively and permanently occupy the treated area, or adjacent areas receiving pesticide at rates commensurate with the treatment rate. This assumption would produce a maximum estimate of exposure for risk characterization. This assumption would likely lead to an overestimation of exposure for species that do not permanently and exclusively occupy the treated area (USEPA 2004).
- Exposure through incidental ingestion of pesticide contaminated soil is not considered in the USEPA risk assessment protocols. Research suggests <15% of the diet can consist of incidentally ingested soil depending upon species and feeding strategy (Beyer et al. 1994). An assessment of pesticide concentrations in soil compared to food item categories in the Kenaga nomogram indicates incidental soil ingestion would not likely increase dietary exposure to pesticides. Inclusion of soil into the diet would effectively reduce the overall dietary concentration compared to the present assumption that the entire diet consists of a contaminated food source (Fletcher et al. 1994). An exception to this may be soil-applied pesticides in which exposure from incidental ingestion of soil may increase. Potential for pesticide exposure under this assumption may be underestimated for soil-applied pesticides and overestimated for foliar-applied pesticides. The concentration of a pesticide in soil would likely be less than predicted on food items.

- Exposure through inhalation of pesticides is not considered in the USEPA risk assessment protocols. Such exposure may occur through three potential sources: spray material in droplet form at time of application, vapor phase with the pesticide volatilizing from treated surfaces, and airborne particulates (soil, vegetative matter, and pesticide dusts). The USEPA (1990) reported exposure from inhaling spray droplets at the time of application is not an appreciable route of exposure for birds. According to research on mallards and bobwhite quail, respirable particle size (particles reaching the lung) in birds is limited to maximum diameter of 2 to 5 microns. The spray droplet spectra covering the majority of pesticide application scenarios indicate that less than 1% of the applied material is within the respirable particle size. This route of exposure is further limited because the permissible spray drop size distribution for ground pesticide applications is restricted to ASAE medium or coarser drop size distribution.
- Inhalation of a pesticide in the vapor phase may be another source of exposure for some pesticides under certain conditions. This mechanism of exposure to pesticides occurs post application, and it would pertain to those pesticides with a high vapor pressure. The USEPA is currently evaluating protocols for modeling inhalation exposure from pesticides including near-field and near-ground air concentrations based upon equilibrium and kinetics-based models. Risk characterization for exposure with this mechanism is unavailable.
- The effect from exposure to dusts contaminated with the pesticide cannot be assessed generically as partitioning issues related to application site soils and chemical properties of the applied pesticides render the exposure potential from this route highly situation specific.
- Dermal exposure may occur through three potential sources: direct application of spray to terrestrial wildlife in the treated area or within the drift footprint, incidental contact with contaminated vegetation, or contact with contaminated water or soil. Interception of spray and incidental contact with treated substrates may pose risk to avian wildlife (Driver et al. 1991). However, available research related to wildlife dermal contact with pesticides is extremely limited, except dermal toxicity values are common for some mammals used as human surrogates (rats and mice). The USEPA is currently evaluating protocols for modeling dermal exposure. Risk characterization may be underestimated for this route of exposure, particularly with high risk pesticides such as some organophosphates or carbamate insecticides. If protocols are established by the USEPA for assessing dermal exposure to pesticides, they would be considered for incorporation into pesticide assessment protocols.
- Exposure to a pesticide may occur from consuming surface water, dew or other water on treated surfaces. Water soluble pesticides have the potential to dissolve in surface runoff and puddles in a treated area may contain pesticide residues. Similarly, pesticides with lower organic carbon partitioning characteristics and higher solubility in water have a greater potential to dissolve in dew and other water associated with plant surfaces. Estimating the extent to which such pesticide loadings to drinking water occurs is complex and would depend upon the partitioning characteristics of the active ingredient, soils types in the treatment area, and the meteorology of the treatment area. In addition, the use of various water sources by wildlife is highly species-specific. Currently, risk characterization for this exposure mechanism is not available. The USEPA is actively developing protocols to quantify drinking water exposures from puddles and dew. If and when protocols are formally established by the USEPA for assessing exposure to pesticides through drinking water, these protocols would be incorporated into pesticide risk assessment protocols.
- Risk assessments are based upon the assumption that the entire treatment area would be subject to pesticide application at the rates specified on the label. In most cases, there is potential for uneven application of pesticides through such plausible incidents such as changes in calibration of application equipment, spillage, and localized releases at specific

areas in or near the treated field that are associated with mixing and handling and application equipment as well as applicator skill. Inappropriate use of pesticides and the occurrence of spills represent a potential underestimate of risk. It is likely not an important factor for risk characterization. All pesticide applicators are required to be certified by the state in which they apply pesticides. Certification training includes the safe storage, transport, handling, and mixing of pesticides; equipment calibration; and proper application with annual continuing education.

- The USEPA relies on Fletcher (1994) for setting the assumed pesticide residues in wildlife dietary items. The USEPA (2004) “believes that these residue assumptions reflect a realistic upper-bound residue estimate, although the degree to which this assumption reflects a specific percentile estimate is difficult to quantify.” Fletcher’s (1994) research suggests that the pesticide active ingredient residue assumptions used by the USEPA represent a 95th percentile estimate. However, research conducted by Pfleeger et al. (1996) indicates USEPA residue assumptions for short grass was not exceeded. Baehr and Habig (2000) compared USEPA residue assumptions with distributions of measured pesticide residues for the USEPA’s UTAB database. Overall residue selection level will tend to overestimate risk characterization. This is particularly evident when wildlife individuals are likely to have selected a variety of food items acquired from multiple locations. Some food items may be contaminated with pesticide residues whereas others are not contaminated. However, it is important to recognize differences in species feeding behavior. Some species may consume whole above-ground plant material, but others will preferentially select different plant structures. Also, species may preferentially select a food item although multiple food items may be present. Without species specific knowledge regarding foraging behavior characterizing ecological risk other than in general terms is not possible.
- Acute and chronic risk assessments rely on comparisons of wildlife dietary residues with LC₅₀ or NOEC values expressed as concentrations of pesticides in laboratory feed. These comparisons assume that ingestion of food items in the field occurs at rates commensurate with those in the laboratory. Although the screening assessment process adjusts dry-weight estimates of food intake to reflect the increased mass in fresh-weight wildlife food intake estimates, it does not allow for gross energy and assimilative efficiency differences between wildlife food items and laboratory feed. Differences in assimilative efficiency between laboratory and wild diets suggest that current screening assessment methods are not accounting for a potentially important aspect of food requirements.
- There are several other assumptions that can affect non-target species not considered in the risk assessment process. These include possible additive or synergistic effects from applying two or more pesticides or additives in a single application, co-location of pesticides in the environment, cumulative effects from pesticides with the same mode of action, effects of multiple stressors (e.g., combination of pesticide exposure, adverse abiotic and biotic factors) and behavioral changes induced by exposure to a pesticide. These factors may exist at some level contributing to adverse effects to non-target species, but they are usually characterized in the published literature in only a general manner limiting their value in the risk assessment process.
- It is assumed that aquatic species exclusively and permanently occupy the water body being assessed. Actual habitat requirements of aquatic species are not considered. With the possible exception of scenarios where pesticides are directly applied to water, it is assumed that no habitat use considerations specific for any species would place the organisms in closer proximity to pesticide use sites. This assumption produces a maximum estimate of exposure or risk characterization. It would likely be realistic for many aquatic species that may be

found in aquatic habitats within or in close proximity to treated terrestrial habitats. However, the spatial distribution of wildlife is usually not random because wildlife distributions are often related to habitat requirements of species. Clumped distributions of wildlife may result in an under- or over-estimation of risk depending upon where the initial pesticide concentration occurs relative to the species or species habitat.

- For species found in the water column, it would be assumed that the greatest bioavailable fraction of the pesticide active ingredient in surface waters is freely dissolved in the water column. Additional chemical exposure from materials associated with suspended solids or food items is not considered because partitioning onto sediments likely is minimal. Adsorption and bioconcentration occurs at lower levels for many newer pesticides compared with older more persistent bioaccumulative compounds. Pesticides with RQs close to the listed species level of concern, the potential for additional exposure from these routes may be a limitation of risk assessments, where potential pesticide exposure or risk may be underestimated.
- Mass transport losses of pesticide from a water body (except for losses by volatilization, degradation and sediment partitioning) would not be considered for ecological risk assessment. The water body would be assumed to capture all pesticide active ingredients entering as runoff, drift, and adsorbed to eroded soil particles. It would also be assumed that pesticide active ingredient is not lost from the water body by overtopping or flow-through, nor is concentration reduced by dilution. In total, these assumptions would lead to a near maximum possible water-borne concentration. However, this assumption would not account for the potential to concentrate pesticide through the evaporative loss. This limitation may have the greatest impact on water bodies with high surface-to-volume ratios such as ephemeral wetlands, where evaporative losses are accentuated and applied pesticides have low rates of degradation and volatilization.
- For acute risk assessments, there would be no averaging time for exposure. An instantaneous peak concentration would be assumed, where instantaneous exposure is sufficient in duration to elicit acute effects comparable to those observed over more protracted exposure periods (typically 48 to 96 hours) tested in the laboratory. In the absence of data regarding time-to-toxic event, analyses and latent responses to instantaneous exposure, risk would likely be overestimated.
- For chronic exposure risk assessments, the averaging times considered for exposure are commensurate with the duration of invertebrate life-cycle or fish-early life stage tests (e.g., 21-28 days and 56-60 days, respectively). Response profiles (time to effect and latency of effect) to pesticides likely vary widely with mode of action and species and should be evaluated on a case-by-case basis as available data allow. Nevertheless, because the USEPA relies on chronic exposure toxicity endpoints based on a finding of no observed effect, the potential for any latent toxicity effects or averaging time assumptions to alter the results of an acceptable chronic risk assessment prediction is limited. The extent to which duration of exposure from water-borne concentrations overestimate or underestimate actual exposure depends on several factors. These include the following: localized meteorological conditions, runoff characteristics of the watershed (e.g., soils, topography), the hydrological characteristics of receiving waters, environmental fate of the pesticide active ingredient, and the method of pesticide application. It should also be understood that chronic effects studies are performed using a method that holds water concentration in a steady state. This method is not likely to reflect conditions associated with pesticide runoff. Pesticide concentrations in the field increase and decrease in surface water on a cycle influenced by rainfall, pesticide use patterns, and degradation rates. As a result of the dependency of this assumption on

several undefined variables, risk associated with chronic exposure may in some situations underestimate risk and overestimate risk in others.

- There are several other factors that can affect non-target species not considered in the risk assessment process. These would include the following: possible additive or synergistic effects from applying two or more pesticides or additives in a single application, co-location of pesticides in the environment, cumulative effects from pesticides with the same mode of action, effects of multiple stressors (e.g., combination of pesticide exposure, adverse abiotic [not pesticides] and biotic factors), and sub-lethal effects such as behavioral changes induced by exposure to a pesticide. These factors may exist at some level contributing to adverse effects to non-target species, but they are not routinely assessed by regulatory agencies. Therefore, information on the factors is not extensive limiting their value for the risk assessment process. As this type of information becomes available, it would be included, either quantitatively or qualitatively, in this risk assessment process.
- USEPA is required by the Food Quality Protection Act to assess the cumulative risks of pesticides that share common mechanisms of toxicity, or act the same within an organism. Currently, USEPA has identified four groups of pesticides that have a common mechanism of toxicity requiring cumulative risk assessments. These four groups are: the organophosphate insecticides, N-methyl carbamate insecticides, triazine herbicides, and chloroacetanilide herbicides.

G.7.3 Pesticide Mixtures and Degradates

Pesticide products are usually a formulation of several components generally categorized as active ingredients and inert or other ingredients. The term active ingredient is defined by the FIFRA as preventing, destroying, repelling, or mitigating the effects of a pest, or it is a plant regulator, defoliant, desiccant, or nitrogen stabilizer. In accordance with FIFRA, the active ingredient(s) must be identified by name(s) on the pesticide label along with its relative composition expressed in percentage(s) by weight. In contrast, inert ingredient(s) are not intended to affect a target pest. Their role in the pesticide formulation is to act as a solvent (keep the active ingredient in a liquid phase), an emulsifying or suspending agent (keep the active ingredient from separating out of solution), or a carrier (such as clay in which the active ingredient is impregnated on the clay particle in dry formulations). For example, if isopropyl alcohol would be used as a solvent in a pesticide formulation, then it would be considered an inert ingredient. FIFRA only requires that inert ingredients identified as hazardous and associated percent composition, and the total percentage of all inert ingredients must be declared on a product label. Inert ingredients that are not classified as hazardous are not required to be identified.

The USEPA (September 1997) issued Pesticide Regulation Notice 97-6, which encouraged manufacturers, formulators, producers, and registrants of pesticide products to voluntarily substitute the term “other ingredients” for “inert ingredients” in the ingredient statement. This change recognized that all components in a pesticide formulation potentially could elicit or contribute to an adverse effect on non-target organisms and, therefore, are not necessarily inert. Whether referred to as “inerts” or “other ingredients,” these constituents within a pesticide product have the potential to affect species or environmental quality. The USEPA categorizes regulated inert ingredients into the following four lists (<http://www.epa.gov/opprd001/inerts/index.html>):

- List 1 – Inert Ingredients of Toxicological Concern
- List 2 – Potentially Toxic Inert Ingredients

- List 3 – Inerts of Unknown Toxicity
- List 4 – Inerts of Minimal Toxicity

Several of the List 4 compounds are naturally-occurring earthen materials (e.g., clay materials, simple salts) that would not elicit toxicological response at applied concentrations. However, some of the inerts (particularly the List 3 compounds and unlisted compounds) may have moderate to high potential toxicity to aquatic species based on MSDSs or published data.

Comprehensively assessing potential effects to non-target fish, wildlife, plants, and/or their habitats from pesticide use is a complex task. It would be preferable to assess the cumulative effects from exposure to the active ingredient, its degradates, and inert ingredients as well as other active ingredients in the spray mixture. However, it would only be feasible to conduct deterministic risk assessments for each component in the spray mixture singly. Limited scientific information is available regarding ecological effects (additive or synergistic) from chemical mixtures that typically rely upon broadly encompassing assumptions. For example, the US Forest Service (2005) found that mixtures of pesticides used in land (forest) management likely would not cause additive or synergistic effects to non-target species based upon a review of scientific literature regarding toxicological effects and interactions of agricultural chemicals (ATSDR 2004). Moreover, information on inert ingredients, adjuvants, and degradates is often limited by the availability of and access to reliable toxicological data for these constituents.

Toxicological information regarding “other ingredients” may be available from sources such as the following:

- TOMES (a proprietary toxicological database including USEPA’s IRIS, the Hazardous Substance Data Bank, the Registry of Toxic Effects of Chemical Substances [RTECS])
- USEPA’s ECOTOX database, which includes AQUIRE (a database containing scientific papers published on the toxic effects of chemicals to aquatic organisms)
- TOXLINE (a literature searching tool)
- Material Safety Data Sheets (MSDSs) from pesticide suppliers
- Other sources such as the Farm Chemicals Handbook

Because there is a lack of specific inert toxicological data, inert(s) in a pesticide may cause adverse ecological effects. However, inert ingredients typically represent only a small percentage of the pesticide spray mixture, and it would be assumed that negligible effects would be expected to result from inert ingredient(s).

Although the potential effects of degradates should be considered when selecting a pesticide, it is beyond the scope of this assessment process to consider all possible breakdown chemicals of the various product formulations containing an active ingredient. Degradates may be more or less mobile and more or less hazardous in the environment than their parent pesticides (Battaglin et al. 2003). Differences in environmental behavior (e.g., mobility) and toxicity between parent pesticides and degradates would make assessing potential degrade effects extremely difficult. For example, a less toxic and more mobile, bioaccumulative, or persistent degrade may have potentially greater effects on species and/or degrade environmental quality. The lack of data on the toxicity of degradates for many pesticides would represent a source of uncertainty for assessing risk.

A USEPA-approved label specifies whether a product can be mixed with one or more pesticides. Without product-specific toxicological data, it would not possible to quantify the potential effects of

these mixtures. In addition, a quantitative analysis could only be conducted if reliable scientific information allowed a determination of whether the joint action of a mixture would be additive, synergistic, or antagonistic. Such information would not likely exist unless the mode of action would be common among the chemicals and receptors. Moreover, the composition of and exposure to mixtures would be highly site- and/or time-specific and, therefore, it would be nearly impossible to assess potential effects to species and environmental quality.

To minimize or eliminate potential negative effects associated with applying two or more pesticides as a mixture, the use would be conducted in accordance with the labeling requirements. Labels for two or more pesticides applied as a mixture should be completely reviewed, where products with the least potential for negative effects would be selected for use on the Refuge. This is especially relevant when a mixture would be applied in a manner that may already have the potential for an effect(s) associated with an individual pesticide (e.g., runoff to ponds in sandy watersheds). Use of a tank mix under these conditions would increase the level of uncertainty in terms of risk to species or potential to degrade environmental quality.

Adjuvants generally function to enhance or prolong the activity of pesticide. For terrestrial herbicides, adjuvants aid in the absorption into plant tissue. Adjuvant is a broad term that generally applies to surfactants, selected oils, anti-foaming agents, buffering compounds, drift control agents, compatibility agents, stickers, and spreaders. Adjuvants are not under the same registration requirements as pesticides and the USEPA does not register or approve the labeling of spray adjuvants. Individual pesticide labels identify types of adjuvants approved for use with it. In general, adjuvants compose a relatively small portion of the volume of pesticides applied. Selection of adjuvants with limited toxicity and low volumes would be recommended to reduce the potential for the adjuvant to influence the toxicity of the pesticide.

G.7.4 Determining Effects to Soil and Water Quality

The approval process for pesticide uses would consider potential to degrade water quality on and off refuge lands. A pesticide can only affect water quality through movement away from the treatment site. After application, pesticide mobilization can be characterized by one or more of the following (Kerle et al. 1996):

- Attach (sorb) to soil, vegetation, or other surfaces and remain at or near the treated area
- Attach to soil and move off-site through erosion from runoff or wind
- Dissolve in water that can be subjected to runoff or leaching

As an initial screening tool, selected chemical characteristics and rating criteria for a pesticide can be evaluated to assess potential to enter ground and/or surface waters. These would include the following: persistence, sorption coefficient (K_{oc}), groundwater ubiquity score (GUS), and solubility.

Persistence, which is expressed as half-life ($t_{1/2}$), represents the length of time required for 50% of the deposited pesticide to degrade (completely or partially). Persistence in the soil can be categorized as the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days (Kerle et al. 1996). Half-life data are usually available for aquatic and terrestrial environments

Another measure of pesticide persistence is dissipation time (DT_{50}). It represents the time required for 50% of the deposited pesticide to degrade and move from a treated site; whereas, half-life describes the rate for degradation only. As for half-life, units of dissipation time are usually

expressed in days. Field or foliar dissipation time is the preferred data for use to estimate pesticide concentrations in the environment. However, soil half-life is the most common persistence data cited in published literature. If field or foliar dissipation data are not available, soil half-life data may be used. The average or representative half-life value of most important degradation mechanism would be selected for quantitative analysis for both terrestrial and aquatic environments.

Mobility of a pesticide is a function of how strongly it is adsorbed to soil particles and organic matter, its solubility in water, and its persistence in the environment. Pesticides strongly adsorbed to soil particles, relatively insoluble in water, and not environmentally persistent would be less likely to move across the soil surface into surface waters or to leach through the soil profile and contaminate groundwater. Conversely, pesticides that are not strongly adsorbed to soil particles, are highly water soluble, and are persistent in the environment would have greater potential to move from the application site (off-site movement).

The degree of pesticide adsorption to soil particles and organic matter (Kerle et al. 1996) is expressed as the soil adsorption coefficient (K_{oc}). The soil adsorption coefficient is measured as micrograms of pesticide per gram of soil ($\mu\text{g/g}$) that can range from near zero to the thousands. Pesticides with higher K_{oc} values are strongly sorbed to soil and, therefore, would be less subject to movement.

Water solubility describes the amount of pesticide that will dissolve in a known quantity of water. The water solubility of a pesticide is expressed as milligrams of pesticide dissolved in a liter of water (mg/L or parts per million [ppm]). Pesticide with solubility <0.1 ppm are virtually insoluble in water, 100-1,000 ppm are moderately soluble, and $>10,000$ ppm highly soluble (USGS 2000). As pesticide solubility increases, there would be greater potential for off-site movement.

The Groundwater Ubiquity Score (GUS) is a quantitative screening tool to estimate a pesticide's potential to move in the environment. It utilizes soil persistence and adsorption coefficients in the following formula.

$$GUS = \log_{10}(t_{1/2}) \times [4 - \log_{10}(K_{oc})]$$

The potential pesticide movement rating would be based upon its GUS value. Pesticides with a GUS <0.1 would be considered to have an extremely low potential to move toward groundwater. Values of 1.0-2.0 would be low, 2.0-3.0 would be moderate, 3.0-4.0 would be high, and >4.0 would have a very high potential to move toward groundwater.

Water solubility describes the amount of pesticide dissolving in a specific quantity of water, where it is usually measured as mg/L or ppm. Solubility is useful as a comparative measure because pesticides with higher values are more likely to move by runoff or leaching. GUS, water solubility, $t_{1/2}$, and K_{oc} values are available for selected pesticides from the OSU Extension Pesticide Properties Database at <http://npic.orst.edu/ppdmove.htm>. Many of the values in this database were derived from the SCS/ARS/CES Pesticide Properties Database for Environmental Decision Making (Wauchope et al. 1992).

Soil properties influence the fate of pesticides in the environment. The following six properties are mostly likely to affect pesticide degradation and the potential for pesticides to move off-site by leaching (vertical movement through the soil) or runoff (lateral movement across the soil surface):

- Permeability is the rate of water movement vertically through the soil. It is affected by soil texture and structure. Coarse textured soils (e.g., high sand content) have a larger pore size and they are generally more permeable than fine textured soils (i.e., high clay content). The more permeable soils would have a greater potential for pesticides to move vertically down through the soil profile. Soil permeability rates (inches/hour) are usually available in county soil survey reports.
- Soil texture describes the relative percentage of sand, silt, and clay. In general, greater clay content with smaller the pore size would lower the likelihood and rate water that would move through the soil profile. Clay also serves to adsorb (bind) pesticides to soil particles. Soils with high clay content would adsorb more pesticide than soils with relatively low clay content. In contrast, sandy soils with coarser texture and lower water holding capacity would have a greater potential for water to leach through them.
- Soil structure describes soil aggregation. Soils with a well-developed soil structure have looser, more aggregated, structure that would be less likely to be compacted. Both characteristics would allow for less restricted flow of water through the soil profile resulting in greater infiltration.
- Organic matter would be the single most important factor affecting pesticide adsorption in soils. Many pesticides are adsorbed to organic matter which would reduce their rate of downward movement through the soil profile. Also, soils high in organic matter would tend to hold more water, which may make less water available for leaching.
- Soil moisture affects how fast water would move through the soil. If soils are already wet or saturated before rainfall or irrigation, excess moisture would run off rather than infiltrate into the soil profile. Soil moisture also would influence microbial and chemical activity in soil, which effects pesticide degradation.
- Soil pH would influence chemical reactions that occur in the soil which in turn determines whether or not a pesticide will degrade, rate of degradation, and, in some instances, which degradation products are produced.

