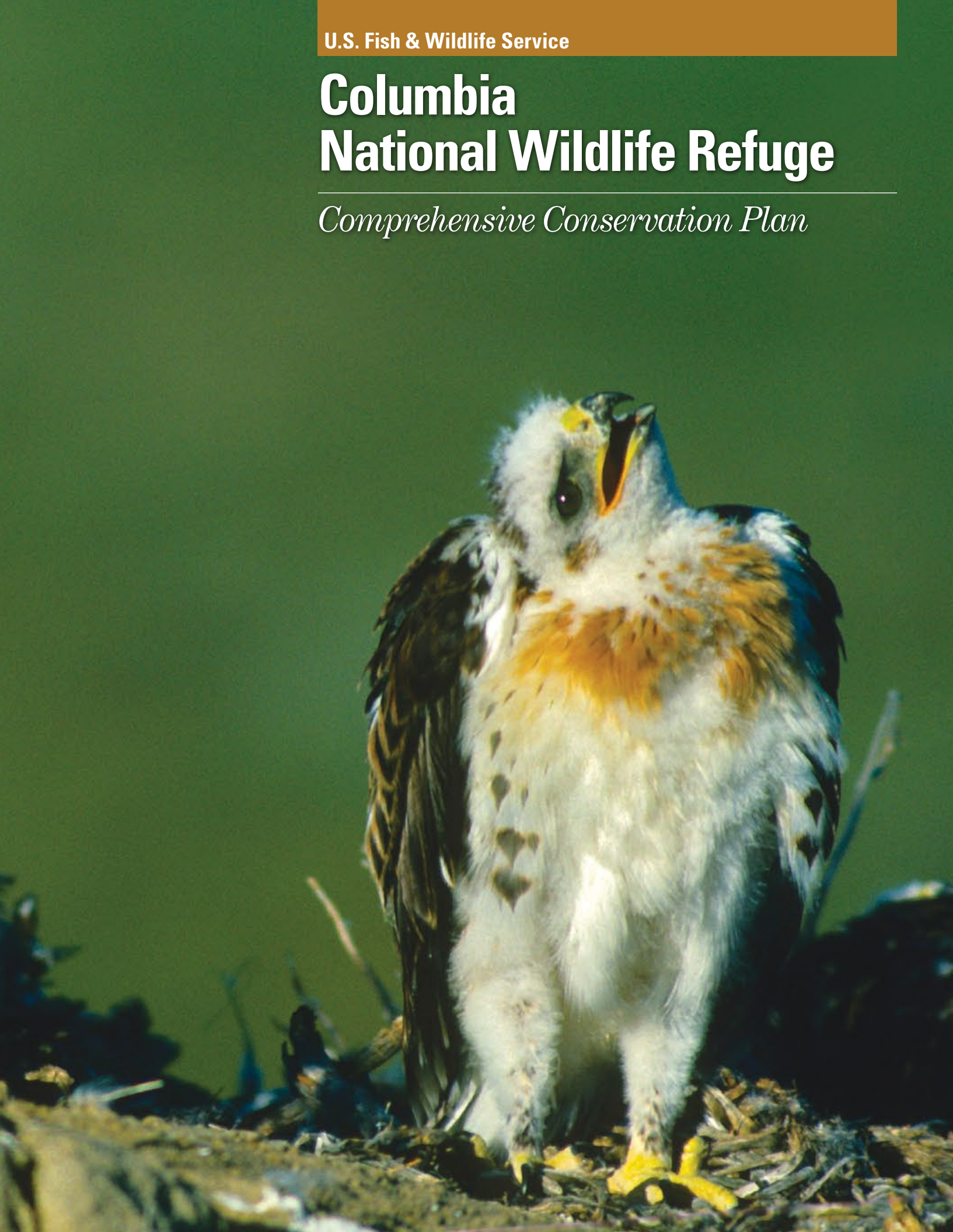
U.S. Fish & Wildlife Service

Columbia National Wildlife Refuge

Comprehensive Conservation Plan



A Desert Vision

Columnar basalt pillars, lava flows and other channeled scabland formations provide the dramatic backdrop for the Columbia National Wildlife Refuge landscape, as they have for thousands of years. Intermingled with lands managed by other Federal agencies and the State of Washington, the Refuge helps to create a connected system of wildlife habitats important to migratory and resident species. A few thousand acres of lakes and wetlands, along with their adjacent uplands, attract many thousands of mallards, northern pintails, Canada geese, Sandhill cranes, and other migrating waterfowl and waterbirds to this otherwise arid environment. Long-billed curlews, Wilson's phalaropes, black-necked stilts, and American avocets find nourishment in the refuge's mudflats and nest in nearby grasslands.

Shrub-steppe habitat on Columbia National Wildlife Refuge is healing from the scars of wildfires, invasive species, and other adverse impacts, with loggerhead shrikes, sage thrashers, sage sparrows, and other sagebrush-obligate species becoming more abundant within contiguous blocks of bunchgrass and sagebrush habitat. Badgers, burrowing owls, and Washington ground squirrels continue to thrive as they play out their ancient predator and prey relationships. The nests of prairie falcons, ferruginous hawks, canyon and rock wrens are secure—high on the refuge's cliffs, outcroppings and talus slopes—which they share with other rocky residents including rattlesnakes, skinks, bats, marmots, and colorful lichens.

Visitors come to see, feel, hear, learn about, and enjoy Washington's high desert fish, wildlife, plant, cultural, geologic, and scenic resources. They value, respect, and care for these wild lands and share those values with others. By reaching out to neighbors and building strategic partnerships in the Mid-Columbia River Basin, Columbia National Wildlife Refuge continues to seek new and innovative ways to conserve, protect, and teach others about fish and wildlife resources.

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.

Sandhill cranes
©Sunny Walter

Columbia National Wildlife Refuge
Comprehensive Conservation Plan

Prepared by:

Columbia National Wildlife Refuge
64 Maple Street
Burbank, Washington 99323

and

U.S. Fish and Wildlife Service
911 NE 11th Avenue
Portland, Oregon 97232-4181

September 2011

Approved: _____ 9/28/11
Acting Regional Director, Region 1 Date
Portland, Oregon

U.S. Fish and Wildlife Service
Columbia 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 Columbia National Wildlife Refuge (Refuge). The purpose of this CCP is to specify a management direction for the Refuge for the next 15 years. The goals, objectives and strategies for improving Refuge 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 Service's preferred alternative for managing the Refuge is described in this CCP and the effects on the human environment were described in the Draft CCP and Environmental Assessment.

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

Jeffrey M. Howland — 9/26/11
Jeffrey M. Howland, Acting Project Leader — Date
Mid-Columbia River National Wildlife Refuge Complex

Concur: _____ 9/27/11
Robert Flores — Date
Refuge Supervisor

Concur: Robin J. West — 9/28/11
Robin West — Date
Regional Chief, National Wildlife Refuge System

Finding of No Significant Impact for the Columbia National Wildlife Refuge Comprehensive Conservation Plan

Adams and Grant Counties, Washington

The U.S. Fish and Wildlife Service (Service) has completed a Comprehensive Conservation Plan (CCP) and Environmental Assessment (EA) for Columbia National Wildlife Refuge (Refuge). The CCP will guide management of the Refuge for 15 years. The CCP/EA describes our proposals for managing the Refuge and their effects on the human environment under three alternatives, including the no action alternative.

Decision

Based on our comprehensive review and analysis in the CCP/EA and the comments received during the public review of the draft CCP/EA, we selected a combination of alternatives presented in the draft—primarily Alternatives 2 and 3—for implementation. This combination of management strategies from Alternatives 2 and 3 will guide management of the Refuge in a manner that:

- Achieves the mission of the National Wildlife Refuge System, as well as the purposes, vision and goals of the Refuge.
- Maintains and restores the ecological integrity of the Refuge's habitats and populations.
- Addresses the important issues identified during the CCP scoping process.
- Addresses the legal mandates of the Service and the Refuge.
- Is consistent with the scientific principles of sound wildlife management and endangered species recovery.
- Facilitates priority public uses appropriate and compatible with the Refuge's purposes and the Refuge System mission.