Based upon the aforementioned properties, soils most vulnerable to groundwater contamination would be sandy soils with low organic matter. In contrast, the least vulnerable soils would be well-drained clayey soils with high organic matter. Consequently, pesticides with the lowest potential for movement in conjunction with appropriate best management practices (see below) would be used in an IPM framework to treat pests while minimizing effects to non-target biota and protecting environmental quality.

Along with soil properties, the potential for a pesticide to affect water quality through runoff and leaching would consider site-specific environmental and abiotic conditions including rainfall, water table conditions, and topography (Huddleston 1996).

- Water is necessary to separate pesticides from soil. This can occur in two basic ways. Pesticides that are soluble move easily with runoff water. Pesticide-laden soil particles can be dislodged and transported from the application site in runoff. The concentration of pesticides in the surface runoff would be greatest for the first runoff event following treatment. The rainfall intensity and route of water infiltration into soil, to a large extent, determine pesticide concentrations and losses in surface runoff. The timing of the rainfall after application also would have an effect. Rainfall interacts with pesticides at a shallow soil depth ($\frac{1}{4}$ to $\frac{1}{2}$ inch), which is called the mixing zone (Baker and Miller 1999). The pesticide/water mixture in the mixing zone would tend to leach down into the soil or runoff depending upon how quickly

the soil surface becomes saturated and how rapidly water can infiltrate into the soil. Leaching would decrease the amount of pesticide available near the soil surface (mixing zone) to runoff during the initial rainfall event following application and subsequent rainfall events.

- Terrain slope would affect the potential for surface runoff and the intensity of runoff. Steeper slopes would have greater potential for runoff following a rainfall event. In contrast, soils that are relatively flat would have little potential for runoff, except during intense rainfall events. In addition, soils in lower areas would be more susceptible to leaching as a result of receiving excessive water from surrounding higher elevations.
- Depth to groundwater would be an important factor affecting the potential for pesticides to leach into groundwater. If the distance from the soil surface to the top of the water table is shallow, pesticides would have less distance to travel to reach groundwater. Shallower water tables that persist for longer periods would be more likely to experience groundwater contamination. Soil survey reports are available for individual counties. These reports provide data in tabular format regarding the water table depths and the months during which it is persists. In some situations, a hard pan exists above the water table that would prevent pesticide contamination from leaching.

G.7.5 Determining Effects to Air Quality

Pesticides may volatilize from soil and plant surfaces and move from the treated area into the atmosphere. The potential for a pesticide to volatilize is determined by the pesticide's vapor pressure which would be affected by temperature, sorption, soil moisture, and the pesticide's water solubility. Vapor pressure is often expressed in mm Hg. To make these numbers easier to compare, vapor pressure may be expressed in exponent form ($I \times 10^{-7}$), where I represents a vapor pressure index. In general, pesticides with $I < 10$ would have a low potential to volatilize; whereas, pesticides with $I > 1,000$ would have a high potential to volatilize (OSU 1996). Vapor pressure values for pesticides are usually available in the pesticide product MSDS or the USDA Agricultural Research Service (ARS) pesticide database.

G.7.6 Preparing a Chemical Profile

The following instructions would be used by Service personnel to complete Chemical Profiles for pesticides. Specifically, profiles would be prepared for pesticide active ingredients (e.g., glyphosate, imazapic) that would be contained in one or more trade name products that are registered and labeled with USEPA. All information fields under each category (e.g., Toxicological Endpoints, Environmental Fate) would be completed for a Chemical Profile. If no information is available for a specific field, then "No data are available in references" would be recorded in the profile. Available scientific information would be used to complete Chemical Profiles. Each entry of scientific information would be shown with applicable references.

Completed Chemical Profiles would provide a structured decision-making process utilizing quantitative assessment/screening tools with threshold values (where appropriate) that would be used to evaluate potential biological and other environmental effects to refuge resources. For ecological risk assessments presented in these profiles, the "worst-case scenario" would be evaluated to determine whether a pesticide could be approved for use considering the maximum single application rate specified on pesticide labels for habitat management and croplands/facilities maintenance treatments pertaining to refuges. Where the "worst-case scenario" likely would only result in minor, temporary, and localized effects to listed and non-listed species with appropriate BMPs (see Section

5.0), the proposed pesticide's use in a PUP would have a scientific basis for approval under any application rate specified on the label that is at or below rates evaluated in a Chemical Profile. In some cases, the Chemical Profile would include a lower application rate than the maximum labeled rate in order to protect refuge resources. As necessary, Chemical Profiles would be periodically updated with new scientific information or as pesticides with the same active ingredient are proposed for use on the Refuge in PUPs.

Throughout this section, threshold values (to prevent or minimize potential biological and environmental effects) would be clearly identified for specific information presented in a completed Chemical Profile. Comparison with these threshold values provides an explicit scientific basis to approve or disapprove PUPs for habitat management and cropland/facilities maintenance on refuge lands. In general, PUPs would be approved for pesticides with Chemical Profiles where there would be no exceedances of threshold values. However, BMPs are identified for some screening tools that would minimize/eliminate potential effects (exceedance of the threshold value) as a basis for approving PUPs.

Date: Service personnel would record the date when the Chemical Profile is completed or updated. Chemical Profiles (e.g., currently approved pesticide use patterns) would be periodically reviewed and updated, as necessary. The most recent review date would be recorded on a profile to document when it was last updated.

Trade Name(s): Service personnel would accurately and completely record the trade name(s) from the pesticide label, which includes a suffix that describes the formulation (e.g., WP, DG, EC, L, SP, I, II or 64). The suffix often distinguishes a specific product among several pesticides with the same active ingredient. Service personnel would record a trade name for each pesticide product with the same active ingredient.

Common chemical name(s): Service personnel would record the common name(s) listed on the pesticide label or material safety data sheet (MSDS) for an active ingredient. The common name of a pesticide is listed as the active ingredient on the title page of the product label immediately following the trade name, and the MSDS, Section 2: Composition/ Information on Ingredients. A Chemical Profile is completed for each active ingredient.

Pesticide Type: Service personnel would record the type of pesticide for an active ingredient as one of the following: herbicide, desiccant, fungicide, fumigant, growth regulator, insecticide, piscicide, or rodenticide.

EPA Registration Number(s): This number (EPA Reg. No.) appears on the title page of the label and MSDS, Section 1: Chemical Product and Company Description. It is not the EPA Establishment Number that is usually located near it. Service personnel would record the EPA Reg. No. for each trade name product with an active ingredient based upon PUPs.

Pesticide Class: Service personnel would list the general chemical class for the pesticide (active ingredient). For example, malathion is an organophosphate and carbaryl is a carbamate.

CAS (Chemical Abstract Service) Number: This number is often located in the second section (Composition/Information on Ingredients) of the MSDS. The MSDS table listing components usually contains this number immediately prior to or following the % composition.

Other Ingredients: From the most recent MSDS for the proposed pesticide product(s), Service personnel would include any chemicals in the pesticide formulation not listed as an active ingredient that are described as toxic or hazardous, or regulated under the Superfund Amendments and Reauthorization Act (SARA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Toxic Substances Control Act (TSCA), Occupational Safety and Health Administration (OSHA), State Right-to-Know, or other listed authorities. These are usually found in MSDS sections titled “Hazardous Identifications,” “Exposure Control/Personal Protection,” and “Regulatory Information.” If concentrations of other ingredients are available for any compounds identified as toxic or hazardous, then Service personnel would record this information in the Chemical Profile by trade name. MSDS(s) may be obtained from the manufacturer, manufacturer’s website or from an on-line database maintained by Crop Data Management Systems, Inc. (see list below).

G.7.7 Toxicological Endpoints

Toxicological endpoint data would be collected for acute and chronic tests with mammals, birds, and fish. Data would be recorded for species available in the scientific literature. If no data are found for a particular taxonomic group, then “No data are available in references” would be recorded as the data entry. Throughout the Chemical Profile, references (including toxicological endpoint data) would be cited using parentheses (#) following the recorded data.

Mammalian LD₅₀: For test species in the scientific literature, Service personnel would record available data for oral lethal dose (LD₅₀) in mg/kg-bw (body weight) or ppm-bw. Most common test species in scientific literature are the rat and mouse. The lowest LD₅₀ value found for a rat would be used as a toxicological endpoint for dose-based RQ calculations to assess acute risk to mammals (see Table 1 in Section 7.1).

Mammalian LC₅₀: For test species in the scientific literature, Service personnel would record available data for dietary lethal concentration (LC₅₀) as reported (e.g., mg/kg-diet or ppm-diet). Most common test species in scientific literature are the rat and mouse. The lowest LC₅₀ value found for a rat would be used as a toxicological endpoint for diet-based RQ calculations to assess acute risk (see Table G-1 in Section 7.1).

Mammalian Reproduction: For test species listed in the scientific literature, Service personnel would record the test results (e.g., Lowest Observed Effect Concentration [LOEC], Lowest Observed Effect Level [LOEL], No Observed Adverse Effect Level [NOAEL], No Observed Adverse Effect Concentration [NOAEC]) in mg/kg-bw or mg/kg-diet for reproductive test procedure(s) (e.g., generational studies [preferred], fertility, new born weight). Most common test species available in scientific literature are rats and mice. The lowest NOEC, NOAEC, NOEL, or NOAEL test results found for a rat would be used as a toxicological endpoint for RQ calculations to assess chronic risk (see Table G-1 in Section 7.1).

Avian LD₅₀: For test species available in the scientific literature, Service personnel would record values for oral lethal dose (LD₅₀) in mg/kg-bw or ppm-bw. Most common test species available in scientific literature are the bobwhite quail and mallard. The lowest LD₅₀ value found for an avian species would be used as a toxicological endpoint for dose-based RQ calculations to assess acute risk (see Table G-1 in Section 7.1).

Avian LC₅₀: For test species available in the scientific literature, Service personnel would record values for dietary lethal concentration (LC₅₀) as reported (e.g., mg/kg-diet or ppm-diet). Most common test species available in scientific literature are the bobwhite quail and mallard. The lowest LC₅₀ value found for an avian species would be used as a toxicological endpoint for dietary-based RQ calculations to assess acute risk (see Table G-1 in Section 7.1).

Avian Reproduction: For test species available in the scientific literature, Service personnel would record test results (e.g., LOEC, LOEL, NOAEC, NOAEL) in mg/kg-bw or mg/kg-diet consumed for reproductive test procedure(s) (e.g., early life cycle, reproductive). Most common test species available in scientific literature are the bobwhite quail and mallard. The lowest NOEC, NOAEC, NOEL, or NOAEL test results found for an avian species would be used as a toxicological endpoint for RQ calculations to assess chronic risk (see Table G-1 in Section 7.1).

Fish LC₅₀: For test freshwater or marine species listed in the scientific literature, Service personnel would record a LC₅₀ in ppm or mg/L. Most common test species available in the scientific literature are the bluegill, rainbow trout, and fathead minnow (marine). Test results for many game species may also be available. The lowest LC₅₀ value found for a freshwater fish species would be used as a toxicological endpoint for RQ calculations to assess acute risk (see Table G-1 in Section 7.1).

Fish Early Life Stage (ELS)/Life Cycle: For test freshwater or marine species available in the scientific literature, Service personnel would record test results (e.g., LOEC, NOAEL, NOAEC, LOAEC) in ppm for test procedure(s) (e.g., early life cycle, life cycle). Most common test species available in the scientific literature are bluegill, rainbow trout, and fathead minnow. Test results for other game species may also be available. The lowest test value found for a fish species (preferably freshwater) would be used as a toxicological endpoint for RQ calculations to assess chronic risk (see Table G-1 in Section 7.1).

Other: For test invertebrate as well as non-vascular and vascular plant species available in the scientific literature, Service personnel would record LC₅₀, LD₅₀, LOEC, LOEL, NOAEC, NOAEL, or EC₅₀ (environmental concentration) values in ppm or mg/L. Most common test invertebrate species available in scientific literature are the honey bee and the water flea (*Daphnia magna*). Green algae (*Selenastrum capricornutum*) and pondweed (*Lemna minor*) are frequently available test species for aquatic non-vascular and vascular plants, respectively.

G.7.8 Ecological Incident Reports

After a site has been treated with pesticide(s), wildlife may be exposed to these chemical(s). When exposure is high relative to the toxicity of the pesticides, wildlife may be killed or visibly harmed (incapacitated). Such events are called ecological incidents. The USEPA maintains a database (Ecological Incident Information System) of ecological incidents. This database stores information extracted from incident reports submitted by various federal and state agencies and non-government organizations. Information included in an incident report is date and location of the incident, type and magnitude of effects observed in various species, use(s) of pesticides known or suspected of contributing to the incident, and results of any chemical residue and cholinesterase activity analyses conducted during the investigation.

Incident reports can play an important role in evaluating the effects of pesticides by supplementing quantitative risk assessments. All incident reports for pesticide(s) with the active ingredient and associated information would be recorded.

G.7.9 Environmental Fate

Water Solubility: Service personnel would record values for water solubility (S_w), which describes the amount of pesticide that dissolves in a known quantity of water. S_w is expressed as mg/L (ppm). Pesticide S_w values would be categorized as one of the following: insoluble <0.1 ppm, moderately soluble = 100 to 1,000 ppm, highly soluble >10,000 ppm (USGS 2000). As pesticide S_w increases, there would be greater potential to degrade water quality through runoff and leaching.

S_w would be used to evaluate potential for bioaccumulation in aquatic species [see **Octanol-Water Partition Coefficient (K_{ow})** below].

Soil Mobility: Service personnel would record available values for soil adsorption coefficient (K_{oc} [$\mu\text{g/g}$]). It provides a measure of a chemical's mobility and leaching potential in soil. K_{oc} values are directly proportional to organic content, clay content, and surface area of the soil. K_{oc} data for a pesticide may be available for a variety of soil types (e.g., clay, loam, sand).

K_{oc} values would be used in evaluating the potential to degrade groundwater by leaching (see **Potential to Move to Groundwater** below).

Soil Persistence: Service personnel would record values for soil half-life ($t_{1/2}$), which represents the length of time (days) required for 50% of the deposited pesticide to degrade (completely or partially) in the soil. Based upon the $t_{1/2}$ value, soil persistence would be categorized as one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days (Kerle et al. 1996).

Threshold for Approving PUPs:

If soil $t_{1/2} \leq 100$ days, then a PUP would be approved without additional BMPs to protect water quality.

*If soil $t_{1/2} > 100$ days, then a PUP would only be approved with additional BMPs specifically to protect water quality. One or more BMPs such as the following would be included in the **Specific Best Management Practices (BMPs)** section to minimize potential surface runoff and leaching that can degrade water quality:*

- *Do not exceed one application per site per year.*
- *Do not use on coarse-textured soils where the ground water table is <10 feet and average annual precipitation >12 inches.*
- *Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.*

Along with K_{oc} , soil $t_{1/2}$ values would be used in evaluating the potential to degrade groundwater by leaching (see **Potential to Move to Groundwater** below).

Soil Dissipation: Dissipation time (DT_{50}) represents the time required for 50% of the deposited pesticide to degrade and move from a treated site; whereas, soil $t_{1/2}$ describes the rate for degradation only. As for $t_{1/2}$, units of dissipation time are usually expressed in days. Field dissipation time would be the preferred data for use to estimate pesticide concentrations in the environment because it is based upon field studies compared to soil $t_{1/2}$, which is derived in a laboratory. However, soil $t_{1/2}$ is

the most common persistence data available in the published literature. If field dissipation data are not available, soil half-life data would be used in a Chemical Profile. The average or representative half-life value of most important degradation mechanism would be selected for quantitative analysis for both terrestrial and aquatic environments.

Based upon the DT_{50} value, environmental persistence in the soil also would be categorized as one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days.

Threshold for Approving PUPs:

If soil $DT_{50} \leq 100$ days, then a PUP would be approved without additional BMPs to protect water quality.

*If soil $DT_{50} > 100$ days, then a PUP would only be approved with additional BMPs specifically to protect water quality. One or more BMPs such as the following would be included in the **Specific Best Management Practices (BMPs)** section to minimize potential surface runoff and leaching that can degrade water quality:*

- *Do not exceed one application per site per year.*
- *Do not use on coarse-textured soils where the ground water table is <10 feet and average annual precipitation >12 inches.*
- *Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.*

Along with K_{oc} , soil DT_{50} values (preferred over soil $t_{1/2}$) would be used in evaluating the potential to degrade groundwater by leaching (see Potential to Move to Groundwater below), if available.

Aquatic Persistence: Service personnel would record values for aquatic $t_{1/2}$, which represents the length of time required for 50% of the deposited pesticide to degrade (completely or partially) in water. Based upon the $t_{1/2}$ value, aquatic persistence would be categorized as one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days (Kerle et al. 1996).

Threshold for Approving PUPs:

If aquatic $t_{1/2} \leq 100$ days, then a PUP would be approved without additional BMPs to protect water quality.

*If aquatic $t_{1/2} > 100$ days, then a PUP would only be approved with additional BMPs specifically to protect water quality. One or more BMPs such as the following would be included in the **Specific Best Management Practices (BMPs)** section to minimize potential surface runoff and leaching that can degrade water quality:*

- *Do not exceed one application per site per year.*
- *Do not use on coarse-textured soils where the ground water table is <10 feet and average annual precipitation >12 inches.*
- *Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.*

Aquatic Dissipation: Dissipation time (DT_{50}) represents the time required for 50% of the deposited pesticide to degrade or move (dissipate); whereas, aquatic $t_{1/2}$ describes the rate for degradation only. As for $t_{1/2}$, units of dissipation time are usually expressed in days. Based upon the DT_{50} value, environmental persistence in aquatic habitats also would be categorized as one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days.

Threshold for Approving PUPs:

If aquatic $DT_{50} \leq 100$ days, then a PUP would be approved without additional BMPs to protect water quality.

*If aquatic $DT_{50} > 100$ days, then a PUP would only be approved with additional BMPs specifically to protect water quality. One or more BMPs such as the following would be included in the **Specific Best Management Practices (BMPs)** section to minimize potential surface runoff and leaching that can degrade water quality:*

- *Do not exceed one application per site per year.*
- *Do not use on coarse-textured soils where the ground water table is <10 feet and average annual precipitation >12 inches.*
- *Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.*

Potential to Move to Groundwater: Groundwater Ubiquity Score (GUS) = $\log_{10}(\text{soil } t_{1/2}) \times [4 - \log_{10}(K_{oc})]$. If a DT_{50} value is available, it would be used rather than a $t_{1/2}$ value to calculate a GUS score. Based upon the GUS value, the potential to move toward groundwater would be recorded as one of the following categories: extremely low potential <1.0, low - 1.0 to 2.0, moderate - 2.0 to 3.0, high - 3.0 to 4.0, or very high >4.0.

Threshold for Approving PUPs:

If GUS ≤ 4.0 , then a PUP would be approved without additional BMPs to protect water quality.

*If GUS >4.0, then a PUP would only be approved with additional BMPs specifically to protect water quality. One or more BMPs such as the following would be included in the **Specific Best Management Practices (BMPs)** section to minimize potential surface runoff and leaching that can degrade water quality:*

- *Do not exceed one application per site per year.*
- *Do not use on coarse-textured soils where the ground water table is <10 feet and average annual precipitation >12 inches.*
- *Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.*

Volatilization: Pesticides may volatilize (evaporate) from soil and plant surfaces and move off-target into the atmosphere. The potential for a pesticide to volatilize is a function of its vapor pressure that is affected by temperature, sorption, soil moisture, and the pesticide's water solubility. Vapor pressure is often expressed in mm Hg. To make these values easier to compare, vapor pressure would be recorded by Service personnel in exponential form ($I \times 10^{-7}$), where I represents a vapor pressure index. In general, pesticides with $I < 10$ would have low potential to volatilize; whereas, pesticides

with $I > 1,000$ would have a high potential to volatilize (OSU 1996). Vapor pressure values for pesticides are usually available in the pesticide product MSDS or the USDA Agricultural Research Service (ARS) pesticide database (see References).

Threshold for Approving PUPs:

If $I \leq 1,000$, then a PUP would be approved without additional BMPs to minimize drift and protect air quality.

*If $I > 1,000$, then a PUP would only be approved with additional BMPs specifically to minimize drift and protect air quality. One or more BMPs such as the following would be included in the **Specific Best Management Practices (BMPs)** section to reduce volatilization and potential to drift and degrade air quality:*

- *Do not treat when wind velocities are < 2 or > 10 mph with existing or potential inversion conditions.*
- *Apply the large-diameter droplets possible for spray treatments.*
- *Avoid spraying when air temperatures $> 85^\circ\text{F}$.*
- *Use the lowest spray height possible above target canopy.*
- *Where identified on the pesticide label, soil incorporate pesticide as soon as possible during or after application.*

Octanol-Water Partition Coefficient (K_{ow}): The octanol-water partition coefficient (K_{ow}) is the concentration of a pesticide in octanol and water at equilibrium at a specific temperature. Because octanol is an organic solvent, it is considered a surrogate for natural organic matter. Therefore, K_{ow} would be used to assess potential for a pesticide to bioaccumulate in tissues of aquatic species (e.g., fish). If $K_{ow} > 1,000$ or $S_w < 1$ mg/L and soil $t_{1/2} > 30$ days, then there would be high potential for a pesticide to bioaccumulate in aquatic species such as fish (USGS 2000).

Threshold for Approving PUPs:

If there is not a high potential for a pesticide to bioaccumulate in aquatic species, then the PUP would be approved.

If there is a high potential to bioaccumulate in aquatic species ($K_{ow} > 1,000$ or $S_w < 1$ mg/L and soil $t_{1/2} > 30$ days), then the PUP would not approved, except under unusual circumstances where approval would only be granted by the Washington Office.

Bioaccumulation/Bioconcentration: The physiological process where pesticide concentrations in tissue would increase in biota because they are taken and stored at a faster rate than they are metabolized or excreted. The potential for bioaccumulation would be evaluated through bioaccumulation factors (BAFs) or bioconcentration factors (BCFs). Based upon BAF or BCF values, the potential to bioaccumulate would be recorded as one of the following: low – 0 to 300, moderate – 300 to 1,000, or high $> 1,000$ (Calabrese and Baldwin 1993).

Threshold for Approving PUPs:

If BAF or BCF $\leq 1,000$, then a PUP would be approved without additional BMPs.

If BAF or BCF > 1,000, then a PUP would not be approved, except under unusual circumstances where approval would only be granted by the Washington Office.

Worst-Case Ecological Risk Assessment

Max Application Rates (acid equivalent): Service personnel would record the highest application rate of an active ingredient (ae basis) for habitat management and cropland/facilities maintenance treatments in this data field of a Chemical Profile. These rates can be found in Table CP.1 under the column heading “Max Product Rate – Single Application (lbs/acre – AI on acid equiv basis)”. This table would be prepared for a Chemical Profile from information specified in labels for trade name products identified in PUPs. If these data are not available in pesticide labels, then write “NS” for “not specified on label” in this table.

EECs: An estimated environmental concentration (EEC) represents potential exposure to fish and wildlife (birds and mammals) from using a pesticide. EECs would be derived by Service personnel using an USEPA screening-level approach (USEPA 2004). For each max application rate [see description under **Max Application Rates (acid equivalent)**], Service personnel would record 2 EEC values in a Chemical Profile; these would represent the worst-case terrestrial and aquatic exposures for habitat management and croplands/facilities maintenance treatments. For terrestrial and aquatic EEC calculations, see description for data entry under **Presumption of Unacceptable Risk/Risk Quotients**, which is the next field for a Chemical Profile.

Presumption of Unacceptable Risk/Risk Quotients: Service personnel would calculate and record acute and chronic risk quotients (RQs) for birds, mammals, and fish using the provided tabular formats for habitat management and/or cropland/facilities maintenance treatments. RQs recorded in a Chemical Profile would represent the worst-case assessment for ecological risk. See Section 7.2 for discussion regarding the calculations of RQs.

For aquatic assessments associated with habitat management treatments, RQ calculations would be based upon selected acute and chronic toxicological endpoints for fish and the EEC would be derived from Urban and Cook (1986) assuming 100% overspray to an entire 1-foot deep water body using the max application rate (ae basis [see above]).

For aquatic assessments associated with cropland/facilities maintenance treatments, RQ calculations would be done by Service personnel based upon selected acute and chronic toxicological endpoints for fish and an EEC would be derived from the aquatic assessment in AgDRIFT® model version 2.01 under Tier I ground-based application with the following input variables: max application rate (acid basis [see above]), low boom (20 inches), fine to medium/coarse droplet size, 20 swaths, EPA-defined wetland, and 25-foot distance (buffer) from treated area to water.

See Section 7.2.1.2 for more details regarding the calculation of EECs for aquatic habitats for habitat management and cropland/facilities maintenance treatments.

For terrestrial avian and mammalian assessments, RQ calculations would be done by Service personnel based upon dietary exposure, where the “short grass” food item category would represent the worst-case scenario. For terrestrial spray applications associated with habitat management and cropland/facilities maintenance treatments, exposure (EECs and RQs) would be determined using the Kenaga nomogram method through the USEPA’s T-REX version 1.5. T-REX input variables would include the following: max application rate (acid basis [see above]) and pesticide half-life (days) in

soil to estimate the initial, maximum pesticide residue concentration on general food items for terrestrial vertebrate species in short (<20 cm tall) grass.

For granular pesticide formulations and pesticide-treated seed with a unique route of exposure for terrestrial avian and mammalian wildlife, see Section 7.2.1.1.2 for the procedure that would be used to calculate RQs.

All calculated RQs in both tables would be compared with Levels of Concern (LOCs) established by USEPA (see Table G-2 in Section 7.2). If a calculated RQ exceeds an established LOC value (in brackets inside the table), then there would be a potential for an acute or chronic effect (unacceptable risk) to federally listed (T&E) species and nonlisted species. See Section 7.2 for detailed descriptions of acute and chronic RQ calculations and comparison to LOCs to assess risk.

Threshold for approving PUPs:

If $RQs \leq LOCs$, then a PUP would be approved without additional BMPs.

*If $RQs > LOCs$, then a PUP would only be approved with additional BMPs specifically to minimize exposure (ecological risk) to bird, mammal, and/or fish species. One or more BMPs such as the following would be included in the **Specific Best Management Practices (BMPs)** section to reduce potential risk to non-listed or listed species:*

- *Lower application rate and/or fewer number of applications so $RQs \leq LOCs$*
- *For aquatic assessments (fish) associated with cropland/facilities maintenance, increase the buffer distance beyond 25 feet so $RQs \leq LOCs$.*

Justification for Use: Service personnel would describe the reason for using the pesticide based control of specific pests or groups of pests. In most cases, the pesticide label provides the appropriate information regarding control of pests to describe in the section.

Specific Best Management Practices (BMPs): Service personnel would record specific BMPs necessary to minimize or eliminate potential effects to non-target species and/or degradation of environmental quality from drift, surface runoff, or leaching. These BMPs would be based upon scientific information documented in previous data fields of a Chemical Profile. Where necessary and feasible, these specific practices would be included in PUPs as a basis for approval.

If there are no specific BMPs that are appropriate, then Service personnel would describe why the potential effects to refuge resources and/or degradation of environmental quality is outweighed by the overall resource benefit(s) from the proposed pesticide use in the BMP section of the PUP. See Section 4.0 of this document for a complete list of BMPs associated with mixing and applying pesticides appropriate for all PUPs with ground-based treatments that would be additive to any necessary, chemical-specific BMPs.

References: Service personnel would record scientific resources used to provide data/information for a chemical profile. Use the number sequence to uniquely reference data in a chemical profile.

The following on-line data resources are readily available for toxicological endpoint and environmental fate data for pesticides:

1. California Product/Label Database. Department of Pesticide Regulation, California Environmental Protection Agency (<http://www.cdpr.ca.gov/docs/label/labelque.htm#regprods>)
2. ECOTOX database. Office of Pesticide Programs, US Environmental Protection Agency, Washington, DC. (<http://cfpub.epa.gov/ecotox/>)
3. Extension Toxicology Network (EXTOXNET) Pesticide Information Profiles. Cooperative effort of University of California-Davis, Oregon State University, Michigan State University, Cornell University and University of Idaho through Oregon State University, Corvallis, Oregon (<http://extoxnet.orst.edu/pips/ghindex.html>)
4. FAO specifications and evaluations for plant protection products. Pesticide Management Unit, Plant Protection Services, Food and Agriculture Organization, United Nations (<http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/Pesticid/>)
5. Human health and ecological risk assessments. Pesticide Management and Coordination, Forest Health Protection, US Department of Agriculture, US Forest Service (<http://www.fs.fed.us/foresthealth/pesticide/risk.htm>)
6. Pesticide Chemical Fact Sheets. Clemson University Pesticide Information Center (<http://entweb.clemson.edu/pesticid/Document/Labels/factshee.htm>)
7. Pesticide Fact Sheets. Published by Information Ventures, Inc. for Bureau of Land Management, Department of the Interior; Bonneville Power Administration, U.S. Department of Energy; and Forest Service, US Department of Agriculture (<http://infoventures.com/e-hlth/pesticide/pest-fac.html>)
8. Pesticide Fact Sheets. National Pesticide Information Center (<http://npic.orst.edu/npicfact.htm>)
9. Pesticide Fate Database. US Environmental Protection Agency, Washington, DC (<http://cfpub.epa.gov/pfate/home.cfm>)
10. Pesticide product labels and material safety data sheets. Crop Data Management Systems, Inc. (CDMS) (<http://www.cdms.net/pfa/LUpdateMsg.asp>) or multiple websites maintained by agricultural companies
11. Registered Pesticide Products (Oregon database). Oregon Department of Agriculture (http://www.oda.state.or.us/dbs/pest_products/search.lasso)
12. Regulatory notes. Pest Management Regulatory Agency, Health Canada, Ontario, Canada (<http://www.hc-sc.gc.ca/pmra-arla/>)
13. Reptile and Amphibian Toxicology Literature. Canadian Wildlife Service, Environment Canada, Ontario, Canada (http://www.cws-scf.ec.gc.ca/nwrc-cnrf/ratl/index_e.cfm)
14. Specific Chemical Fact Sheet – New Active Ingredients, Biopesticide Fact Sheet and Registration Fact Sheet. U.S. Environmental Protection Agency, Washington, DC (http://www.epa.gov/pesticides/factsheets/chemical_fs.htm)
15. Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas. The Invasive Species Initiative. The Nature Conservancy (<http://tnsweeds.ucdavis.edu/handbook.html>)
16. Wildlife Contaminants Online. US Geological Survey, Department of Interior, Washington, D.C. (<http://www.pwrc.usgs.gov/contaminants-online/>)
17. One-liner database. 2000. US Environmental Protection Agency, Office of Pesticide Programs, Washington, DC

Chemical Profile

Date:			
Trade Name(s):		Common Chemical Name(s):	
Pesticide Type:		EPA Registration Number:	
Pesticide Class:		CAS Number:	
Other Ingredients:			

Toxicological Endpoints

Mammalian LD₅₀:	
Mammalian LC₅₀:	
Mammalian Reproduction:	
Avian LD₅₀:	
Avian LC₅₀:	
Avian Reproduction:	
Fish LC₅₀:	
Fish ELS/Life Cycle:	
Other:	

Ecological Incident Reports

Environmental Fate

Water solubility (S_w):	
Soil Mobility (K_{oc}):	
Soil Persistence ($t_{1/2}$):	
Soil Dissipation (DT_{50}):	
Aquatic Persistence ($t_{1/2}$):	
Aquatic Dissipation (DT_{50}):	
Potential to Move to Groundwater (GUS score):	
Volatilization (mm Hg):	
Octanol-Water Partition Coefficient (K_{ow}):	
Bioaccumulation/Bioconcentration:	BAF: BCF:

Worst Case Ecological Risk Assessment

Max Application Rate (ai lbs/acre – ae basis)	Habitat Management: Croplands/Facilities Maintenance:
EECs	Terrestrial (Habitat Management): Terrestrial (Croplands/Facilities Maintenance): Aquatic (Habitat Management): Aquatic (Croplands/Facilities Maintenance):

Habitat Management Treatments:

Presumption of Unacceptable Risk		Risk Quotient (RQ)	
		Listed (T&E) Species	Nonlisted Species
Acute	Birds	[0.1]	[0.5]
	Mammals	[0.1]	[0.5]
	Fish	[0.05]	[0.5]
Chronic	Birds	[1]	[1]
	Mammals	[1]	[1]
	Fish	[1]	[1]

Cropland/Facilities Maintenance Treatments:

Presumption of Unacceptable Risk		Risk Quotient (RQ)	
		Listed (T&E) Species	Nonlisted Species
Acute	Birds	[0.1]	[0.5]
	Mammals	[0.1]	[0.5]
	Fish	[0.05]	[0.5]
Chronic	Birds	[1]	[1]
	Mammals	[1]	[1]
	Fish	[1]	[1]

Justification for Use:

Specific Best Management Practices (BMPs):

References:

Table CP.1 Pesticide Name

Trade Name ^a	Treatment Type ^b	Max Product Rate – Single Application (lbs/acre or gal/acre)	Max Product Rate - Single Application (lbs/acre - AI on acid equiv basis)	Max Number of Applications Per Season	Max Product Rate Per Season (lbs/acre/season or gal/acre/season)	Minimum Time Between Applications (Days)

^aFrom each label for a pesticide identified in pesticide use proposals (PUPs), Service personnel would record application information associated with possible/known uses on Service lands.

^bTreatment type: H – habitat management or CF – cropland/facilities maintenance. If a pesticide is labeled for both types of treatments (uses), then record separate data for H and CF applications.

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Appendix H. Abbreviations and Glossary

H.1 Abbreviations

Below is a list of the most common acronyms and abbreviations within this CCP document.

a.i.	Active Ingredient
Act	National Wildlife Refuge System Improvement Act of 1997 (also Improvement Act or NWRSIA)
ABC	American Bird Conservancy
ADA	Americans with Disabilities Act
Administration Act	National Wildlife Refuge System Administration Act of 1966
AHPA	Archaeological and Historic Preservation Act
AM	Adaptive Management
ARPA	Archaeological Resources Protection Act
AUD	Appropriate Use Determination
BCC	Birds of Conservation Concern
BCR	Bird Conservation Region
BIDEH	Biological Diversity, Integrity, and Environmental Health
BMC	Birds of Management Concern
BMP	Best Management Practice
BP	Before Present
CCP	Comprehensive Conservation Plan
CD	Compatibility Determination
CEQ	White House Council on Environmental Quality
CFR	Code of Federal Regulations
CLMA	Cooperative Land Management Agreement
CMP	Conceptual Management Plan
COE	U. S. Army Corps of Engineers
CRBAP	Chehalis River Basin Action Plan
CWCS	Comprehensive Wildlife Conservation Strategy
DO	Dissolved Oxygen
DOI	Department of the Interior
DM	U.S. Department of the Interior Manual
DPS	Distinct Population Segment
DSL	Department of State Lands
EA	Environmental Assessment
EE	Environmental Education
EIS	Environmental Impact Statement
E.O.	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act

ESU	Ecological Significant Unit
FAA	Federal Aviation Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	Finding of No Significant Impact
FR	Federal Register
FWS	U.S. Fish and Wildlife Service (also, Service, USFWS)
GHG	Greenhouse Gas
GIS	Geographic Information System
GLO	Government Land Office
IBA	Important Bird Area
Improvement Act	National Wildlife Refuge System Improvement Act of 1997 (also Act, NWRISA)
IPCC	Intergovernmental Panel on Climate Change
IPM	Integrated Pest Management
LE	Law Enforcement
LPP	Land Protection Plan
LCC	Landscape Conservation Cooperative
LCD	Landscape Conservation Design
LWCF	Land and Water Conservation Fund
LWD	Large Woody Debris
MAPS	Monitoring Avian Productivity System
MBCC	Migratory Bird Conservation Commission
MBCF	Migratory Bird Conservation Fund
MBTA	Migratory Bird Treaty Act
MMS	Maintenance Management System
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
mph	Miles per Hour
MSDS	Material Safety Data Sheet
NAS	National Audubon Society
NAWCA	North American Wetlands Conservation Act
NAWCP	North American Waterbirds Conservation Plan
NAWMP	North American Waterfowl Management Plan
NEPA	National Environmental Policy Act
NGO	Non-Governmental Organization
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge

NWRC	National Wildlife Refuge Complex
NWRS	National Wildlife Refuge System
NWRSIA	National Wildlife Refuge System Improvement Act of 1997
OSF	Oregon Spotted Frog
PFMP	Pacific Flyway Management Plan
PIF	Partners in Flight
PPE	Personal Protective Equipment
PPP	Preliminary Project Proposal
PPT	Parts Per Thousand
PUD	Public Utilities District
PUP	Pesticide Use Proposal
PUPS	Pesticide Use Proposal System
R1	Region 1 of the U.S. Fish and Wildlife Service
RAPP	Refuge Annual Performance Plan
RCRA	Resource Conservation and Recovery Act.
RCG	Reed Canarygrass
Refuge System	National Wildlife Refuge System
RM	Refuge Manual
RM	River Mile
RNA	Research Natural Area
ROC	Resource of Concern
RONs	Refuge Operating Needs System
ROS	Recreational Opportunity Spectrum
ROW	Right-of-Way
SAMMS	Service Asset Maintenance and Management System
SCORP	Statewide Comprehensive Outdoor Recreation Plan
Service	U.S. Fish and Wildlife Service (also FWS, USFWS)
SHPO	State Historic Preservation Office
SLAMM	Sea Level Affecting Marshes Model
SOC	Species of Concern
SUP	Special Use Permit
T&E	Threatened and Endangered Species
TNC	The Nature Conservancy
TCNWCB	Thurston County Noxious Weed Control Board
TESS	Federal Threatened and Endangered Species list
USACE	U.S. Army Corps of Engineers
USCB	U.S. Census Bureau
U.S.C.	United States Code
USDOI	U.S. Department of the Interior
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service (also FWS, Service)

USGS	U.S. Geological Survey
USSCP	U.S. Shorebird Conservation Plan
WAP	Washington Wildlife Action Plan
WCC	Washington Conservation Corps
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington State Department of Natural Resources
WDOE	Washington Department of Ecology
WFWO	Washington Fish and Wildlife Office (of USFWS)
WPA	Works Progress Administration
WRIA	Water Resources Inventory and Assessment
WRP	Wetland Reserve Program
WSSC	Washington State Service Corps
WSDA	Washington State Department of Agriculture
WSPRC	Washington State Parks and Recreation Commission
WTHP	Washington Trust for Historic Preservation
USSCP	U.S. Shorebird Conservation Plan

H.2 Glossary

Accessible. Without fences or vegetative barriers (tall, dense vegetation) at its margins.

Adaptive Management. The rigorous application of management, research, and monitoring to gain information and experience necessary to assess and modify management activities. A process that uses feedback from refuge research and monitoring and evaluation of management actions to support or modify objectives and strategies at all planning levels (Service Manual 602 FW 1.4).

Alternative. Different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the Refuge System mission, and resolving issues (Service Manual 602 FW 1.6). The “no action” alternative is current refuge management, while the “action” alternatives are all other alternatives.

Appropriate Use. A proposed or existing use on a refuge that meets at least one of the following four conditions:

- (1) The use is a wildlife-dependent recreational use as identified in the Improvement Act.
- (2) The use contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the Improvement Act was signed into law.
- (3) The use involves the take of fish and wildlife under State regulations.
- (4) The use has been found to be appropriate as specified in section 1.11 of the USFWS Appropriate Use Policy (Service Manual 603FW1).

Approved Acquisition Boundary. National wildlife refuge boundary approved by the National or Regional U.S. Fish and Wildlife Service Director for potential acquisition of lands by the Service.

Approved Refuge Boundary. A national wildlife refuge boundary approved by the National or Regional U.S. Fish and Wildlife Service Director. Within this boundary, the Service may negotiate with landowners to acquire lands not already owned by the Service (Modified from Region 1 Landowner Guide, USFWS Division of Refuge Planning).

Archaeology. The scientific study of material evidence remaining from past human life and culture (Webster’s II).

Benefiting Resources. Those species, species groups, or resources expected to benefit from actions taken for a resource of concern.

Big Six. Wildlife-dependent recreational uses identified in the Refuge System Improvement Act that receive priority consideration in planning: hunting, fishing, wildlife observation, photography, environmental education, and interpretation.

Birds of Conservation Concern. A category assembled by the U.S. Fish and Wildlife Service Division of Migratory Birds identifying the migratory and nonmigratory species (beyond those already designated as federally threatened or endangered) that represent the Division’s highest conservation priorities (FWS, Division of Migratory Birds).

Biological Diversity (also Biodiversity). The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and communities and ecosystems in which

they occur (Service Manual 601FW3). The Refuge System's focus is on indigenous species, biotic communities, and ecological processes.

Biological Integrity. Biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms, and communities (Service Manual 601FW3).

Bog. A slightly domed, low-nutrient, and low-pH plant system which grows on sphagnum peat. The system depends on low-nutrient rainfall for its moisture. Plants growing in these sensitive wetlands are specifically adapted to these severe conditions and are uncommon elsewhere.

Bulkhead. A man-made wall-like structure whose primary purpose is to hold or prevent sliding of soil caused by erosion and wave action. In Grays Harbor, a bulkhead was constructed in the 1940s to hold rock and soil. The entire bulkheaded area eventually was filled and became Bowerman Airport.

Candidate Species (Federal). Fish, wildlife, or plant species for which the Service or NOAA has on file sufficient information on biological vulnerability and threats to support a proposal to list as endangered or threatened under the ESA, but the proposal is precluded by other priorities.

Candidate Species (State). Fish, wildlife, or plant species that a state will review for possible listing as a state-endangered, -threatened, or -sensitive species. A species will be considered for designation as a state candidate if sufficient evidence suggests that its status may meet the listing criteria defined for state-endangered, -threatened, or -sensitive.

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).

Channel. Channel habitat is where water flows within the confines of river or tributary banks and includes the nearby edges of the gently sloped bank.

Compatibility Determination. A written determination signed and dated by the refuge manager and regional chief signifying that a proposed or existing use of a national wildlife refuge is a compatible use or is not a compatible use. The Director makes this delegation through the Regional Director (Service Manual 603 FW 2).

Compatible Use. A wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the refuge manager, will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge (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. A plan that describes the desired future conditions of a refuge or planning unit and provides long-range guidance and management direction to achieve the purpose(s) of the refuge; helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the biological integrity, diversity, and environmental health of each refuge and the Refuge System; helps achieve the goals of the National Wilderness Preservation System, if appropriate; and meets other mandates (Service Manual 602 FW 1.4).

Concern: See Issue.

Connectivity. The arrangement of habitats that allows organisms and ecological processes to move across the landscape; patches of similar habitats are either close together or linked by corridors of appropriate vegetation.

Conservation Targets (also see **Resources of Concern; Priority Species, Species Groups, Focal Species, and Communities**). Term used by land management agencies and conservation organizations to describe the resources (ecological systems, ecological communities, species, species groups, or other natural resources) selected as the focus of conservation actions (Adapted from Low, Functional Landscapes 2003).

Consumptive Use. Recreational activities such as hunting and fishing that involve harvest or removal of wildlife or fish, generally to be used as food by humans.

Contaminants or Environmental Contaminants. Chemicals present at levels greater than those naturally occurring in the environment resulting from anthropogenic or natural processes that potentially result in changes to biota at any ecological level (USGS, assessing EC threats to lands managed by USFWS). Pollutants that degrade other resources upon contact or mixing (Adapted from Webster's II).

Cooperative Agreement. An official agreement between two parties.

Cover. The estimated percent of an area, projected onto a horizontal surface, occupied by a particular plant species.

Cover Type. The present vegetation of an area.

Cultural Resources. The physical remains, objects, historic records, and traditional lifeways that connect us to our Nation's past (USFWS, Considering Cultural Resources).

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).

Deciduous. Describes trees and shrubs which shed all their leaves each year.

Direct Loss. Loss of food or habitat when nonnative species outcompete native species.

Dissolved Oxygen. The concentration of oxygen dissolved in water, expressed in mg/l or as percent saturation, where saturation is the maximum amount of oxygen that can theoretically be dissolved in water at a given altitude and temperature.

Distinct Population Segment (DPS). A subdivision of a vertebrate species that is treated as a species for purposes of listing under the Endangered Species Act. To be so recognized, a potential DPS must satisfy standards specified in a Service or NOAA policy statement (See the February 7,

1996, Federal Register, pages 4722-4725). The standards require it to be separable from the remainder of and significant to the species to which it belongs.

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

Ecological Attribute. A characteristic or condition required to support the life history, habitat, physical processes, or community interaction of conservation targets.

Ecosystem. A dynamic and interrelated complex of plant and animal communities and their associated nonliving 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.

Effect (Impact). A direct result of an action which occurs at the same time and place, or an indirect result of an action which occurs later in time or in a different place and is reasonably foreseeable, or the cumulative results from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions (40 CFR 1508.8).

Emergent Vegetation. Herbaceous plants that require a water environment to grow for at least part of their life cycle, stem structure is rigid and self-supporting, and vegetative growth continues above the waterline.

Endemic. A species that is native to the area in which it is found; a species confined to a specific region.

Environmental Assessment. 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. 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 environmental versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR 1508.11).

Endangered Species (Federal). An animal or plant species 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 a state 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 Health. Composition, structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment (Service Manual 601FW3).

Enhance. To improve the condition of an area or habitat, usually for the benefit of certain native species.

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 fresh water.

Ethnography. The study and systematic recording of human cultures; a descriptive work produced from such research.

Exotic Species. A species from another part of the state or the world that does not occur naturally in an area. A nonnative species, either plant or animal (see nonnative, invasive, nuisance, noxious).

Executive Order. A President's or Governor's declaration which has the force of law, usually based on existing statutory powers, and requiring no action by the Congress or state legislature.

Experimental Population. A population (including its offspring) of a listed species designated by a rule published in the Federal Register that is wholly separate geographically from other populations of the same species. An experimental population may be subject to less stringent prohibitions than are applied to the remainder of the species to which it belongs.