Summary of the Actions to be Implemented

Implementing the selected alternative will have no significant impacts on the environmental resources identified in the draft CCP/EA and final CCP. Refuge management under the selected alternative will protect, maintain and enhance habitat for priority species and resources of concern and improve the Refuge's capability to serve as an "inviolate sanctuary, or for other management purposes, for migratory birds" (Migratory Bird Conservation Act) and as a "refuge and breeding ground for migratory birds and other wildlife" (Public Land Order 243). Improving the Refuge's farm fields; wetlands; lakes, streams and riparian areas; grasslands; shrub-steppe; and willow woodlands will increase the value of lands and waters for a wide variety of native fish and wildlife.

The availability and quality of wildlife-dependent recreation on the Refuge will improve under the selected alternative, but within a regional context, the cumulative change will be small. Implementing the Refuge hunt programs will result in no significant, adverse cumulative population level impacts to hunted or nonhunted wildlife species. A summary of the major CCP actions we will implement follows.

Under the selected alternative, the Refuge will:

- Protect, maintain, and, where feasible, restore habitat for priority species, including lesser sandhill cranes and waterfowl, and imperiled Federal and state listed species, such as upper Columbia River steelhead, northern leopard frogs, redband trout, and Washington ground squirrels.
- Maintain high-quality green forage for geese and other migratory birds.
- Manage invasive species and State- and county-listed noxious weeds.
- Protect, restore, and enhance sagebrush, greasewood, grassland and scrub-shrub habitats.
- Protect, restore, and enhance in-stream, lake, riparian, emergent marsh and other wetland habitats.
- Convert moist soil management areas to other wetland types.
- Increase inventory and monitoring efforts.
- Assist in recovery efforts for Washington ground squirrels, northern leopard frogs, upper Columbia River steelhead, and other state and Federal threatened and endangered species.
- Provide for additional public use opportunities, including wildlife observation, hunting, photography, and interpretation.
- Construct a trail through the Drumheller Channel National Natural Landmark and improve the existing auto tour route.
- Discontinue inappropriate uses of the Refuge, such as camping and overnight access.
- Explore land exchanges and purchases to improve management and conditions for wildlife.

Public Involvement

We incorporated a variety of public involvement techniques in developing and reviewing the CCP/EA. This included an open house; three planning updates; meetings with partners, state agencies, and other Federal agencies; and public review and comment on the draft CCP/EA. The details of our public involvement program are described in Chapter 4 of the CCP, and the comments received on the draft CCP/EA, and our response to those comments, are available for a limited time on our web site at www.fws.gov/columbia/management.html and by request thereafter.

Changes Made to the CCP Based on Comments

Based on the public comments we received and considered, the CCP has been slightly modified. Most of the changes were corrective in measure and none will have a significant impact on the environment.

Conclusions

Based on review and evaluation of the information contained in the supporting references, I have determined that implementing a combination of Alternatives 2 and 3 as the CCP for Columbia 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. Accordingly, we are not required to prepare an environmental impact statement.

Acting Regional Director

9/28/11
Date

Supporting References

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

U.S. Fish and Wildlife Service. September 2011. Columbia National Wildlife Refuge Comprehensive Conservation Plan.

U.S. Fish and Wildlife Service. September 2011. Comments and responses to the Draft Columbia National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment. Available by request (see note below) or for a limited time at www.fws.gov/columbia/management.html.

Note: This Finding of No Significant Impact and supporting references are available for public review at Columbia National Wildlife Refuge, 735 Main Street, Othello, Washington 99344; the Mid-Columbia River National Wildlife Refuge Complex, 64 Maple Street, Burbank, Washington 99323, and U.S. Fish and Wildlife Service, Division of Planning, Visitor Services, and Transportation, 911 NE 11th Avenue, Portland, Oregon 97232. These documents can also be found on the Internet at pacific.fws.gov/planning/ and for a limited time at www.fws.gov/columbia/management.html. Interested and affected parties are being notified of our decision.