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).

Floodplain. A flood plain is an area of relatively level land—usually bordering a lake, stream, or river—that gets inundated with water from time to time. The flood plain includes the floodway, the border area of land that normally gets inundated during annual or 10-year floods, and the floodway fringe, which may get inundated during a 100-year or 500-year flood (WDOE).

Focal Conservation Target. A suite of conservation targets that for purposes of planning are sorted and condensed to represent threats to biological integrity, diversity, and environmental health at the refuge level.

Focal Species. Those species whose ecological requirements are used to define quality habitat (on a refuge), to measure habitat conditions and ecological processes, and maintain the range required by the species and many other species using the same habitats.

Forb. An herbaceous, flowering plant that is not a grass, sedge, or rush.

Goal. Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Service Manual 620 FW 1.6).

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

Habitat Connectivity (also Landscape Connectivity). The arrangement of habitats that allows organism and ecological processes to move across the landscape; patches of similar habitats are either close together or linked by corridors of appropriate vegetation. The opposite of fragmentation.

Habitat Management Plan. A plan that provides refuge managers with a decision-making process; guidance for the management of refuge habitat; long-term vision, continuity, and consistency for habitat management on refuge lands (Service Manual Habitat Management Planning policy 620FW1.4).

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

Historic Conditions. Composition, structure, and functioning of ecosystems resulting from natural processes that we believe, based on sound professional judgment, were present prior to substantial human-related changes to the landscape. (Service Manual 601FW3)

Hydrology. A science dealing with the properties, distribution, and circulation of water on and below the earth's surfaces and in the atmosphere.

Hydrograph. A graph of water flows in a river or stream. A hydrograph provides a way of seeing seasonal and yearly changes in the flow or discharge of a waterway.

Hydroperiod. A segment of a hydrograph for a specific time frame.

Important Bird Area. A site that provides essential habitat for one or more species of bird and that is recognized as being important on a global, continental, or state level.

Indicator. A measurable characteristic of a key ecological attribute that strongly correlates with the status of the key ecological attribute. Something that serves as a sign or symptom.

Inholding. Refers to lands within an approved refuge boundary that are not owned by the Service. These can be private lands or lands owned by city, county, state, or other Federal agencies.

Integrated Pest Management (IPM). The use of pest and environmental information in conjunction with available pest control technologies to prevent unacceptable levels of pest damage by the most economical means and with the least possible hazard to persons, property, and the environment (U.S. EPA Pesticide Glossary).

Interpretation. A teaching technique that combines factual information with stimulating explanation. Frequently used to help people understand natural and cultural resources (yourdictionary.com).

Interpretive Trail. A trail with informative signs that provide factual and stimulating explanations of what the visitors see, hear, feel, or otherwise experience while on the trail.

Intertidal Mudflat. Expanses of silt, mud, or sandy mud affected by rising and falling tides. They are often components of estuaries and are revealed when the tide goes out.

Invasive. Nonnative species (plant or animal) disrupting and replacing native species and disrupting ecological function and processes (thebiotechdictionary.com) (see exotic, nonnative, nuisance).

Inventory. A survey of the plants or animals inhabiting an area.

Inviolate Sanctuary. The original intent of the term *inviolate sanctuary* is found in the Migratory Bird Conservation Act (first passed in 1918 as the Migratory Bird Treaty Act and amended in 1934 and 1938). This Act originally required that all refuges be inviolate sanctuaries and deemed refuges' primary purposes were as breeding grounds and habitat for migratory birds. Migratory bird hunting was prohibited on migratory waterfowl areas by the Act, but most other human uses were not addressed. The 1938 amendment to the Act gave refuge managers authority to decide if, when, and how bird hunting would be allowed. After World War II, public demand for opening refuges to recreation increased. The 1949 Duck Stamp Act allowed waterfowl hunting on refuges, but restricted the percentage of each refuge open to hunting. Current policy states that portions of a refuge are considered "inviolate sanctuaries" if they were (a) acquired with the approval of the Migratory Bird Conservation Commission (MBCC) for the purpose of an inviolate sanctuary; (b) acquired with MBCC approval or Land and Water Conservation Funds to protect a threatened or endangered species; or (c) established by an instrument or document which states the intent to manage the area as an "inviolate sanctuary for migratory birds" or to fulfill the purpose of the Migratory Bird Conservation Act. Policy further allows migratory game bird hunting on no more than 40 percent of the area considered inviolate sanctuary if compatible with a refuge's purposes and mission. Inviolate sanctuary classification imposes no limits on hunting nonmigratory birds, fur bearers, or other game species.

Issue. Any unsettled matter that requires a management decision, e.g., an initiative, opportunity, resource management problem, threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition (Service Manual 620 FW 1.6).

Key Ecological Attributes. Those aspects of the environment, such as ecological processes or patterns of biological structure and composition, that are critical to sustain the long-term viability of the target. These key ecological attributes are further divided into measurable indicators.

Keystone Species. Species who enrich ecosystem function in a unique and significant manner through their activities, and the effect is disproportionate to their numerical abundance. Their removal initiates changes in ecosystem structure and often loss of diversity. These keystones may be habitat modifiers (i.e., cottonwood or beaver), predators (i.e., puma or coyote) or herbivores (i.e., prairie dog) (Sonoran Desert Conservation Plan).

Land Protection Plan (LPP). A plan detailing the protection, via acquisition of fee-title, easement, lease, cooperative agreement, or other means, of a given land parcel to protect important natural resource values on the land. An LPP is prepared by the Service to evaluate the needs, goals, and appropriate strategies for implementing land protection.

Legacy Data. Historic or past data collected from surveys, monitoring, or study projects conducted upon refuges.

Listed Species (Federal). Species that have been formally listed under the Endangered Species Act as threatened or endangered. Also includes candidate and proposed species. An endangered species is one that is in danger of extinction throughout all or a significant portion of its range. A threatened species is one that is likely to become endangered in the foreseeable future. Candidate species include those taxa for which there is sufficient biological information to support a proposal to list as endangered or threatened. Proposed species include taxa for which the Service or NOAA has

published a proposal to list as endangered or threatened in the Federal Register. (Oregon Fish and Wildlife Office).

Macrophyte. A macrophyte may be an emergent, submergent, or floating type of aquatic plant. Its ecological significance is to provide cover for fish and act as substrate for aquatic invertebrates, as well as to produce oxygen and serve as food for some fish and other wildlife.

Maintenance. The upkeep of constructed facilities, structures, and capitalized equipment necessary to realize the originally anticipated useful life of a fixed asset. Maintenance includes preventative maintenance; cyclic maintenance; repairs; replacement of parts, components, or items of equipment; periodic condition assessment; periodic inspections, adjustment, lubrication, and cleaning (nonjanitorial) of equipment; painting, resurfacing, rehabilitation; special safety inspections; and other actions to assure continuing service and to prevent breakdown.

Maintenance Management System (MMS). A national database of refuge maintenance needs and deficiencies. It serves as a management tool for prioritizing, planning, and budgeting purposes (RMIS descriptions).

Mean High Water. The average level of the surface of the river, as used as a standard in determining land elevation or sea depths.

Mean Higher High Water. The average of the two high waters of any tidal day (24-hr period).

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

Migratory Birds. Those species of birds listed under 50 CFR 10.13 (Service Manual 720 FW 1, Policies and Responsibilities of the Migratory Bird Program).

Mixed Forest. Mixed forest is a habitat type in uplands that consists of a group of native plant species in a layered structure appropriate to this Puget Sound lowland area. The forest includes native deciduous and coniferous trees, a midstory of small trees and shrubs, and an understory of herbaceous ground cover plants.

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

Monoculture. Vegetation composed primarily of a single species, such as areas dominated by invasive weeds.

National Environmental Policy Act of 1969 (NEPA). Requires all Federal agencies 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 (40 CFR 1500).

Native Species. A species that naturally or historically occurs in a particular ecosystem.

National Natural Landmark. A nationally significant natural area that has been designated by the Secretary of the Interior. To be nationally significant, a site must be one of the best examples of a type of biotic community or geologic feature in its physiographic province.

National Register of Historic Places. The Nation's master inventory of known historic properties administered by the National Park Service. Includes buildings, structures, sites, objects, and districts that possess historic, architectural, engineering, archeological, or cultural significance at the national, state, and local levels (USFWS, Considering Cultural Resources).

National Wildlife Refuge. A designated area of land, water, or an interest in land or water within the National Wildlife Refuge System, excluding coordination areas (Service Manual 601 FW1.3).

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; game ranges; wildlife management areas; or waterfowl production areas.

National Wildlife Refuge System Administration Act of 1966. A Federal law creating the National Wildlife Refuge System and stating its 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 (16 U.S.C. 668dd) (Public Law 114-38).

National Wildlife Refuge System Improvement Act of 1997 A Federal law that amended and updated the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668) (Public Law 105-57).

Naturalized. A nonnative plant or animal that has been established for so long it is sometimes considered part of the native flora and fauna.

Neotropical migrant. A bird that winters in southern Mexico, Central or South America, or the West Indies and migrates northward to breed in North America.

Nonnative Grasslands. Upland areas formerly used for agricultural purposes such as pastures and include a mixture of nonnative pasture grasses and herbaceous plants.

Nonnative Species. An introduced species that did not naturally occur in an area prior to Euroamerican settlement of the Americas.

Nonconsumptive recreation. Recreational activities that do not involve harvest, removal, or consumption of fish, wildlife, or other natural resources.

Nonpoint Source. Coming from more than one location. Frequently refers to pollution or erosion that comes from a widespread area and accumulates in streams and rivers.

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 nonnative, 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 has adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.

Nuisance Species. An aggressive or difficult to manage species that impairs plant community function or natural processes. Usually a noxious, nonnative, or invasive species of plant or animal.

Objective. A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Objectives should be attainable, time-specific, and measurable (Service Manual 620 FW 1.6).

Operations. Activities related to the normal performance of facilities and equipment. Costs such as utilities (electricity, water, sewage) fuel, janitorial services, window cleaning, rodent and pest control, upkeep of grounds, vehicle rentals, waste management, and personnel costs for operating staff are generally included within the scope of operations.

Open Water. A habitat type that may include ponds, freshwater lakes, oceans, or estuaries. Regarding an estuary, it is the area of water that remains in the estuary regardless of tidal exchange processes.

Outreach. Providing information to the public on a specific issue through the use of the media, printed materials, and presentations.

Pacific Flyway. One of several major north-south travel corridors for migratory birds. The Pacific Flyway is west of the Rocky Mountains.

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

Peat. The least decomposed of all organic soil material. Peat contains a large amount of well-preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material. Peat forms in bottomland hydric soils and in the Black River these are the Semiahmoo and Mukilteo muck soils.

Planning Team. The primary U.S. Fish and Wildlife Service staff and others who play a key role in developing and writing the CCP. Planning teams are interdisciplinary in membership and function. Teams generally consist of a planning team leader, refuge manager, and staff biologists, a state natural resource agency representative, and other appropriate program specialists (e.g., social scientist, ecologist, recreation specialist). We also include other natural resource agencies to provide team members, as appropriate. The planning team prepares the CCP and appropriate NEPA documentation (Service Manual 620 FW 1.6).

Plant Association. A classification of plant communities based on the similarity in dominants of all layers of vascular species in a climax community (e.g., Oregon white oak/ovalleaf viburnum/poison oak plant association).

Plant Community. An assemblage of plant species that is unique in its composition, occurs in particular locations under particular influences, reflects or integrates the environmental influences on the site, such as soils, temperature, elevation, solar radiation, slope, aspect, and rainfall, and that denotes a general kind of climax plant community (e.g., Oregon white oak woodland).

Port of Grays Harbor. State legislation established the laws that would allow communities like Grays Harbor to form their own public port. Founded in 1911, PGH district was founded and is governed by three elected commissioners.

Parts Per Thousand (Ppt). A measure of salinity in oceans, estuaries, river mouths, and other waters.

Preferred Alternative. The alternative determined to best achieve the Refuge purpose, vision, and goals; to best contribute to the Refuge System mission; to best address the significant issues; and to be consistent with principles of sound fish and wildlife management.

Preplanning. The first phase of comprehensive conservation planning. It includes identifying the planning area and data needs, establishing the planning team and planning schedule, reviewing available information, preparing a public involvement plan, and conducting internal scoping.

Priority Public Uses. Hunting, fishing, wildlife observation and photography, environmental education and interpretation, where compatible, are defined under the National Wildlife Refuge System Improvement Act of 1997 as the six priority public uses of the National Wildlife Refuge System (See **Big Six**).

Priority Species. Fish and wildlife species that the Washington Department of Fish and Wildlife believes require protective measures and/or management guidelines to ensure their perpetuation. Priority species include:

- 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;
- 3) Species of recreation, commercial, and/or Tribal importance.

Proclamation. The official designation of the reason(s) a particular national monument was established and the purposes for which it is to be managed.

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

Public Land Order. Public lands consist of that class of land remaining from the original public domain that was acquired by the United States by treaty, purchase, or cession from a foreign power.

Public Use Area. A designated area within a refuge that is open to the public.

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

Refuge Operating Needs System (RONS). A national database of unfunded refuge operating needs required to meet and/or implement station goals, objectives, management plans, and legal mandates.

It is used as a planning, budgeting, and communication tool describing funding and staffing needs of the Refuge System.

Refuge Purpose(s). 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, refuge unit, or refuge subunit (Service Manual 620 FW 1.6).

Research Natural Area (RNA). Special designation areas on national wildlife refuges established to (1) Preserve examples of major ecosystem types or other outstanding physical or biological phenomena; (2) Provide research and educational opportunities; and (3) Preserve a full range of genetic and behavioral diversity for native plants and animals, including endangered or threatened species.

Resource of Concern (ROC). All plant and/or animal species, species groups, or communities specifically identified in refuge purpose(s), Refuge System mission, or international, national, regional, state, or ecosystem conservation plans or acts. For example, waterfowl and shorebirds are a resource of concern on a refuge whose purpose is to protect “migrating waterfowl and shorebirds.” Federal or State threatened and endangered species on that same refuge are also a resource of concern under terms of the respective endangered species acts (FWS Habitat Management Planning policy, 620 FW1.4).

Restoration/Restore. The act of bringing back to a former or original condition (Webster’s II).

Riparian Forest. A wooded habitat between upland and aquatic habitats. The forest is higher in elevation than a swamp, but has seasonally wet or moist soils. The forest is generally composed of more deciduous than conifer trees and has a species-rich and dense mid- and understory.

River Mile. The river is measured and numbered by mile, from the river mouth (starting number 0) to the head waters.

Salmonid. A category of elongate, boney fishes that have the last three vertebrae upturned, such as salmon, steelhead, and trout.

Salt and Brackish Marsh. Emergent wetlands growing on the edge of the mudflat up to the highest tide lines and are frequently inundated with tidal (saline) water depending on tide height. Salt marsh plants are adapted to and tolerant of higher saline levels ranging from moderate to essentially that of sea water (18- to 30-ppt salt). Brackish marshes need greater freshwater inputs to reduce the intensity of marine water levels (0.5 to 18 ppt salt).

Scoping. Engaging State, local and tribal governments and the public in the early identification of concerns, potential impacts, relevant effects of past actions, and possible alternative actions. Outreach is used to notify the public of the opportunity to participate.

Seasonally Flooded, Nonnative Grasslands. Low-lying lands flooded from October to May that are dominated by the aggressive, dense, and nonnative reed canarygrass. Most likely farmers established reed canarygrass in these floodplain sites to provide livestock forage.

Seral. Of or relating to an ecological sere; a seral stage.

Shrub Swamp. Freshwater wetlands found in broad low-lying zones where soils are poorly drained, fine-textured organic muck, and the substrate is permanently saturated or underwater during 6 months of the year. The habitat is dominated by shrubby native plants adapted to very wet conditions that can grow into virtually impenetrable thickets.

Significant Effect. Use of the term in NEPA requires consideration of both context and intensity (40 CFR 1508.27). Context means the significance of an action must be analyzed in its current and proposed short- and long-term effects on the whole of a given resource (e.g., affected region). Intensity refers to the severity of the effect.

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

Source. An extraneous factor that causes stress (the most proximate cause) (TNC 2000).

Species of Concern. An informal term referring to a species determined by a refuge or fish and wildlife office to be in need of conservation action. This could include a need for periodic monitoring of populations and the threats to the species and its habitat. Such species receive no legal protection, and use of the term does not imply that a species will eventually be proposed for Federal listing.

Step-down Management Plan. A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, safety) or groups of related subjects. It describes strategies and implementation schedules for meeting CCP goals and objectives (Service Manual 620 FW 1.6).

Strategy. A specific action, tool, technique, or combination of actions, tools, and techniques used to meet unit objectives (Service Manual 620 FW 1.6).

Stress. The impairment or degradation of a key ecological attribute for a conservation target (TNC 2000).

Sweetgrass. Also known as “common three-square bulrush.” Its current scientific name is *Schoenoplectus pungens*; its former scientific name was *Scirpus americanus*. This sedge (not a grass) is a component of basket weaving in Pacific Northwest Native American cultures.

Threatened Species (Federal). An animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

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

Turbidity. A level or measurement of water clarity based on particles suspended in the water.

Vegetation Type (Also Habitat Type, Forest Cover Type, Plant Community). A land classification system based upon the concept of distinct plant associations.

Vision Statement. A concise statement of what the planning unit should be, or what we hope to do, based primarily upon the Refuge System mission and specific refuge purposes and other mandates. The vision statement for a refuge is tied to the mission of the Refuge System; the purpose(s) of a refuge; the maintenance or restoration of the ecological integrity of each refuge and the Refuge System; and other mandates (Service Manual 620 FW 1.6).

Waterfowl. Resident and migratory ducks, geese, and swans.

Water Quality. A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.

Watershed. The land area that drains water to a particular stream, river, or lake. It is a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge. Large watersheds, like the Mississippi River basin, contain thousands of smaller watersheds.

Wetlands. Wetlands are transitional lands between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water at some time during the growing season of each year (Service Manual 660 FW 2; Cowardin et al. 1979).

Wildlife-Dependent Recreational Use. A use of a refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation. These are the six priority public uses of the Refuge System as established in the National Wildlife Refuge System Administration Act, as amended. Wildlife-dependent recreational uses, other than the six priority public uses, are those that depend on the presence of wildlife. The Service will also consider these other uses in the preparation of refuge CCPs; however, the six priority public uses always will take precedence. (Service Manual 620 FW 1.6)

Appendix I. CCP Team Members and Contributors

I.1 Planning Team Members

The Comprehensive Conservation Plan was developed primarily by a core planning team. Team members are the primary strategists, analysts, and writers, and attended all team meetings. To avoid scheduling and logistical conflicts, the core team had a limited number of participants.

The extended team, which included professionals from several different agencies, organizations, and Service programs, played a supporting role to the core team. Extended team members provided critical input early in the alternatives development process, and continued to provide review and comment as the document evolved. They attended periodic planning meetings, and provided comments on portions of the plan within their areas of expertise. In addition, content specialists from other agencies, universities, or organizations were contacted as needed by members of the core and extended teams for specific planning needs. Core and extended team members are listed below.

The following Service personnel served as core planning team members for the Comprehensive Conservation Plan:

Name and title	Degree(s)	Organization
Glynnis Nakai, Refuge Manager	MS, Wildlife Biology BS, Zoology	USFWS Nisqually NWRC
Jean Takekawa, Former Refuge Manager	BS, Wildlife Biology	USFWS Nisqually NWRC (retired)
Doug Roster, Deputy Refuge Manager	BS, Wildlife Biology	USFWS Nisqually NWRC
Marian Bailey, Wildlife Biologist	MS, Biology BS, Wildlife Biology	USFWS Nisqually NWRC
Sheila McCartan, Former Visitor Services Manager	BS, Environmental Education	USFWS Nisqually NWRC
Rebecca Young, Former Conservation Planner	BS, Natural Resource Management	USFWS/Region 1/Branch of Planning
Khemarith So, Conservation Planner	MS, Resource Ecology and Management BS, English and Environmental Science	USFWS/Region 1/Branch of Planning
Brian Root, Wildlife Biologist	BS, MS, PhD, Wildlife Biology	Former USFWS/Region 1/Inventory and Monitoring

The following personnel served as extended planning team members for the Comprehensive Conservation Plan:

Name and title	CCP Contributions
Jonathan Bloomfield, Realty Specialist, Lands Division, National Wildlife Refuge System, Region 1, <i>replaced</i> Dave Allen, Realty Specialist, Division of Realty and Refuge Information, National Wildlife Refuge System, Region 1	Realty analysis, review of related sections in document, assisted with verifying map accuracy
Brad Bortner, Chief, Migratory Birds and Habitat Programs, USFWS Region 1 (departed)	General guidance on migratory bird planning
Joseph Buchanan, Natural Resource Scientist, Washington Department of Fish and Wildlife	Subject matter expert on shorebird ecology, raptors, estuary habitats
Erin Carver, Economist, USFWS	Economic analysis
Rex Crawford, Ecologist, Washington Natural Heritage Program, Washington Department of Natural Resources (retired)	Subject matter expert on habitat descriptions and ecology
Liz Cruz, Geographer, Lands Division, National Wildlife Refuge System, Region 1, <i>replaced</i> Tom Miewald, Geographer, Lands Division, National Wildlife Refuge System, Region 1	Development of working, public involvement, and document maps; GIS data gathering and analysis
Joe Engler, Regional Refuge Biologist, National Wildlife Refuge System, Region 1	Lead reviewer of biological goals/objectives/strategies; AUFs and CDs; IPM
Bridgette Flanders-Wanner, Chief, Branch of Refuge Biology and Inventory & Monitoring, National Wildlife Refuge System, Region 1	Reviewer of IPM; mosquito management
Kevin Foerster, Regional Refuge Chief, National Wildlife Refuge System, Region 1, <i>replaced</i> , Robin West, Regional Refuge Chief, National Wildlife Refuge System, Region 1 (retired)	Major decisions on CCP direction, CCP/EA and Federal Register Notice approvals
Glenda Franich, Visitor Services and Communication, National Wildlife Refuge System, Region 1	Document and related products (e.g., planning update) print management; CCP cover design
Brock Hoenes, Wildlife Biologist, Washington Department of Fish and Wildlife	Subject matter expert on invasive species; reviewer
Jeff Holm, Chief, Branch of Geospatial Services, Assets, and Transportation, National Wildlife Refuge System, Region 1	Review of transportation-related goals/objective/strategies
Kay Kier-Haggenjos, Technical Writer/Editor, National Wildlife Refuge System, Region 1	Processing Federal Register notices; development of related products (e.g., planning updates); website management
Charles Houghten, Chief, Lands Division, National Wildlife Refuge System, Region 1	CCP advisor for realty, planning policy and guidance; reviewer

Name and title	CCP Contributions
Linda Kunze, Washington Department of Natural Resources (retired)	Subject matter expert on wetland habitats, rare species; scientific information gathering; preliminary writing and documentation
Judy Lantor, Fish and Wildlife Biologist, Environmental Assessment and Restoration, USFWS Washington Fish and Wildlife Office, Region 1	Subject matter expert on grassland, prairie habitats
Deanna Lynch, Fish and Wildlife Biologist, Listing and Recovery, USFWS Washington Fish and Wildlife Office, Region 1	Subject matter expert on Oregon spotted frog ecology, wetland habitats, invasive species, resource management
Mike Marxen, Former Branch Chief, Visitor Services, National Wildlife Refuge System, Region 1	Visitor services review and guidance on public use goals/objectives/strategies; assistance with related alternatives development workshop
Nicole McCarthy, Technical Writer/Editor, National Wildlife Refuge System, Region 1	Technical edit and review of CCP; pre-print production
Virginia Parks, Archaeologist, National Wildlife Refuge System, Region 1	Cultural and historic resources goals/objectives/strategies and affected environment and environmental consequences
Charlie Pelizza, Branch Chief, Conservation Planning and Visitor Services, National Wildlife Refuge System, Region 1, <i>replaced</i> Scott McCarthy, Branch Chief, Conservation Planning, National Wildlife Refuge System, Region 1 (retired)	CCP advisor for planning policy and guidance; planning workload priorities; coordination with other divisions; reviewer
Sylvia Pelizza, Refuge Supervisor, National Wildlife Refuge System, Region 1, <i>replaced</i> Bob Flores, Refuge Supervisor, National Wildlife Refuge System, Region 1 (retired)	Assist with coordination; reviewer of document and related products; guidance on overall process and components
Miranda Plumb, Fish and Wildlife Biologist, Environmental Assessment and Restoration, USFWS Washington Fish and Wildlife Office, Region 1	Subject matter expert on fish, aquatic habitats; reviewer
Kayla Saville, Park Ranger, Nisqually National Wildlife Refuge Complex (departed)	Gathering preliminary information; draft writing, organizing, and documentation
Michelle Tirhi, District Wildlife Biologist, Washington Department of Fish and Wildlife	Subject matter expert on Oregon spotted frog, wetland habitats, invasive species, grasslands, elk, resource management
Brad Thompson, Division Manager, Listing and Recovery, USFWS Washington Fish and Wildlife Office, Region 1	Subject matter expert on fish, freshwater invertebrates, aquatic habitats; advised on communications and interpretation
Robyn Thorson, Regional Director, National Wildlife Refuge System, Region 1	Final decision-maker, CCP/EA and Federal Register Notice approvals

Name and title	CCP Contributions
Kim Trust, Deputy Regional Refuge Chief, National Wildlife Refuge System, Region 1, <i>replaced</i>	CCP advisor
Ben Harrison, Deputy Regional Refuge Chief (formerly Division Chief, Natural and Cultural Resources), National Wildlife Refuge System, Region 1, (retired)	CCP advisor, reviewer of policy, AUF, CDs, and wilderness

Appendix J. Public Involvement

J.1 Summary of Public Involvement

The Comprehensive Conservation Plan (CCP) process for Grays Harbor National Wildlife Refuge (NWR or Refuge) was undertaken simultaneously with the Black River Unit (Unit) of Billy Frank Jr. Nisqually National Wildlife Refuge. The draft CCP and Environmental Assessment (EA) for the Refuge and the Unit was published in September 2016. The public involvement described below includes references to Grays Harbor NWR and the Black River Unit.

The planning process began in 2010. A core team and an expanded team were formed to guide development of the CCP (see Appendix I). However, CCP development was not restricted to just these teams; we also held workshops and meetings with local, State, and Federal agencies, other organizations, and the public.

Public scoping was initiated in 2011 to help us to further identify issues and priorities to consider during CCP development. The first planning update was published and distributed on May 6, 2011, to a mailing list of approximately 500 recipients. A press release was also sent to 25 media sources for distribution. In addition, the planning update was posted on the Refuges' websites and copies were available at public open houses (see below), along with a comment form.

The U.S. Fish and Wildlife Service (Service) held two public open houses: May 18, 2011, in Aberdeen, Washington, and May 19, 2011, in Littlerock, Washington. Press releases notifying the public of the open houses were sent to several daily newspapers (including The Daily World and The Olympian). In addition, The Daily World and The Olympian published articles regarding the planning meetings.

At each open house, the Nisqually NWR Complex project leader gave a brief presentation and explained the CCP process; the Refuge and Unit purposes and current management; and preliminary management issues, concerns, and opportunities that had been identified early in the planning process. At the end of the presentation, Refuge and Unit staff were stationed at tables to write down comments and questions on flipcharts. A total of 44 private citizens and representatives from various organizations attended the open houses, providing comments on the issues and opportunities presented. Eight people attended the open house in Aberdeen and 36 people attended in Littlerock.

In addition to comments recorded by staff during the public open house meetings, a total of 18 written responses were received from individuals or organizations from May 6 through June 2011. Ten of these were comment forms returned by mail or fax, at the public meetings, or hand delivered to the Refuge or Complex. Five comments/letters were sent via email and three were letters received through the postal service.

On June 8, 2011, a notice of intent to prepare a comprehensive conservation plan and associated National Environmental Protection Act document was published in the Federal Register (76 FR 33339).

The Service provided newsletters and planning updates at strategic points during the planning process to keep the public updated. The mailing list grew from the initial scoping of approximately 300 recipients to over 470 recipients.

The draft CCP/EA was issued for public review and comment on October 26, 2016. The availability of the plan was announced through a notice in the Federal Register (October 26, 2016, 81 FR 74476) and via direct contact with individuals and organizations on our mailing list. The plan was made available for downloading on the Refuges' websites and was made available upon request in CD or printed format. Printed copies of the draft CCP/EA were available at local public libraries, and upon request. Comments were received from 8 entities during the 31-day public comment period held October 26, 2016, through November 25, 2016. All changes made as a result of public and agency comments were documented. A summary of public involvement is included in Appendix J; public comments on the draft CCP/EA and the Service's responses to comments are included in Appendix M.

To date, the four planning updates distributed to the public included:

- Planning Update 1 (May 2011): Announced the start of public scoping for the CCP.
- Planning Update 2 (December 2012): Provided information on public comments received during public scoping.
- Planning Update 3 (June 2013): Provided the preliminary management alternatives.
- Planning Update 4 (October 2016): Announced the availability of the draft CCP/EA.

A fifth planning update will be distributed alongside of a Federal Register notice, press release, direct mailings, and website postings announcing the availability of the CCP and Finding of No Significant Impact.

J.2 Issues Identification during Public Scoping

The preliminary issues distributed with Planning Update 1 and presented during the public open house meetings in 2011 posed the following questions for Grays Harbor NWR:

- **Habitat Management and Restoration.** *What actions are needed to sustain and restore priority species and habitats over the next 15 years? How is sedimentation affecting shorebird habitat quality? What will the effects of climate change and sea level rise have on Refuge habitats and species?*
- **Invasive Species Control.** *Invasive plant species degrade habitat quality for shorebirds, migratory birds, and many other fish and wildlife species. Invasive animals may compete with native fish and wildlife for limited resources. How can we reduce the incidence and spread of invasive species?*
- **Visitor Services and Education Opportunities.** *Wildlife observation, interpretation, photography, and environmental education are provided at Grays Harbor NWR. How can we improve these services and programs? What visitor services facilities are needed or planned? What volunteer programs and partnerships can be developed or strengthened to improve outreach and education? Trespassing, vandalism, and other illegal activities take place at the Refuge. What can be done to reduce these activities and improve wildlife and habitat protection?*

Additional public issues, concerns, and opportunities raised during public scoping included the following:

- **Hunting and Fishing Opportunities.** *Are there opportunities to provide hunting and/or fishing at the Refuge?*
- **Contaminants.** *What can be done to address potential sources and impacts of contaminants on and around the Refuge?*

The preliminary issues distributed with Planning Update 1 and presented during the public open house meetings in 2011 posed the following questions for the Black River Unit of Billy Frank Jr. Nisqually National Wildlife Refuge:

- **Land and Water Protection.** *What actions are needed to sustain and restore priority species and habitats over the next 15 years? How can we help improve habitat protection and connectivity and reduce habitat fragmentation? How can we improve water quality and quantity in the Black River system for fish and wildlife?*
- **Habitat Management and Restoration.** *Most habitats have been altered by human actions and are in need of management and restoration to increase value as fish and wildlife habitat. What actions will help provide important information on key species, habitat composition, and the management prescription needed for the Black River Unit? What will the effects of climate change and sea level rise have on Unit habitats and species? How can we enhance Oregon spotted frog recovery?*

Invasive Species Control. *Invasive plant species degrade habitat quality for migratory birds, fish, amphibians, and many other forms of fish and wildlife. Nonnative animals may compete with native fish and wildlife for limited resources. How can we reduce the incidence and spread of invasive species?*

- **Visitor Services and Education Opportunities.** *The Black River Unit has remained largely closed because of the fragmented nature of current Unit land ownership. Trespassing, vandalism, and other illegal activities take place. How can we reduce these activities and improve wildlife habitat and protection? What wildlife-dependent priority public uses should be considered at the Unit?*

Additional public issues, concerns, and opportunities raised during public scoping included the following:

- **Visitor Facilities/Enhancements (Boats and River Access).** *What opportunities are there for improving access to Black River, boat launching, and parking on the Unit?*
- **Education, Outreach, and Volunteer Programs.** *What opportunities are there for providing environmental education, interpretation, and outreach activities focused on the Black River Unit? How can partnerships and volunteers be developed to support visitor service programs?*
- **Hunting and Fishing.** *Are there opportunities to provide hunting and/or fishing?*
- **Conservation Partnership.** *How can the Service develop a coordinated approach with other groups and agencies including Washington Department of Fish and Wildlife, United States Coast Guard, Washington Department of Natural Resources, Washington Department of*

Ecology, Soil Conservation Service, Thurston County, Fish and Wildlife Service Ecological Services, law enforcement agencies, Capitol Land Trust, and The Nature Conservancy to plan and manage for the protection, restoration, and interpretation of lands and waters within the Black River corridor?

Appendix K. List of Black River Unit Species

This is a list of species that have been documented to be currently on the Unit or are strongly suspected to be. More species are expected to be added upon conducting additional baseline monitoring, surveys, and scientific studies.

Birds	
Common Name	Scientific Name
Waterfowl	
Greater White-fronted Goose	<i>Anser albifrons</i>
Cackling Goose	<i>Branta hutchinsii</i>
Canada Goose	<i>Branta canadensis</i>
Wood Duck	<i>Aix sponsa</i>
Eurasian Wigeon ^{^*}	<i>Anas penelope</i>
American Wigeon	<i>Anas americana</i>
Mallard	<i>Anas platyrhynchos</i>
Cinnamon Teal	<i>Anas cyanoptera</i>
Northern Shoveler	<i>Ana clypeata</i>
Northern Pintail	<i>Anas acuta</i>
Green-winged Teal	<i>Anas crecca</i>
Ring-necked Duck	<i>Aythya collaris</i>
Bufflehead	<i>Bucephala albeola</i>
Hooded Merganser	<i>Lophodytes cucullatus</i>
Pheasants, Grouse	
California quail	<i>Callipepla californica</i>
Ring-necked Pheasant ^{^*}	<i>Phasianus colchicus</i>
Ruffed Grouse	<i>Bonasa umbellus</i>
Dusky Grouse	<i>Dendragapus obscurus</i>
Grebes	
Pied-billed Grebe	<i>Podilymbus podiceps</i>
Pelicans, Cormorants, Herons	
American Bittern	<i>Botaurus lentiginosus</i>
Great Blue Heron	<i>Ardea herodias</i>
Green Heron	<i>Butorides virescens</i>
Raptors, Vultures	
Turkey Vulture	<i>Cathartes aura</i>
Osprey	<i>Pandion haliaetus</i>
Bald Eagle	<i>Haliaeetus leucocephalus</i>
Northern Harrier	<i>Circus cyaneus</i>
Sharp-shinned Hawk [^]	<i>Accipiter striatus</i>
Cooper's Hawk [^]	<i>Accipiter cooperii</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>
American Kestrel	<i>Falco sparverius</i>

Common Name	Scientific Name
Rails, Coots, Cranes	
Virginia Rail	<i>Rallus limicola</i>
Sora	<i>Porzana carolina</i>
American Coot	<i>Fulica americana</i>
Shorebirds	
Black-bellied Plover	<i>Pluvialis squatarola</i>
Semipalmated Plover	<i>Charadrius semipalmatus</i>
Killdeer	<i>Charadrius vociferus</i>
Greater Yellowlegs	<i>Tringa melanoleuca</i>
Western Sandpiper	<i>Calidris mauri</i>
Least Sandpiper	<i>Calidris minutilla</i>
Dunlin	<i>Calidris alpina</i>
Long-billed Dowitcher^	<i>Limnodromus scolopaceus</i>
Wilson's Snipe	<i>Gallinago delicata</i>
Gulls	
Gull spp.	
Doves, Pigeons	
Rock Pigeon^*	<i>Columba livia</i>
Band-tailed Pigeon	<i>Columba fasciata</i>
Eurasian Collared-Dove^*	<i>Streptopelia decaocto</i>
Mourning Dove	<i>Zenaida macroura</i>
Owls	
Barn Owl	<i>Tyto alba</i>
Western Screech-Owl^	<i>Otus kennicottii</i>
Great Horned Owl	<i>Bubo virginianus</i>
Short-eared Owl^	<i>Asio flammeus</i>
Northern Saw-whet Owl^	<i>Aegolius acadicus</i>
Swifts, Hummingbirds	
Vaux's Swift^	<i>Chaetura vauxi</i>
Rufous Hummingbird	<i>Selaphorus rufus</i>
Kingfishers	
Belted Kingfisher	<i>Megaceryle Alcyon</i>
Woodpecker	
Red-breasted Sapsucker	<i>Sphyrapicus ruber</i>
Downy Woodpecker	<i>Picoides pubescens</i>
Hairy Woodpecker^	<i>Picoides villosus</i>
Northern Flicker	<i>Colaptes auratus</i>
Pileated Woodpecker	<i>Dryocopus pileatus</i>
Flycatchers	
Olive-sided Flycatcher^	<i>Contopus cooperi</i>
Western Wood-pewee	<i>Contopus sordidulus</i>
Willow Flycatcher	<i>Empidonax traillii</i>

Common Name	Scientific Name
Pacific-slope Flycatcher	<i>E. difficilis</i>
Vireos	
Cassin's Vireo	<i>Vireo cassinii</i>
Hutton's Vireo^	<i>Vireo huttoni</i>
Warbling Vireo	<i>Vireo gilvus</i>
Red-eyed Vireo	<i>Vireo olivaceus</i>
Corvids	
Steller's Jay	<i>Cyanocitta stelleri</i>
Western Scrub Jay	<i>Aphelocoma californica</i>
American Crow	<i>Corvus brachyrhynchos</i>
Common Raven	<i>Corvus corax</i>
Swallows	
Purple Martin	<i>Progne subis</i>
Tree Swallow	<i>Tachycineta bicolor</i>
Violet-green Swallow	<i>Tachycineta thalassina</i>
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>
Barn Swallow	<i>Hirundo rustica</i>
Chickadees and Allies	
Black-capped Chickadee	<i>Poecile atricapilla</i>
Chesnut-backed Chickadee	<i>Poecile rufescens</i>
Bushtit	<i>Psaltirparus minimus</i>
Creepers, Wrens	
Red-breasted Nuthatch	<i>Sitta canadensis</i>
Brown Creeper	<i>Certhia americana</i>
Bewick's Wren	<i>Thryomanes bewickii</i>
House Wren	<i>Troglodytes aedon</i>
Pacific Wren	<i>Troglodytes pacificus</i>
Marsh Wren	<i>Cistothorus palustris</i>
Kinglets	
Golden-crowned Kinglet	<i>Regulus satrapa</i>
Ruby-crowned Kinglet^	<i>Regulus calendula</i>
Thrushes, Pipits	
Swainson's Thrush	<i>Catharus ustulatus</i>
Hermit Thrush	<i>Catharus guttatus</i>
American Robin	<i>Turdus migratorius</i>
Varied Thrush	<i>Ixoreus naevius</i>
Waxwings, Starlings	
European Starling*	<i>Sturnus vulgaris</i>
Cedar Waxwing	<i>Bombycilla cedrorum</i>
Warblers	
Orange-crowned Warbler	<i>Vermivora celata</i>

Common Name	Scientific Name
Yellow Warbler	<i>Dendroica petechia</i>
Yellow-rumped Warbler	<i>Dendroica coronata</i>
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>
Townsend's Warbler^	<i>Dendroica townsendi</i>
MacGillivray's Warbler^	<i>Oporornis tolmiei</i>
Common Yellowthroat	<i>Geothlypis trichas</i>
Wilson's Warbler	<i>Wilsonia pusilla</i>
Towhees, Sparrows	
Spotted Towhee	<i>Pipilo maculatus</i>
Savannah Sparrow	<i>Passerculus sandwichensis</i>
Fox Sparrow^	<i>Passerella iliaca</i>
Song Sparrow	<i>Melospiza melodia</i>
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>
Golden-crowned Sparrow^	<i>Zonotrichia atricapilla</i>
Dark-eyed Junco	<i>Junco hyemalis</i>
Tanager and Allies	
Western Tanager	<i>Piranga ludoviciana</i>
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>
Lazuli Bunting^	<i>Passerina amoena</i>
Blackbirds	
Red-winged Blackbird	<i>Agelaius phoeniceus</i>
Western Meadowlark^	<i>Sturnella neglecta</i>
Brewer's blackbird^	<i>Euphagus cyanocephalus</i>
Brown-headed Cowbird*	<i>Molothrus ater</i>
Bullocks Oriole	<i>Icterus bullockii</i>
Finches	
Purple Finch	<i>Carpodacus purpureus</i>
House Finch	<i>Carpodacus mexicanus</i>
Red Crossbill^	<i>Loxia Curvirostra</i>
Pine Siskin	<i>Carduelis pinus</i>
American Goldfinch	<i>Carduelis tristis</i>
Evening Grosbeak	<i>Coccothraustes vespertinus</i>
Old World Sparrows	
House Sparrow*	<i>Passer domesticus</i>

Mammals	
Common Name	Scientific Name
Bat, Big Brown	<i>Eptesicus fuscus</i>
Bat, California	<i>Myotis californicus</i>
Bat^, Keen's	<i>Myotis keenii</i>
Bat, Little Brown	<i>Myotis lucifugus</i>
Bat, Long-eared	<i>Myotis evotis</i>

Common Name	Scientific Name
Bat, Long-legged	<i>Myotis volans</i>
Bat, Silver-haired	<i>Lasionycteris noctivagans</i>
Bat, Townsend's Big-eared^	<i>Plecotus townsendii</i>
Bat, Yuma	<i>Myotis yumanensis</i>
Bear, Black	<i>Ursus americanus</i>
Beaver	<i>Castor canadensis</i>
Beaver^, Mountain	<i>Aplodontia rufa</i>
Bobcat^	<i>Lynx rufus</i>
Chipmunk, Townsend's	<i>Tamias townsendii</i>
Cottontail*, Eastern	<i>Sylvilagus floridanus</i>
Cougar^	<i>Puma concolor</i>
Coyote	<i>Canis latrans</i>
Deer, Columbian Black-tailed	<i>Odocoileus hemionus columbianus</i>
Elk, Roosevelt	<i>Cervus elaphus</i>
Mink	<i>Neovison vison</i>
Mole, Coast	<i>Scapanus orarius</i>
Mole^, Townsend's	<i>Scapanus townsendii</i>
Mole, Shrew	<i>Neurotrichus gibbsii</i>
Mouse, Deer	<i>Peromyscus sp.</i>
Mouse^, Pacific jumping	<i>Zapus trinotatus</i>
Muskrat	<i>Ondatra zibethicus</i>
Nutria*	<i>Myocastor coypus</i>
Opossum^*, Virginia	<i>Didelphis virginiana</i>
Otter, River	<i>Lontra canadensis</i>
Shrew, Dusky	<i>Sorex monticolus</i>
Shrew^, Masked	<i>Sorex cinereus</i>
Shrew^, Trowbridger's	<i>Sorex trowbridgii</i>
Shrew, Vagrant	<i>Sorex vagrans</i>
Shrew, Water	<i>Sorex bendirii</i>
Skunk^, Spotted	<i>Spilogale gracilis</i>
Skunk^, Striped	<i>Mephitis mephitis</i>
Squirrel, Douglas	<i>Tamiasciurus douglasii</i>
Squirrel*, Eastern Gray	<i>Sciurus carolinensis</i>
Vole, Creeping	<i>Microtus oregonii</i>
Vole^, Gapper's red-backed	<i>Clethrionomys gapperi</i>
Vole^, Long-tailed	<i>Microtus longicaudus</i>
Vole, Townsend's	<i>Microtus townsendii</i>
Weasel, Long-tailed	<i>Mustela frenata</i>
Weasel, Short-tailed (Ermine)	<i>Mustela erminea</i>
Woodrat^, Bushy-tailed	<i>Neotoma cinerea</i>

Reptiles and Amphibians

Common Name	Scientific Name
Boa^, Rosy	<i>Charina bottae</i>
Frog*, Bull	<i>Rana catesbeiana</i>
Frog, Pacific chorus (Or Pacific tree frog)	<i>Hyla regilla</i>
Frog, Red-legged	<i>Rana aurora</i>
Frog, Oregon spotted	<i>Rana pretiosa</i>
Lizard, Northern Alligator	<i>Elgaria coerulea</i>
Lizard^, Western fence	<i>Sceloporus occidentalis</i>
Newt, Roughskin	<i>Taricha granulosa</i>
Salamander, Long-toed	<i>Ambystoma macrodactylum</i>
Salamander, Northwestern	<i>Ambystoma gracile</i>
Snake, Garter	<i>Thamnophis sp.</i>
Snake^, Gopher	<i>Pituophis catenifer</i>
Turtle*, Red-eared Slider	<i>Trachemys scripta elegans</i>
Turtle^*, Painted	<i>Chrysemys picta</i>

Fish

Common Name	Scientific Name
Bass*, Largemouth	<i>Micropterus salmoides</i>
Bass^*, Smallmouth	<i>Micropterus dolomieu</i>
Bass*, Rock	<i>Ambloplites rupestris</i>
Bluegill*	<i>Lepomis macrochirus</i>
Bullhead*, Brown	<i>Ameiurus nebulosus</i>
Crappie*, Black	<i>Pomoxis nigromaculatus</i>
Dace, Speckled	<i>Rhinichthys osculus</i>
Lamprey, Pacific	<i>Lampetra tridentata</i>
Lamprey, Western Brook	<i>Lampetra richardsoni</i>
Lamprey^, Pacific	<i>Lampetra tridentata</i>
Lamprey^, Western Brook	<i>Lampetra richardsoni</i>
Mudminnow, Olympic	<i>Novumbra hubbsi</i>
Peamouth	<i>Mylocheilus caurinus</i>
Perch*, Yellow	<i>Perca flavescens</i>
Pikeminnow*, Northern	<i>Ptychocheilus oregonensis</i>
Pumpkinseed*	<i>Lepomis gibbosus</i>
Salmon, Chinook	<i>Oncorhynchus tshawytscha</i>
Salmon, Chum	<i>Oncorhynchus keta</i>
Salmon, Coho	<i>Oncorhynchus kisutch</i>
Sculpin, Prickly	<i>Cottus asper</i>
Sculpin, Reticulate	<i>Cottus perplexus</i>
Sculpin, Riffle	<i>Cottus gulosus</i>
Sculpin, Torrent	<i>Cottus rhotheus</i>