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U.S. Fish & Wildlife Service

Columbia National Wildlife Refuge

Adams and Grant Counties, Washington

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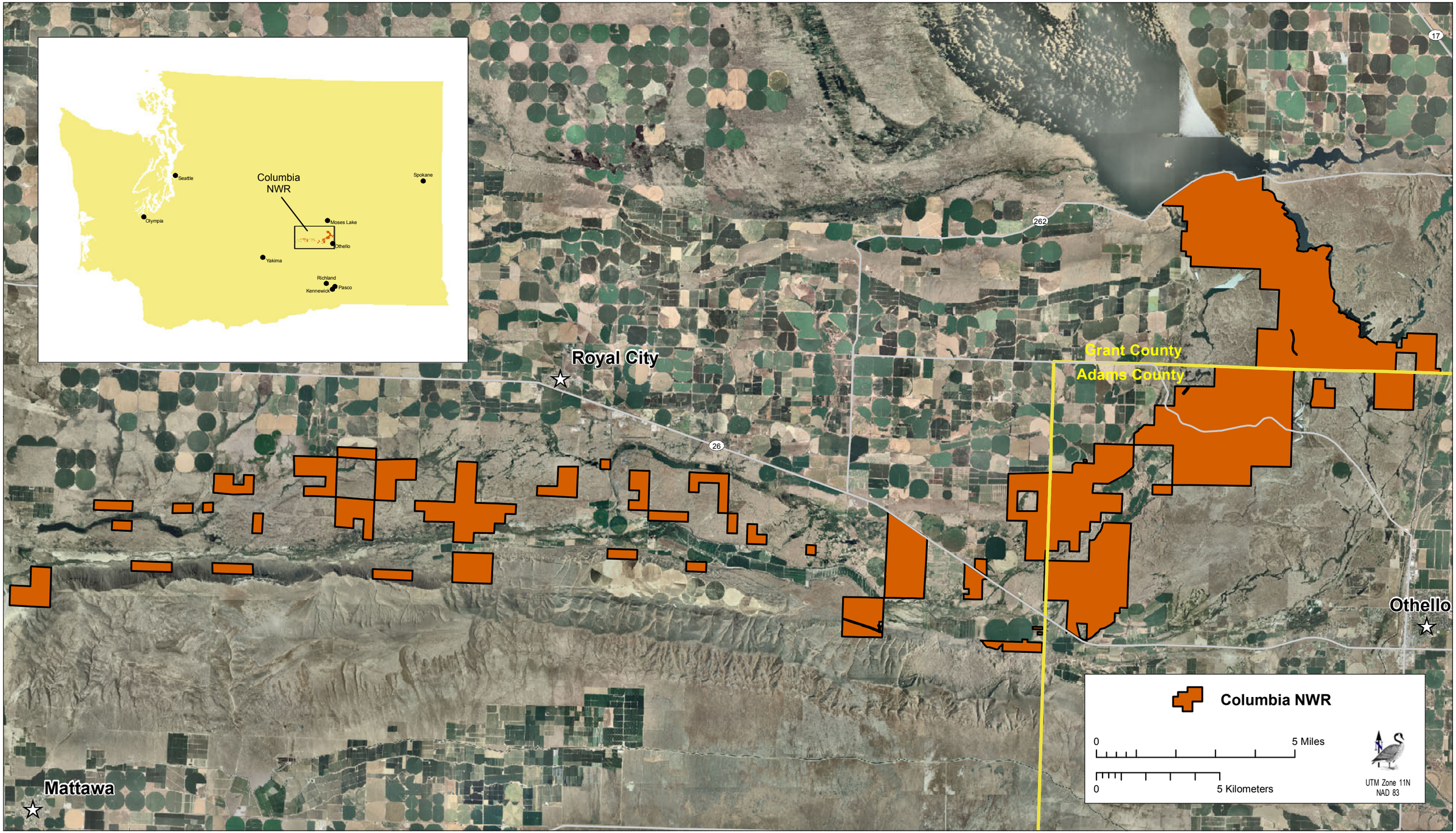