Common Name	Scientific Name
Shad*, American	<i>Alosa sapidissima</i>
Shiner, Redside	<i>Richardsonius balteatus</i>
Steelhead	<i>Oncorhynchus mykiss</i>
Stickleback, Three-spined	<i>Gasterosteus aculeatus</i>
Sturgeon, Spp Unknown	<i>Acipenseridae</i>
Sucker, Largescale	<i>Catostomus macrocheilus</i>
Trout, Cutthroat (Anadromous)	<i>Oncorhynchus clarki</i>
Trout, Cutthroat (Resident)	<i>Oncorhynchus clarki</i>
Trout, Steelhead	<i>Oncorhynchus mykiss</i>
Trout^*, Rainbow	<i>Oncorhynchus mykiss</i>
Whitefish, Mountain	<i>Prosopium williamsoni</i>

Mussels and Sponges	
Common Name	Scientific Name
Floater, Oregon	<i>Anodonta oregonensis</i>
Sponge, Freshwater (no common name).	<i>Spongilla lacustris</i>
Crayfish, Signal	<i>Pacifasticus leniusculus</i>

Plants	
Common Names	Scientific Names
Trees	
Alder, Gray	<i>Alnus incana</i>
Alder, Red	<i>Alnus rubra</i>
Apple, Cultivated*	<i>Pyrus malus</i>
Ash, Oregon	<i>Fraxinus latifolia</i>
Aspen, Quaking	<i>Populus tremuloides</i>
Cascara	<i>Rhamnus purshiana</i>
Cedar, Western Red	<i>Thuja plicata</i>
Cherry*, Sweet	<i>Prunus avium</i>
Cherry, Bitter	<i>Prunus emarginata</i>
Cottonwood, Black	<i>Populus balsamifera</i>
Crabapple, Pacific	<i>Malus fusca</i>
Dogwood, Pacific	<i>Cornus nuttalli</i>
Fir, Douglas	<i>Pseudotsuga menziesii</i>
Fir, Grand	<i>Abies grandis</i>
Hemlock, Western	<i>Tsuga heterophylla</i>
Holly*, English	<i>Ilex aquifolium</i>
Locust*, Black	<i>Robinia pseudoacacia</i>
Madrone	<i>Arbutus menziesii</i>
Maple, Big-leaf	<i>Acer macrophyllum</i>
Oak, Garry (Or Oregon)	<i>Quercus garryana</i>

Common Names	Scientific Names
Pear*, Cultivated	<i>Pyrus communis</i>
Pine, Lodgepole	<i>Pinus contorta</i>
Pine, Ponderosa	<i>Pinus ponderosa</i>
Plum*, Cultivated	<i>Prunus domestica</i>
Spruce, Sitka	<i>Picea sitchensis</i>
Willow, Geyer	<i>Salix geyeriana</i>
Willow, Hooker	<i>Salix hookeriana</i>
Willow, Pacific	<i>Salix lucida</i>
Willow, Scouler's	<i>Salix scouleriana</i>
Willow, Sitka	<i>Salix sitchensis</i>
Shrubs, Brambles, Vines	
Birch, Bog	<i>Betula glandulosa</i>
Bittersweet*, European	<i>Solanum dulcamara</i>
Blackberry*, Evergreen	<i>Rubus laciniatus</i>
Blackberry*, Himalayan	<i>Rubus armeniacus</i>
Blackberry, Trailing	<i>Rubus ursinus</i>
Blueberry*, Cultivated	<i>Vaccinium sp.</i>
Bog-laurel, Western	<i>Kalmia microphylla</i>
Broom*, Scot's (Or Scotch)	<i>Cytisus scoparius</i>
Bush*,** Butterfly	<i>Buddleia davidii</i>
Cranberry, Highbush	<i>Viburnum edule</i>
Cranberry, Bog	<i>Vaccinium oxycoccus</i>
Currant, Wax	<i>Ribes divaricatum</i>
Dogwood, Red-Osier	<i>Cornus sericea</i>
Elderberry, Red	<i>Sambucus racemosa</i>
Hawthorn*, Ornamental	<i>Crataegus sp.</i>
Hazel, Beaked	<i>Corylus cornuta</i>
Holly*, English	<i>Ilex aquifolium</i>
Honeysuckle, Bearberry	<i>Lonicera involucrata</i>
Honeysuckle, Orange	<i>Lonicera ciliosa.</i>
Huckleberry, Red	<i>Vaccinium parvifolium</i>
Ivy*, English	<i>Hedera helix</i>
Ivy*, Irish	<i>Hedera hibernica</i>
Juniper*, Ornamental	<i>Juniperus sp.</i>
Kinnikinnick	<i>Arctostaphylos uva-ursi</i>
Labrador-Tea	<i>Ledum groenlandicum</i>
Laurel^*,** Spurge	<i>Daphne laureola</i>
Lilac*	<i>Syringa sp.</i>
Maple*, Japanese	<i>Acer palmatum</i>
Maple, Vine	<i>Acer circinatum</i>
Nightshade*, Black	<i>Solanum americanum</i>
Ninebark, Pacific	<i>Physocarpus capitatus</i>

Common Names	Scientific Names
Ocean-spray	<i>Holodiscus discolor</i>
Oregon-grape, Dull	<i>Berberis nervosa</i>
Oregon-grape, Tall	<i>Berberis aquifolium</i>
Plum, Indian	<i>Oemleria cerasiformis</i>
Rhododendron*, Ornamental	<i>Rhododendron sp.</i>
Rose*, Ornamental	<i>Rosa sp.</i>
Rose, Baldhip	<i>Rosa gymnocarpa</i>
Rose, Clustered (Or Swamp)	<i>Rosa pisocarpa</i>
Rose, Nootka	<i>Rosa nutkana</i>
Salal	<i>Gaultheria shallon</i>
Salmonberry	<i>Rubus spectabilis</i>
Serviceberry	<i>Amelanchier alnifolia</i>
Snowberry, Common	<i>Symphoricarpos albus</i>
Snowberry, Creeping	<i>Symphoricarpos hesperius</i>
Spiraea, Douglas'	<i>Spiraea douglasii</i>
Thimbleberry	<i>Rubus parviflorus</i>
Twinflower, Western	<i>Linnaea borealis</i>
Forbes (Herbaceous)	
Aster, Douglas	<i>Aster subspicatus</i>
Baneberry	<i>Actaea rubra</i>
Bedstraw, Small	<i>Galium trifidum</i>
Bedstraw, Sweetscented	<i>Galium triflorum</i>
Beggar-ticks, Nodding	<i>Bidens cernua</i>
Bindweed*, Field	<i>Convolvulus arvensis</i>
Bindweed*, Hedge	<i>Convolvulus sepium</i>
Bleeding Heart, Pacific	<i>Dicentra formosa</i>
Brooklime, American	<i>Veronica americana</i>
Bugleweed, Northern	<i>Lycopus uniflorus</i>
Bunchberry	<i>Cornus canadensis</i>
Burdock*,** Common	<i>Arctium minus</i>
Bur-reed, Narrow-leaved	<i>Sparganium angustifolium</i>
Buttercup*, Creeping	<i>Ranunculus repens</i>
Buttercup, Western	<i>Ranunculus occidentalis</i>
Campion*, Bladder	<i>Silene vulgaris</i>
Carrot, Wild	<i>Daucus carota</i>
Cat's-Ear*, Hairy [Spotted]	<i>Hypochaeris radicata</i>
Chamomile*, Stinking	<i>Anthemis cotula</i>
Chervil*, Burr	<i>Anthriscus caucalis</i>
Chervil*,** Wild	<i>Anthriscus sylvestris</i>
Chicory	<i>Chicorium intybus</i>
Cinquefoil, Marsh	<i>Potentilla palustris</i>
Cleavers	<i>Galium aparine</i>

Common Names	Scientific Names
Clover*, Red	<i>Trifolium pratense</i>
Clover*, White	<i>Trifolium repens</i>
Colt's Foot	<i>Petasites palmatus</i>
Coontail	<i>Ceratophyllum demersum</i>
Corydalis, Scouler's	<i>Corydalis scouleri</i>
Cottongrass	<i>Eriophorum chammisonis</i>
Creeping Charlie*	<i>Glechoma hederacea</i>
Cudweed*, Marsh	<i>Gnaphalium uliginosum</i>
Currant, Wax	<i>Ribes divaricatum</i>
Dandelion*, Common	<i>Taraxacum officinale</i>
Dock*, Curly	<i>Rumex crispus</i>
Dock, Western	<i>Rumex occidentalis</i>
Duckweed, Small	<i>Lemna minor</i>
Fairy-Bell, Hooker	<i>Disporum hookeri</i>
False Lily-of-the-Valley	<i>Maianthemum dilatatum</i>
False Solomon-Seal, Star-flowered	<i>Smilacina stellata</i>
Fireweed*	<i>Epilobium angustifolium</i>
Forget-me-Not, Small Water	<i>Myosotis laxa</i>
Foxglove*	<i>Digitalis purpurea</i>
Fringecup	<i>Tellima grandiflora.</i>
Gentian, King	<i>Gentiana sceptrum</i>
Ginger, Wild	<i>Asarum caudatum</i>
Goldenrod, Canada	<i>Solidago canadensis</i>
Groundsel*, Wood	<i>Senecio vulgaris</i>
Hawksbeard*, Smooth	<i>Crepis capillaris</i>
Hedge-Nettle , Cooley's	<i>Stachys cooleyae</i>
Hemlock*, **, Poison	<i>Conium maculatum</i>
Hogweed^*, **, Giant	<i>Heracleum mantegazzianum</i>
Inside-out Flower	<i>Vancouveria hexandra</i>
Iris*, ** Yellow flag	<i>Iris pseudacorus</i>
Knapweed^* Spp.	<i>Centaurea spp.</i>
Kneeling Angelica	<i>Angelica genuflexa</i>
Knotweed*, ** (Japanese, Giant, Bohemian, Himalayan, & Hybrids)	<i>Polygonum spp.</i>
Ladysthumb*, Spotted	<i>Polygonum persicaria</i>
Lamb's-quarters	<i>Chenopodium album</i>
Lettuce*, Prickly	<i>Lactuca serriola</i>
Lettuce, Wall	<i>Lactuca muralis</i>
Lily*, Ornamental	<i>Lilium sp.</i>
Loosestrife, Purple	<i>Lythrum salicaria</i>
Marsh Yellow Cress	<i>Rorippa palustris</i>
Meadowrue, Western	<i>Thalictrum occidentale</i>

Common Names	Scientific Names
Miner's Lettuce, Siberian (Or Western Spring-Beauty Or Candyflower)	<i>Claytonia sibirica</i>
Mint, Field	<i>Mentha arvensis</i>
Mint, Spear	<i>Mentha spicata</i>
Monkeyflower, Yellow	<i>Mimulus guttata</i>
Mullein*, Common	<i>Verbascum thapsus</i>
Mustard Spp. *	<i>Brassica spp.</i>
Mustard, Hedge	<i>Sisymbrium officinale</i>
Nettle, Stinging	<i>Urtica dioica</i>
Nipplewort*	<i>Lapsana communis</i>
Old man's Beard^*	<i>Clematis vitalba</i>
Orchid, White Bog	<i>Habenaria dilatata</i>
Oxeye-daisy*	<i>Leucanthemum</i>
Parentucellia*, Yellow	<i>Parentucellia viscosa</i>
Pathfinder	<i>Adenocaulon bicolor</i>
Pea, Perennial	<i>Lathyrus latifolius</i>
Pearly Everlasting	<i>Anaphalis margaritacea</i>
Pennywort, Water	<i>Hydrocotyle ranunculoides</i>
Phacelia	<i>Phacelia sp.</i>
Pineapple Weed*	<i>Matricaria discoidea</i>
Plantain*, Common	<i>Plantago major</i>
Plantain*, English	<i>Plantago lanceolata</i>
Pondweed, Fern Leaf	<i>Potamogeton robbinsii</i>
Pondweed, Sago	<i>Potamogeton pectinatus</i>
Purslane*, Water	<i>Ludwigia palustris</i>
Queen-Anne's-lace*	<i>Daucus carota</i>
Ragweed*, Common	<i>Ambrosia artemisiifolia</i>
Ragwort*, Tansy	<i>Senecio jacobaea</i>
Sandwort, Big-leaved	<i>Moehringia macrophylla</i>
Self-heal	<i>Prunella vulgaris</i>
Shepherd's Purse*	<i>Capsella bursa-pastoris</i>
Skullcap, Blue	<i>Scutellaria lateriflora</i>
Skullcap, Mad-Dog	<i>Scutellaria lateriflora</i>
Skunk-cabbage	<i>Lysichiton americanum</i>
Smartweed, Willow	<i>Polygonum lapathifolium</i>
Sorrel*, Sheep	<i>Rumex acetosella</i>
Sow-thistle*, Prickly	<i>Sonchus asper</i>
St. John's-wort*, Common	<i>Hypericum perforatum</i>
Starflower, Broad-Leaved	<i>Trientalis latifolia</i>
Starflower, Western	<i>Trientalis borealis</i>
Stork's-bill*, Common	<i>Erodium cicutarium</i>
Strawberry, Wild	<i>Fragaria virginiana</i>

Common Names	Scientific Names
Strawberry, Woods	<i>Fragaria vesca</i>
Sundew, Round-Leaved	<i>Drosera rotundifolia</i>
Sweet-cicely, Mountain	<i>Osmorhiza chilensis</i>
Sweet-clover*, White	<i>Melilotus alba</i>
Tapegrass*, Water Celery	<i>Vallisneria americana</i>
Thistle*,**, Bull	<i>Cirsium vulgare</i>
Thistle*,**, Canada	<i>Cirsium arvense</i>
Touch-me-Not	<i>Impatiens noli-tangere</i>
Trail-plant	<i>Adenocaulon bicolor</i>
Trefoil*,Birdsfoot-	<i>Lotus corniculatus</i>
Trefoil, Big	<i>Lotus uliginosis</i>
Trillium, Western	<i>Trillium ovatum</i>
Vanilla-leaf	<i>Achlys triphylla</i>
Vetch Spp.	<i>Vicia spp.</i>
Violet Spp.	<i>Viola spp.</i>
Violet, Marsh	<i>Viola palustris</i>
Water hemlock, Western	<i>Cicuta douglasii</i>
Water-carpet, Ground Ivy-leaved	<i>Chrysosplenium glechomaefolium</i>
Watercress, white*	<i>Rorippa nasturtium-aquaticum</i>
Waterleaf, Pacific	<i>Hydrophyllum tenuipes</i>
Water-lily*	<i>Nymphaea sp.</i>
Water-lily, Yellow (Or Spatterdock)	<i>Nuphar polysepalum</i>
Water-parsley, Pacific	<i>Oenanthe sarmentosa</i>
Waterpepper	<i>Polygonum hydropiperoides</i>
Waterplantain, American	<i>Alisma plantago-aquatica</i>
Water-shield	<i>Brasenia schreberi</i>
Water-starwort, Diverse-leaved	<i>Callitriche heterophylla</i>
Waterweed, Common (Or American)	<i>Elodea canadensis</i>
Willow-herb*, Hairy	<i>Epilobium ciliatum</i>
Yarrow	<i>Achillea millefolium</i>
Yerba Buena	<i>Satureja douglasii</i>
Youth-on-Age	<i>Tolmiea menziesii</i>
Sedges, Rushes	
Beak-rush, White	<i>Rhynchospora alba</i>
Bulrush, Hard-stem	<i>Scirpus lacustris</i>
Bulrush, Soft-stemmed	<i>Scirpus tabernaemontanii</i>
Rush Spp.	<i>Juncus spp.</i>
Rush, Baltic	<i>Juncus balticus</i>
Rush, Common (Or Soft)	<i>Juncus effusus</i>
Rush, Pointed	<i>Juncus oxymeris</i>
Rush, Swordleaf	<i>Juncus ensifolius</i>
Rush, Tapered	<i>Juncus acuminatus</i>

Common Names	Scientific Names
Sedge, Beaked	<i>Carex rostrata</i>
Sedge, Bristly	<i>Carex comosa</i>
Sedge, Bristlystalked	<i>Carex leptalea</i>
Sedge, Kellogg's	<i>Carex kelloggii</i>
Sedge, Lenticular	<i>Carex lenticularis</i>
Sedge, Slough	<i>Carex obnupta</i>
Sedge, Water	<i>Carex aquatilis</i>
Spike-rush, Creeping	<i>Eleocharis palustris</i>
Spike-rush, Needle	<i>Eleocharis acicularis</i>
Water Whorlgrass	<i>Catabrosa aquatica</i>
Grasses	
Bentgrass	<i>Agrostis sp.</i>
Canarygrass*, Reed	<i>Phalaris arundinacea</i>
Cat-tail, Common	<i>Typha latifolia</i>
Fescue	<i>Festuca sp.</i>
Grass, Bluejoint	<i>Calamagrostis canadensis</i>
Ryegrass	<i>Lolium spp.</i>
Trisetum, Nodding	<i>Trisetum cernuum</i>
Velvetgrass, Common	<i>Holcus lanatus</i>
Ferns And Allies	
Fern, Deer	<i>Blechnum spicant</i>
Fern, Licorice	<i>Polypodium glycyrrhiza</i>
Fern, Northern Lady	<i>Athyrium filix-femina</i>
Fern, Spiny (Or Spreading) Wood	<i>Dryopteris expansa</i>
Fern, Sword	<i>Polystichum munitum</i>
Fern, Western Bracken	<i>Pteridium aquilinum</i>
Horesetail, Scouring-rush	<i>Equisetum hyemale v</i>
Horsetail, Field	<i>Equisetum arvense</i>
Horsetail, Giant	<i>Equisetum telmateia</i>
Mosses	
Moss, Peat	<i>Sphagnum sp.</i>
Water Moss, Common	<i>Fontinalis antipyretica</i>

Key:

All plants or animals were actual biological observations except those with a ^ character.

^ indicates probable plants or animals that may be within the Refuge boundary

* indicates non-native plants or animals

** indicates non-native / invasive plants or animals that are priority to control

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Appendix L. Maps

Map 1. Chehalis River Basin Overview.

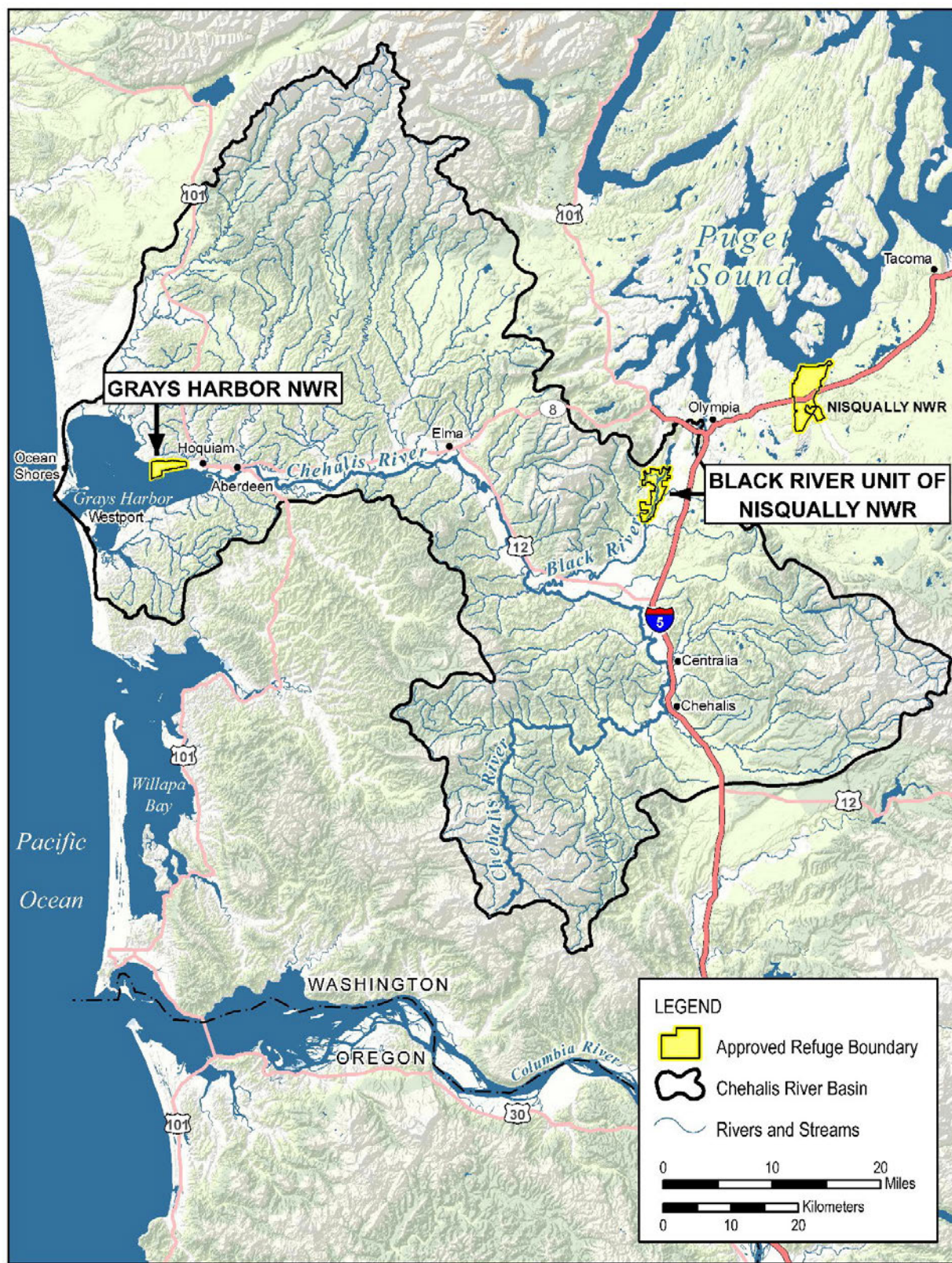
Map 2. Black River Unit Habitats.

Map 3. Black River Unit Land Status.

Map 4. Black River Unit Management Direction.

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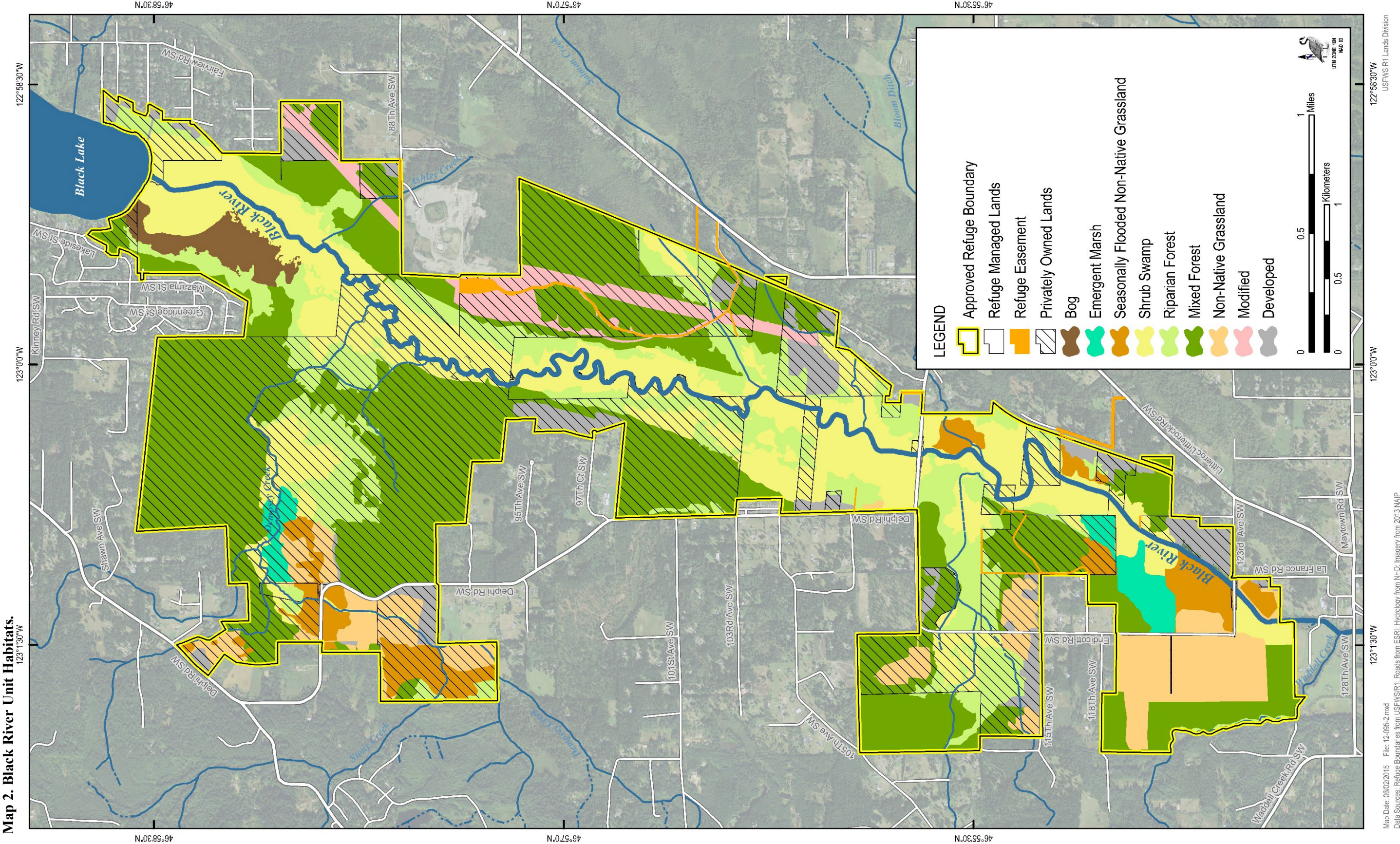
Map 1. Chehalis River Basin Overview.



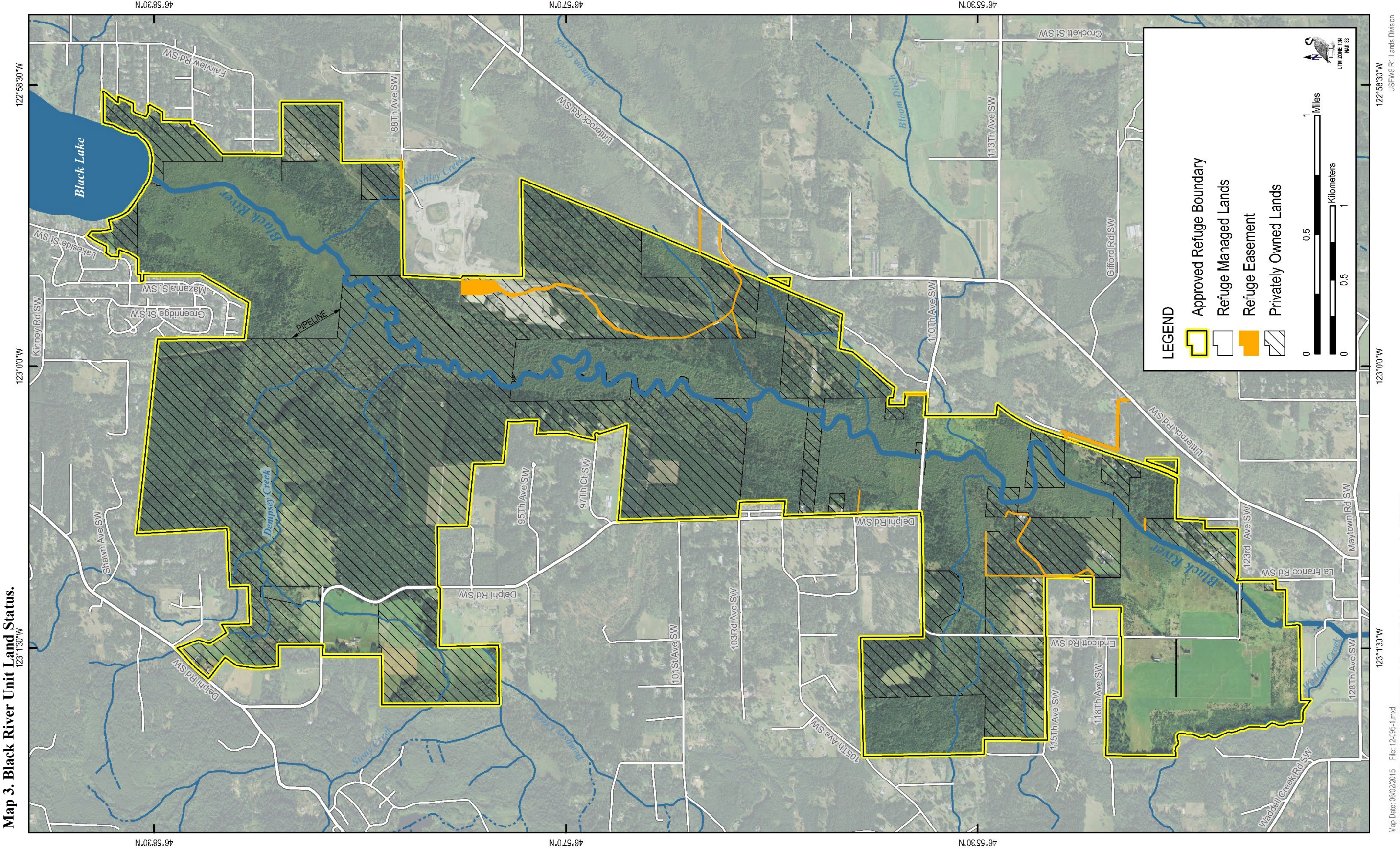
Map Date: 06/02/2015 File: 12-095-10.mxd
Data Sources: Refuge Boundaries from USFWS/R1; Elevation from NED; Hydrology from NHD; Roads from ESRI

USFWS R1 Lands Division

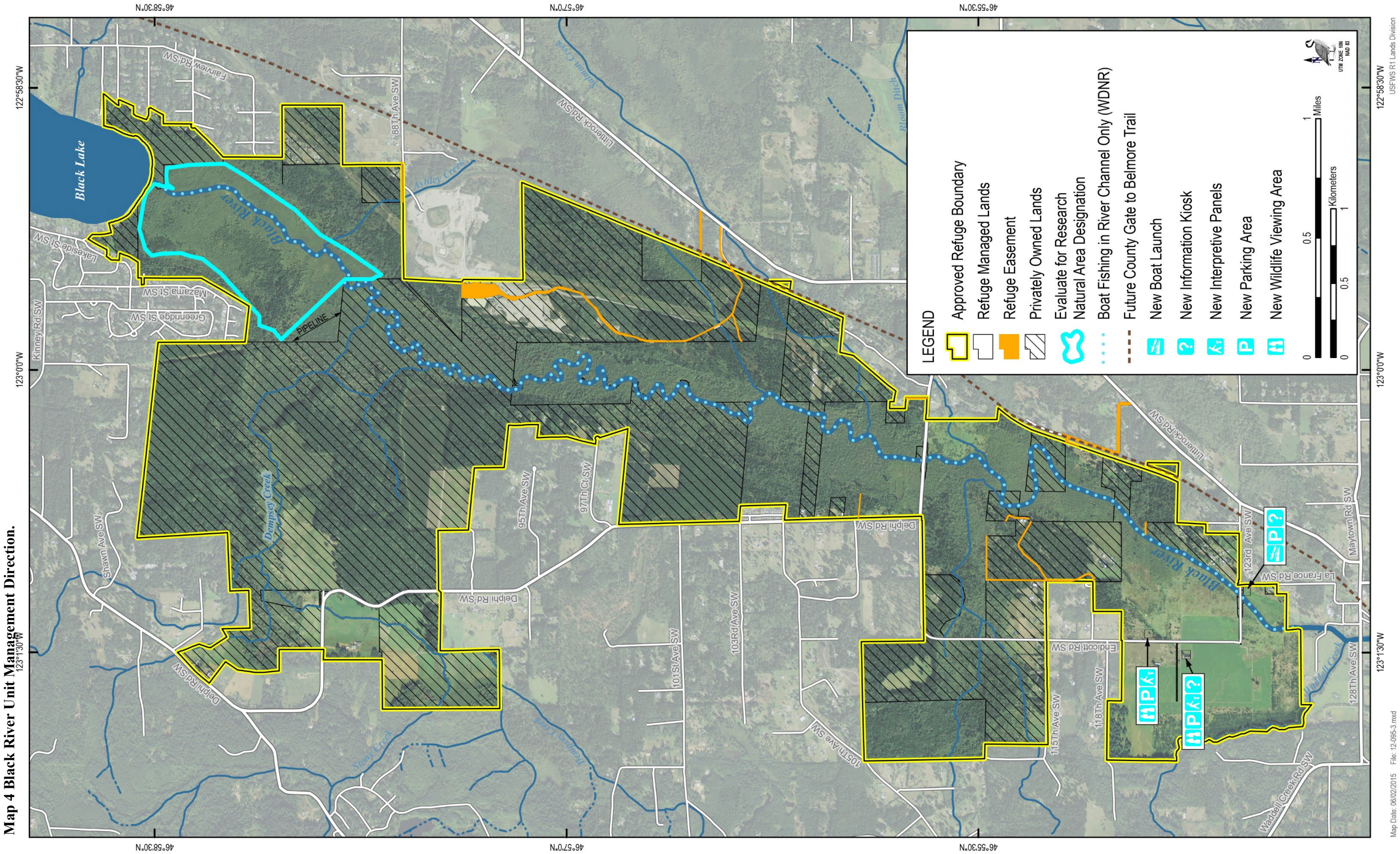
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Appendix M. Public Comments and Service Responses

M.1 Introduction

The U.S. Fish and Wildlife Service (USFWS or Service) received comments from 8 entities during the 31-day public comment period held from October 26, 2016, through November 25, 2016, for the Grays Harbor National Wildlife Refuge (NWR or Refuge) and Black River Unit of Billy Frank Jr. Nisqually NWR (Unit) draft Comprehensive Conservation Plan and Environmental Assessment (CCP/EA). All written comments were reviewed, analyzed, and addressed. A summary of the comments and our response to each is presented in this appendix.

Each original piece of correspondence was identified with the commenter's last name and first initial and a number. Note that for simplicity's sake, we use the word "letter" to refer to any comment or reference document we received, whether by letter, phone call, e-mail, or in person. Multiple correspondences from a commenter are counted as one comment letter.

To help us analyze the comments, a number of themes and subthemes were identified within the letters, and similar comments were grouped together under a theme. Our responses apply to the comments grouped under a theme. Comments that fell outside the scope of the CCP were also considered and responded to as appropriate.

M.2 Changes Made to the Final CCP

The CCP planning team reviewed and evaluated all of the comments we received during the draft CCP/EA comment period. In some cases, the management direction was modified or clarified based on the comments. These changes are described in Section M.3. For additional information on the management direction under the final CCP, see Chapter 2 and Appendix L, Maps.

M.3 Summary of Comments Received and Service Responses

Integrated Pest Management (Grays Harbor NWR and Black River Unit)

1. **Comment:** Comments received regarding integrated pest management (IPM) at either Grays Harbor NWR or the Black River Unit included the following:
 - Support for aggressive control of invasive species that are deemed a threat to priority species and habitats and support for high prioritization of IPM.
 - No chemical applications should take place due to potential impacts on humans.
 - Due to proximity to water and human populations, alternative methods (e.g., organic restoration) should be used for controlling invasive species rather than herbicides or pesticides.
 - The EA should disclose the amount of carbaryl, glyphosate, and surfactants sprayed within the Grays Harbor estuary since the establishment of Grays Harbor NWR to control *Spartina* or ghost shrimp. If *Spartina* within the Refuge becomes a threat, any *Spartina* should be removed by hand or by aggressive mowing, not by chemical treatment.

Response: The control of non-native and invasive species off of Refuge lands is outside of the management jurisdiction of the Refuge. The application of herbicides and pesticides in the greater Grays Harbor estuary outside of Refuge boundaries is considered outside of the scope of this CCP. However, the Service collaborates and partners with organizations such as the Washington Department of Agriculture, Grays Harbor County Noxious Weed Control Board, Chehalis Basin Partnership, Washington Department of Fish and Wildlife, and Grays Harbor Public Utility District on identifying shared management priorities and coordinating control activities, which includes the consideration of control efforts on Refuge resources.

The control of non-native and invasive species on the Grays Harbor NWR and the Black River Unit is proactive and receives high management priority. Decisions to use particular tools and techniques and criteria for their use to control invasive species on Refuge lands are based on numerous factors and considerations (e.g., the particular species being targeted, associated natural history characteristics, proximity to sensitive resources and non-target species, etc.).

IPM is an interdisciplinary approach utilizing methods to prevent, eliminate, contain, and/or control pest species in concert with other management activities on refuge lands and waters to achieve wildlife and habitat management goals and objectives. Overall, the goal of IPM is to use the minimal control methods to achieve a desired objective. IPM methods will be adaptive, based on information about effectiveness and impacts. Alternative methods to herbicides or pesticides include mechanical treatments (e.g., weed pulling or digging, suffocation, cutting, mowing, deflowering, disking, plowing, grazing, or flooding). Depending upon plant responses, control methods could be rotated to continue to reducing plant viability.

The use of herbicides or pesticides to control invasive plants or animals poses several environmental risks, including drift, volatilization, and persistence in the environment, water contamination, and harmful effects to wildlife. There are areas on both Grays Harbor NWR and the Black River Unit potentially subject to herbicide treatment. The potential for the above risks are considered minimal due to the types of herbicides used (non-persistent) and the precautionary measures taken during application (as referenced in Appendix G, IPM Program).

All chemicals used to control invasive plants would be applied by trained staff. Applicators employed by federal, state, or counties must be licensed in Washington and attend training each year to re-certify their license. Every effort is made to limit chemical exposure to the public and staff. The minimal amount of chemical possible is used after all other options for controlling invading plant species is exhausted. If herbicides are required, spot spraying would be used to specifically target offending plants and sometimes, if possible, dabbing herbicide on a cut trunk would be used.

With regards to the specific chemicals mentioned in the comments, carbaryl has not been used in the Grays Harbor NWR. Glyphosate is an active ingredient used in some herbicides. Depending upon the other components used in conjunction with glyphosate, the herbicide may be restricted to use in uplands only, such as Round Up®. However, other herbicides also using glyphosate but different adjuvants have been tested and approved for use in Washington's wetlands such as Rodeo®, AquaMaster®, and AquaPro®. Only wetland approved herbicides would be used to control *Spartina* or other wetland plants and

applicators must be licensed by the State (Washington Department of Ecology 2017). Regarding *Spartina* control, if detected on the Refuge, the Service would use IPM and evaluate the use of hand removal, mowing, and herbicides.

Prescribed Fire (Grays Harbor NWR and Black River Unit)

2. **Comment:** Support for a ban on burning on both Grays Harbor NWR and the Black River Unit due to its impact on soil and budgetary reasons.

Response: Prescribed fire is listed as one of the available IPM strategies for both Grays Harbor NWR and the Black River Unit. If utilized, objectives for prescribed burning may include (1) maintenance of ecological processes, specifically by retarding succession in sites where woody shrub or tree invaders are present; (2) maintenance of vigorous stands of native grasses and forbs; (3) providing open spaces that increase landscape diversity; and/or (4) reducing or maintaining the density of nonnative species. Whether prescribed fire would be implemented depends upon site-specific evaluations. These individual evaluations will contain a higher level of detail than is presented in the CCP. Step-down Wildland Fire Management Plans for Grays Harbor NWR and the Black River Unit were last finalized in 2003. Under all alternatives, an update would be developed using guidance from the Service's Fire Management Handbook (USFWS 2017).

Because of the short residence times, low fuel loads, and patchiness of fuels, few concerns exist over soil heating in most Pacific Northwest dry grasslands and wetlands (Walstad et al. 1990). Removal of larger woody material may be prescribed through cut-and-pile treatments. The effects of pile burning on underlying soil heating are well-studied and reviewed elsewhere (DeBano et al. 1998). In short, piles can generate substantial heat and combust soil organic matter, alter soil structure, and increase the hydrophobic nature of underlying mineral soil. Pile burning can also lead to subsequent nonnative species invasion in areas of localized soil disturbances. In even heavily encroached grasslands, piles typically cause only minor, patchy effects (piles typically cover less than 5 percent of the burned landscape). If pile burning is required, minimization measures could include scattering severity across the landscape with small piles ignited conservatively or removing slash from units prior to burning. Pile burning effects can also be minimized if the small piles are burned over wet soil (during the dormant season), where the soil moisture will resist temperature rise (DeBano et al. 1998). Pile burning locations may require focused follow-up to prevent nonnative species establishment.

Grazing (Grays Harbor NWR and Black River Unit)

3. **Comment:** Support for a ban on grazing on Grays Harbor NWR and the Black River Unit.

Response: The Service did not propose any grazing within Grays Harbor NWR. In the Black River Unit, the Service would continue to engage in a Cooperative Agreement with a neighboring farmer to use a small number of cattle as a land management tool. When carefully managed, grazing has been documented to be a selective and effective land management tool to benefit wildlife populations. In the Black River area, a vegetation assessment showed invasive reed canarygrass (RCG) creates a monoculture which does not support species richness, reduces quality of virtually all habitats, and is a threat to most wildlife populations (Black River Unit CCP, Section 4.6.1). Grazing, as a tool, has been

documented to lessen the height and density of RCG and reduce the tall grass monoculture that most wildlife species refrain from using. Herbivore hooves break apart RCG thatch, reduce substantial root mass effectively, and enhance the decomposition process. Judicious use of grazing can reduce the use of pesticides to control invasive vegetation and can effectively provide low growing vegetation structure thus enhancing dabbling duck, shorebird, and amphibian habitat in areas that seasonally flood.

Forest Management (Grays Harbor NWR and Black River Unit)

4. **Comment:** The Service should not log any trees on either Grays Harbor NWR or the Black River Unit.

Response: The Service did not propose any logging within Grays Harbor NWR. Under the Preferred Alternative for the Black River Unit, forest habitats may be enhanced using various forest management, or silvicultural, practices such as thinning, girdling, and falling, to promote the conversion of young stands into structurally diverse mature forests with mid- and understory development. Thinning (girdling, falling) trees would help return stands to historical densities and provide gaps in the canopy for the accelerated growth of the remaining trees. Snags are also an important component of a late-successional forest and tree girdling (strip of bark removed from circumference of trunk) can be used to kill trees and create snags. The implementation of forest management practices along with maintenance measures such as invasive plant control would allow the Service to provide quality habitat for forest-associated wildlife.

Berm Removal (Grays Harbor NWR)

5. **Comment:** Removing the constructed berm in the northeast corner of Grays Harbor NWR as part of the revised *Nestucca* Oil Spill Restoration Plan would be very costly; the Service should consider alternative methods.

Response: In 1991, the U.S. government settled claims for natural resource damages associated with the 1988 *Nestucca* oil spill, which affected over 800 square miles from Grays Harbor north to Vancouver Island, British Columbia, Canada, and south to Oregon. The court agreement states that "... settlement proceeds shall be used to compensate for injury, destruction, or loss of natural resources within the trusteeship of the U.S. Department of the Interior." In 2004, the Service's Western Washington Fish and Wildlife Office released a revised *Nestucca* Oil Spill Restoration Plan to utilize unspent funds (USFWS 2004). The Revised Plan provided a menu of restoration options for which settlement funds could be used. Grays Harbor NWR was not directly impacted by the oil spill; however, specific restoration projects at the Refuge described within the revised restoration plan included (1) increasing quality salt marsh for shorebirds and other migratory birds by controlling *Phragmites australis* from lands within Grays Harbor estuary and (2) removing an artificial berm and improve tidal inundation to improve salt marsh quality for shorebirds and other migratory birds. While the multi-year *Phragmites australis* control project was implemented, there was not enough funding for the berm removal project. The CCP includes berm removal as common to all alternatives since it has already been analyzed within the 2004 plan. However, funding still needs to be secured and additional project planning, including engineering and permitting, would need to occur prior to actual berm removal.

6. **Comment:** Why was funding not provided for the berm removal as part of the *Nestucca* oil spill settlement? The Service should make berm removal a high priority since it was one of the actions identified in the *Nestucca* Oil Spill Restoration Plan.

Response: The Service's Western Washington Fish and Wildlife Office worked with the Nisqually NWR Complex, which includes Grays Harbor NWR, to identify potential projects to utilize unspent *Nestucca* oil spill funds, via the revised *Nestucca* Oil Spill Restoration Plan, finalized in 2004 (USFWS 2004). After the revised restoration plan was finalized, the Nisqually NWR Complex determined that removal of the berm would be more costly than anticipated due to permitting and construction costs. Additionally, after further consideration, the Service concluded that benefits from berm removal would not provide as great of benefit to the Refuge and Grays Harbor resources as another proposed project that was not known at the time of the restoration plan revision.

Spartina alterniflora and *Spartina densiflora*, two invasive species of *Spartina*, were identified to be colonizing additional extensive areas of Grays Harbor that were previously unknown until the 2005 survey. The Refuge requested that funds for berm removal be utilized instead to address the new threat of additional *Spartina* invasion into Grays Harbor. This request was supported by the Washington State Departments of Fish and Wildlife and Natural Resources, and it was jointly determined that utilizing settlement funds for berm removal would have a greater impact on restoration efforts in Grays Harbor if these funds were instead utilized to control and remove the threat of *Spartina* invasion.

All of the *Nestucca* oil spill settlement funds have been expended on restoration projects.

Sedimentation and Restoration (Grays Harbor NWR)

7. **Comment:** In addition to identifying monitoring and research strategies to assess sedimentation at Grays Harbor NWR, the Service should articulate a plan for addressing the issue to ensure the long-term productivity and viability of the area for migratory shorebird feeding and roosting, especially since this taxa was explicitly recognized within the Refuge purposes. This effort should include protecting and maintaining habitat; intertidal mudflat restoration; developing partnerships; a research plan to test the efficacy and impacts of sediment removal on benthic invertebrates and shorebirds; and incorporation of best available science on the potential role of sea-level rise and other hydrological changes associated with climate change in mitigating sediment accretion.

Response: The characteristics that make the intertidal mudflats and marshes at Grays Harbor NWR highly valued for migratory shorebird feeding and roosting are the result of complex ecological interactions between physical (e.g., hydrology, elevation, sedimentation) and biological factors (e.g., availability of invertebrate prey) across a range of spatial scales and over time. Informed management of this system requires a detailed understanding of these ecological processes and interactions. Many of the inventory, monitoring, and research strategies referenced in Chapter 2 under Goal 4 are intended to collect baseline data, monitor changes over time, and evaluate ecological relationships that would inform and allow assessment of potential methods for protecting, maintaining, and/or restoring shorebird habitat. The Refuge would collaborate with partners including other agencies, non-governmental organizations, and universities to implement these strategies.

While the issue of sedimentation in Bowerman Basin and the potential negative consequences for intertidal shorebird habitat have been described for decades (e.g., State of Washington Department of Ecology, Grays Harbor Regional Planning Commission, National Oceanic and Atmospheric Administration National Ocean Service, United States Office of Ocean and Coastal Resource Management 1987; Drut and Buchanan 2000), developing and evaluating restoration options within the CCP require a more complete understanding of the physical and biological processes affecting the intertidal mudflats and marshes than is currently available. Some examples of site-specific information needs include: identifying the sources and amounts of sediment being delivered to the Refuge, monitoring elevation changes over time, assessing prey availability and shorebird use, and factoring in impacts from sea level rise, which may or may not keep pace with sedimentation. If restoration proposals are not based on site-specific information, the potential for uninformed results is greater. For example, physical removal of sediment from the mudflats may have direct and indirect impacts on shorebirds (e.g., loss of the aerobic and productive layer of sediment for prey and prey availability for shorebirds), on other shorebird foraging sites in Grays Harbor (e.g., through the movement of suspended sediment to other flats), or result in deeper flats on the Refuge subject to more frequent inundation given sea level rise scenarios.

The Service makes management decisions based on the best available science and within an adaptive management framework (Section 2.3.1, Adaptive Management). Monitoring and research are essential for identifying, evaluating, and implementing management strategies, which may include protection, maintenance, and/or restoration, in order to adapt to changing conditions (expected or not). Consequently, the following strategies have been added under the listed objectives:

- Objective 1.3: Conduct inventory, monitoring, and research strategies related to sedimentation, shorebird use, shorebird habitat, and sea level rise (Goal 4) within an adaptive management framework (Section 2.3.1). If shorebird habitat restoration would be potentially needed to fulfill Refuge purposes, then conduct a subsequent detailed planning and design process, including effects assessment under NEPA, surveys and consultation under Section 106 of NHPA, evaluation and consultation under Section 7 of ESA, and compliance with other applicable laws and policies.
- Objective 4.3: If shorebird habitat restoration would be potentially needed to fulfill Refuge purposes, then develop a collaborative plan and initiate pilot research studies to test the efficacy and impacts of silt removal on benthic invertebrates, shorebirds, sediment transport patterns, and hydrology.

The following strategy under Objective 4.2 was modified:

- Install sediment gauges in appropriate Refuge locations to gather information on sedimentation accretion rates.

Oil Spill Response (Grays Harbor NWR)

- 8. Comment:** The CCP/EA should detail all of the oil spill response capabilities within Grays Harbor, the response plan, and how the Grays Harbor NWR would be response priority if Service staff are not on-site.

Response: The Grays Harbor Geographic Response Plan identifies Grays Harbor NWR as a geographic area of concern with high concentration of sensitive species (migratory birds) and a priority for response (WDOE 2013). Washington Department of Ecology and its partners worked with Refuge staff to identify resources at risk, response strategies and implementation, essential point of contacts in the event of a spill. This response plan is complete with maps, contact names and numbers, and specific information on equipment and personnel, such that detailed inclusion into this CCP is not feasible.

Oregon Spotted Frog (Black River Unit)

- 9. Comment:** Support for habitat enhancement measures for the Oregon spotted frog.

Response: Specific actions related to habitat enhancement for the threatened Oregon spotted frog include strategies in the Black River Unit's Objectives 1.1, 1.2, 1.4, 1.6, and 1.7. Activities to enhance the habitats for the frog primarily target invasive plant species (e.g., reed canarygrass) using an integrated approach that includes mowing, haying, disking, grazing, and application of Service-approved herbicide. Overall, repeated habitat enhancements are expected to have great beneficial effect on the frog both in the short and long term, as has been shown in a few recent habitat modifications undertaken by the Service, Washington Department of Fish and Wildlife, and private landowners. Additionally, the Service would control bullfrogs, which outcompete, predate upon, and displace Oregon spotted frogs.

Inventory, Monitoring, and Research (Grays Harbor NWR and Black River Unit)

- 10. Comment:** Support for additional inventory, monitoring, and research, including on topics such as shorebird use of Bowerman Basin in context of flyway trends, the efficacy of silt removal in Bowerman Basin, analysis of archived historical data, climate vulnerability assessments, and impacts of contaminants and regional logging practices on Refuge resources.

Response: We are committed to using sound science in decision-making and providing the public with information of the highest quality possible. Expanded Refuge inventory, monitoring, and research programs, including a focus on shorebirds, sedimentation, and contaminants affecting Grays Harbor NWR, are addressed under Goal 4. Funding, staffing, and the Nisqually NWRComplex's information needs priorities will dictate which surveys will be accomplished in any given year. The impacts of landscape-scale stressors such as climate change and land use change on Refuge resources would be evaluated in collaboration with partners including the North Pacific Landscape Conservation Cooperative, through processes such as the Pacific Northwest Coast Landscape Conservation Design (NPLCC 2016).

- 11. Comment:** Information and data from legacy, current, and future inventory, monitoring, and research efforts should be analyzed, synthesized, and made widely accessible (e.g., through peer reviewed literature and data access tools) for consideration by stakeholders such as other researchers, managers, and interested public.

Response: Nationally, regionally, and locally, the National Wildlife Refuge System's (NWRS or Refuge System) Inventory and Monitoring (I&M) program invests in (1) ensuring the long-term integrity of information and data from legacy, current, and future inventory, monitoring, and research efforts and (2) providing easy to use systems for entering, retrieving, analyzing and reporting the data. I&M program data management policies and guidance focus on the procedures and processes by which Refuge data and information are obtained, stored, and made accessible to resource managers and partners. An additional strategy has been added to Objectives 4.1, 4.2, and 4.3 to require a data management plan for any development or procurement of scientifically-based biological or physical data. The data management plan would describe topics such as data entry, verification, and editing; analysis; metadata generation; data sharing; and data security and archiving.

Partnerships (Grays Harbor NWR and Black River Unit)

- 12. Comment:** Support for the development and strengthening of partnerships for the greater Black River watershed and ecosystem. Habitat protection and enhancement activities by partners occurring adjacent to or within proximity of the Black River Unit (e.g., along Blooms Ditch) complement the Service's efforts.

Response: Section 2.3.1 Features Common to All Alternatives: Partnerships and Objective 3.1 Develop and Strengthen Partnerships describe the Service's commitment to initiate, develop, and continue to strengthen partnerships for the long-term benefit of native wildlife and their habitats. The Service appreciates and works to improve partnerships across many agencies, non-profit organizations, and private landowners to conserve and manage the greater Black River watershed and ecosystem. Habitat protection and enhancement activities occurring adjacent to or within proximity of the Black River Unit, including activities by the Capitol Land Trust along Blooms Ditch, align and work together cumulatively with the Service's activities on both Grays Harbor NWR and the Black River Unit towards maintaining or improving landscape-scale ecological functions and values (e.g., biological integrity, diversity, environmental health, and connectivity).

- 13. Comment:** The Service should actively engage with state decision-makers and others in regard to pest control efforts outside of Grays Harbor NWR boundaries in order to protect, maintain, and restore estuary habitats.

Response: As noted in Section 2.3.1 Features Common to All Alternatives: Landscape-scale conservation; State, local, and interagency coordination; Invasive species control; Integrated pest management; and Partnerships, the Grays Harbor NWR currently works with many state and county agency decision-makers including the Washington Department of Fish and Wildlife, Washington Department of Natural Resources, Washington State Department of Agriculture, Washington State Department of Transportation, Grays Harbor County Noxious Weed Board, and Grays Harbor Public Utilities District to control listed noxious weeds and animals within the Refuge. Specific management of species outside of Refuge boundaries is generally beyond the scope of this document; however we would coordinate and work with partners to protect, maintain and restore estuary habitats.

Participation in Planning and Review of Regional Development Activities and Cumulative Impacts (Grays Harbor NWR)

- 14. Comment:** The Service should make sure that Grays Harbor NWR resource values are recognized and protected by decision-makers in regard to off-Refuge uses within the Chehalis River Basin and Grays Harbor estuary such as oil transport, the use of pesticides by shellfish growers, commercial timber production, and levees and dams.

Response: National wildlife refuges are often small pieces of broad landscapes, but the Refuge System commitment and vision are not small. To be effective in confronting the challenges posed by climate change, invasive species, habitat fragmentation and development, and contaminants, refuges must look beyond refuge boundaries to work and plan with multiple partners. Section 2.3.1 Features Common to All Alternatives: Participation in Planning and Review of Regional Development Activities describe the Service's commitment to actively participating in planning and studies pertaining to future industrial and urban development, transportation, recreation, contamination, and other potential concerns that may affect Refuge resources. In practice, the Refuge often works with the Service's Western Washington Fish and Wildlife Office, based in Lacey, to highlight collective concerns and comment on projects with potential impacts to the Refuge and surrounding environment. The Western Washington Fish and Wildlife Office has the lead on many regulatory responsibilities; however, the Refuge seeks to foster partnerships and continue to have open communication with other federal, state, and local agencies; non-governmental organizations; and private landowners regarding avoiding or mitigating potential adverse impacts to Refuge resources.

- 15. Comment:** The CCP/EA should describe all ongoing and proposed projects within the Chehalis River Basin and Grays Harbor estuary which may impact Grays Harbor NWR resources (e.g., commercial timber production, urban and industrial land uses, flood control dams) and determine what cumulative impacts these would have on the Refuge.

Response: In order to draw federal actions affecting the quality of the environment (e.g., Refuge CCPs) into a broader context, National Environmental Protection Act (NEPA) regulations require agencies to consider the cumulative impacts of their actions combined with "past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions." Cumulative impacts may make individually minor actions significant in the aggregate. As an example, a federal unit-level plan contributing a small amount of deforestation to a watershed would need to consider logging activities outside of the planning area in order to determine the cumulative impact on water quality.

In the case of the CCP/EA for Grays Harbor NWR, the Service focused on looking at projects or factors that affect the portions of the environment that our actions would affect. In general, the Service recognizes that the future growth and development of businesses and industry that will use the watershed, and more specifically the estuary, will most likely stress the ecosystem through both direct (e.g., habitat loss, pollution, spread of invasive species) and indirect impacts (e.g., habitat degradation and fragmentation). However, the cumulative impact of Refuge actions when combined with these ongoing or proposed projects is that the Refuge, although relatively small, becomes increasingly valuable for the persistence of native wildlife and habitats. The active improvement of habitats would increase or maintain the

value of Refuge lands and waters for a diversity of native fish and wildlife and would improve and maintain biological diversity.

See the previous response (#14) for the Service's role with regards to participating in planning and review of regional development activities. It is within this context that the Service evaluates, in detail, projects for their cumulative impacts on Refuge resources and surrounding environment.

- 16. Comment:** The CCP should include reference to and discussions on the Washington Department of Ecology partially funded draft August 2014 Shoreline Analysis Report for Shorelines in Grays Harbor County and shoreline development that is permitted in the Grays Harbor estuary under the Grays Harbor Estuary Management Plan and local Shoreline Master Programs.

Response: The Service reviewed the draft Shoreline Analysis Report, inserted a reference and description of the report within Chapter 1 (Introduction and Background) and incorporated relevant water quality and invasive species information from that report into Chapters 3 (Physical Environment) and 4 (Biological Environment). References to and discussions about the Grays Harbor Estuary Management Plan are located within Chapters 1, 3, and 4.

With regards to shoreline development within the greater Grays Harbor estuary and watershed, as described in Section 2.3.1, Common to All Alternatives, the Service would actively participate in planning and review of regional development activities pertaining to future industrial and urban development, transportation, recreation, contamination, and other potential concerns concerning the greater Grays Harbor estuary and watershed. This includes communications in our working relationships within the government of Grays Harbor County, local municipalities, and the Port of Grays Harbor to encourage prudent management of shorelines and the greater Grays Harbor estuary.

As described in Goal 3, the Refuge will initiate, develop, and continue to strengthen existing partnerships with interested groups for the benefit of the long-term environmental health of native wildlife and their habitats. Through a collaborative landscape conservation design process, the Service would work with partners (State, county, Tribes, non-governmental organizations, and others) to identify the Service's role in conservation efforts in the Grays Harbor estuary ecosystem and surrounding habitats.

Waterfowl Hunting (Grays Harbor NWR and Black River Unit)

- 17. Comment:** The Service received comments in favor of incorporating waterfowl hunting into the management alternatives due to hunters' contribution to wildlife conservation, and in favor of not allowing waterfowl hunting on Grays Harbor NWR and the Black River Unit.

Response: The National Wildlife Refuge System Administration Act (16 U.S.C. 668dd - 668ee, et seq.), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57) recognizes that wildlife-dependent recreational uses including hunting, when determined to be compatible with the mission of the NWRs and the purposes of the Refuge, are legitimate and appropriate uses of national wildlife refuges. During the preparation of this CCP, waterfowl hunting was given careful consideration along with the

need to provide sanctuary for waterfowl and other wildlife, potential conflicts with other uses and management focus, and the ability to provide a high quality experience.

Waterfowl hunting under state regulations is allowed within the Black River channel; however, as described in Section 2.2, Alternatives Considered but Eliminated from Detailed Study, a waterfowl hunting program on Refuge property (walk-in and boat-in hunting) at the Black River Unit is not currently considered feasible because of the difficulty in accessing the river bank due to dense vegetation, the difficulty in maintaining access to the bank, the presence of the federally threatened Oregon spotted frog, and the need to maintain an adequate safety buffer. If additional lands are acquired and added to the Black River Unit, these lands would be evaluated for potential waterfowl hunting and a separate planning and compliance effort could follow such future acquisitions.

As described in Section 2.2, Alternatives Considered but Eliminated from Detailed Study, waterfowl hunting at Grays Harbor NWR would result in unacceptable impacts to migratory birds, including disturbance and displacement of shorebirds. The protection of shorebirds is one of the Refuge's primary purposes. The Refuge is too small to allow the establishment of wildlife sanctuary areas in key habitats that would be separate from hunting areas. In addition, existing high quality wildlife observation, wildlife photography, and education programs would be negatively affected due to the small size of the Refuge and proximity of Refuge trails. The Refuge is too small to allow zoning of these various uses within the Refuge.

Boating and Fishing (Grays Harbor NWR)

18. Comment: Support for closures of fishing and boating at Grays Harbor NWR, due to the small size of the Refuge.

Response: Along with other wildlife-dependent uses (i.e., hunting, wildlife observation and photography, and environmental education and interpretation), fishing is considered an appropriate refuge use, and is to receive priority consideration in refuge planning and management. However, fishing within Grays Harbor NWR was considered but dismissed as described in Section 2.2 because it would cause too much disturbance to migratory birds using the limited waters of the Refuge and negatively affect those participating in wildlife observation, photography, and education activities on Refuge trails. Additionally, habitat within the Refuge is marginal for fishing opportunities due to the shallow waters and extreme tidal fluctuations. Fishing was not implemented for similar reasons during the development of the Management and Development Plan for Grays Harbor NWR (USFWS 1990).

Boating was determined to be not appropriate due to the Refuge's overall size and the potential for disturbance to migratory birds using the mudflat and open water habitats. Boating was considered but not implemented for similar reasons during the development of the Management and Development Plan for Grays Harbor NWR (USFWS 1990).

Welcome and Orientation (Grays Harbor NWR and Black River Unit)

19. Comment: Page 2-35, Section 2.4.1, Objective 5.1: Welcome and Orientation within the draft CCP/EA states: "Customer service and first impressions are important for visitors to

feel welcome and safe at national wildlife refuges.” The public are not “consumers” and should not be treated as “customers.” Delete this term from the final plan.

Response: The Service defined a standard for welcome and orientation of visitors on national wildlife refuges within its policy for wildlife-dependent recreation (605 FW 1.14B):

“We will assure that refuges are welcoming, safe, and accessible. We will provide visitors with clear information so they can easily determine where they can go, what they can do, and how to safely and ethically engage in recreational and educational activities. Facilities will meet the quality criteria defined in 605 FW 1.6. We will treat visitors with courtesy and in a professional manner.”

“Customer service” is a term with broader application than commercial or business use. In context of visitor services on national wildlife refuges, the components of “customer service” include, but are not limited to, providing visitors positively worded regulations and information located in logical and appropriate locations, and ensuring that Refuge staff and volunteers are friendly, professional, and helpful. Some evaluation questions regarding “customer service” listed in the Service’s handbook on visitor services standards include (USFWS 2011):

- Does the staff maintain a professional appearance (e.g., correct uniform components, neat appearance, courteous toward visitors, etc.)?
- Do volunteers who will be visible to the public wear volunteer uniforms and maintain a professional appearance?
- Can the public reach a “live body” via the telephone during normal business hours?
- When a “live body” cannot be reached, does the telephone answering system provide proper information to the public, such as current visitor service activities, wildlife viewing opportunities, and special events, in addition to how to leave a message for obtaining further information or assistance?
- How quickly does the field station staff get back to the caller who left a message?
- Is information posted at appropriate locations at the refuge so that visitors can find staff to answer their questions or provide assistance?
- Has the refuge staff established a Web site to provide refuge-related information to the public? Does this site include welcoming and orienting Information?
- Are there links to other trip planning sites, such as local visitor and tourism bureaus, on the Web site?
- How often is the Web site information updated?

Visitor Services Facilities (Black River Unit)

20. Comment: Support for increased visitor service facilities at the Black River Unit including those along Endicott Road (e.g., vehicle pull-off and parking areas; trails; interpretive signs) and the boat launch at 123rd Avenue, if designed to minimize environmental impacts.

Response: Strategies related to and supporting the opening of the Black River Unit to public use, including wildlife observation, interpretation, and wildlife photography, are described under Goal 5. These strategies are intended to provide a diversity of high-quality wildlife

viewing opportunities for visitors while minimizing disturbance to wildlife and habitats and increasing visitor safety. Subsequent planning and design efforts for visitor service facilities will evaluate site-specific considerations (e.g., ground preparation, slope, avoidance of sensitive biological or cultural features, and minimizing impacts on public access and safety). All activities will undergo appropriate review and consultations, and permits and clearances will be secured as necessary to comply with legal and policy requirements.

Roads (Grays Harbor NWR and Black River Unit)

- 21. Comment:** No new roads should be constructed within Grays Harbor NWR and the Black River Unit.

Response: No new roads are proposed for either Grays Harbor NWR or the Black River Unit within the CCP; access is provided via existing roads. However, the Service recognizes that roads, bridges, parking areas, and trail systems play a vital role in providing access to the public for compatible, wildlife-dependent recreation opportunities. As described in Section 2.3.1, the Service will look for opportunities to collaborate with the Washington Department of Transportation, Department of Public Works, Port of Grays Harbor, and the local communities to maintain and improve safe and appropriate transportation access to the Refuge and the Unit. Additionally, the CCP proposes improvements to the parking area at Grays Harbor NWR (Objective 5.1) and new parking and pull-off areas at the Black River Unit (Objective 5.2). If a new road is identified as a need in the future, additional detailed planning would be performed, including an effects assessment under NEPA, surveys and consultation under Section 106 of National Historic Preservation Act, evaluation and consultation under Section 7 of Endangered Species Act, and compliance with other applicable laws and policies.

Capacity for Implementation (Grays Harbor NWR)

- 22. Comment:** Limitations in budget and staff capacity for Grays Harbor NWR are roadblocks to achieving the level of adaptive management needed to support the habitat values of the Refuge. Support for the establishment of a full-time Refuge Manager position for the Refuge to ensure priority management objectives and collaborative partnerships are pursued.

Response: Full implementation of the CCP will require additional funding, which will be sought from a variety of sources including congressional allocations and public and private partnerships and grants. Activities and projects identified will be implemented as funds become available. Project priorities and projected staffing/funding needs are in Appendix C, Implementation, although special funding initiatives, unforeseeable management issues, and other budget issues will likely require adjustments to the implementation schedule in the future. Regardless, the Service considers having additional staff on-site at Grays Harbor NWR a high priority.

Boundary Expansion (Grays Harbor NWR)

- 23. Comment:** The Service should identify significant fish and wildlife habitats within Grays Harbor estuary (e.g., Point New) for approved Refuge boundary expansion and acquisition into the Refuge System.

Response: The question of whether the Grays Harbor NWR approved refuge boundary should be expanded is considered outside of the scope of the CCP. However, the initial steps for identifying significant fish and wildlife habitats within Grays Harbor estuary could occur through participation in a landscape conservation design process (see Section 2.3.1, Landscape-scale conservation). If priority conservation areas are identified within the ongoing Pacific Northwest Coast Landscape Conservation Design (NPLCC 2016), the Service could then evaluate whether these areas support the priority conservation targets and meet the science-based criteria in the Service’s Strategic Growth policy (602 FW 5). If so, then the Service could then begin the land protection planning (LPP) process (602 FW 2).

The LPP process is an evaluation, planning, and compliance process. During an LPP process, the Service would solicit public involvement, conduct effects analyses, and apply spatially-explicit biological planning and conservation design to evaluate habitat conservation and refuge boundary expansion options within an LPP study area. The Service would describe, analyze, and publish for public review and comment the following documents which constitute “compliance”:

- A NEPA analysis (e.g., an Environmental Assessment or Environmental Impact Statement) evaluates the effects each alternative would have on the physical, biological, social, and economic environment.
- A Land Protection Plan describes resource protection needs, a proposed refuge boundary, and generally prioritizes ownerships that may be acquired from willing sellers. It also describes other conservation opportunities including easements and cooperative management agreements with willing landowners.
- A Conceptual Management Plan (CMP) describes potential refuge management needs, activities, and public uses, and determines which public uses would be compatible with the purpose of the proposed refuge.

Public comments would be reviewed and considered during development of the final decision documents which are forwarded to the Regional Director and Director for approval. The Director reviews the documents and decides what course of action, if any, the Service will take. If a refuge boundary expansion is proposed and approved, the Service would notify the public of the decision and be able to begin the process of identifying funding needs and opportunities and start discussions with interested landowners.

Document Organization (Grays Harbor NWR and Black River Unit)

24. Comment: The CCP should be reorganized so that all information related to Grays Harbor NWR should be in one half of the document and all information on the Black River Unit should be in the other half of the document.

Response: Separate final CCPs for Grays Harbor NWR and the Black River Unit of Billy Frank Jr. Nisqually NWR will be produced.

Corrections and Editorial Comments

Corrections and clarifications for improving readability and accuracy were noted by the commenters. These factual and/or editorial changes were made in the final CCP.

M.4 References

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National Wildlife Refuge System Information
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