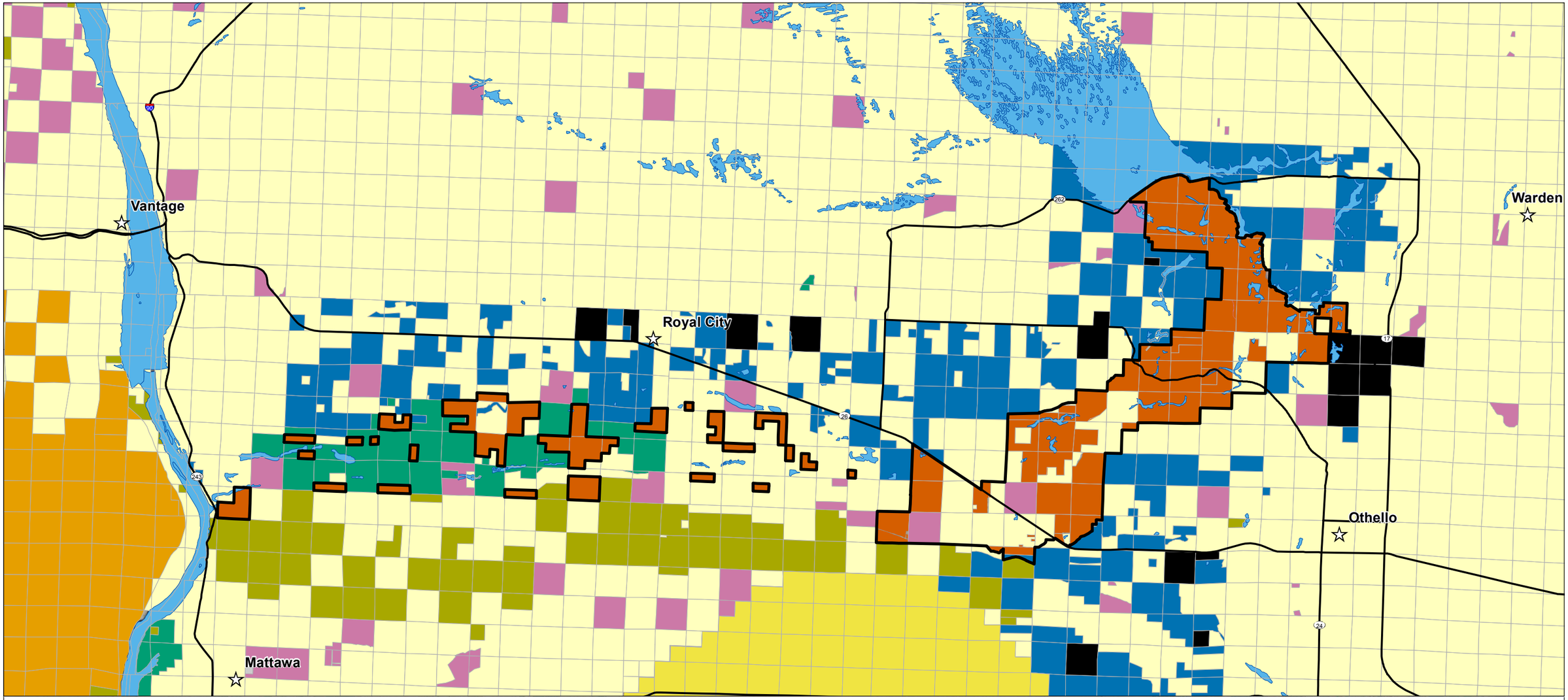
Map01_CMBCCP_Location

U.S. Fish & Wildlife Service

Columbia National Wildlife Refuge

Adams and Grant Counties, Washington

Map 2 - Land Ownership



- Bureau of Land Management
- Bureau of Reclamation
- Yakima Training Center (DoD)
- WA Dept. of Fish and Wildlife
- WA State Agency
- Private Individual or Company
- Private Non-Industrial Owner
- Undetermined
- Hanford Reach NM
- Columbia NWR
- Columbia NWR Approved Boundary

0 1 2 3 4 5 Miles

0 1 2 3 4 5 Kilometers

UTM Zone 11N
NAD 83

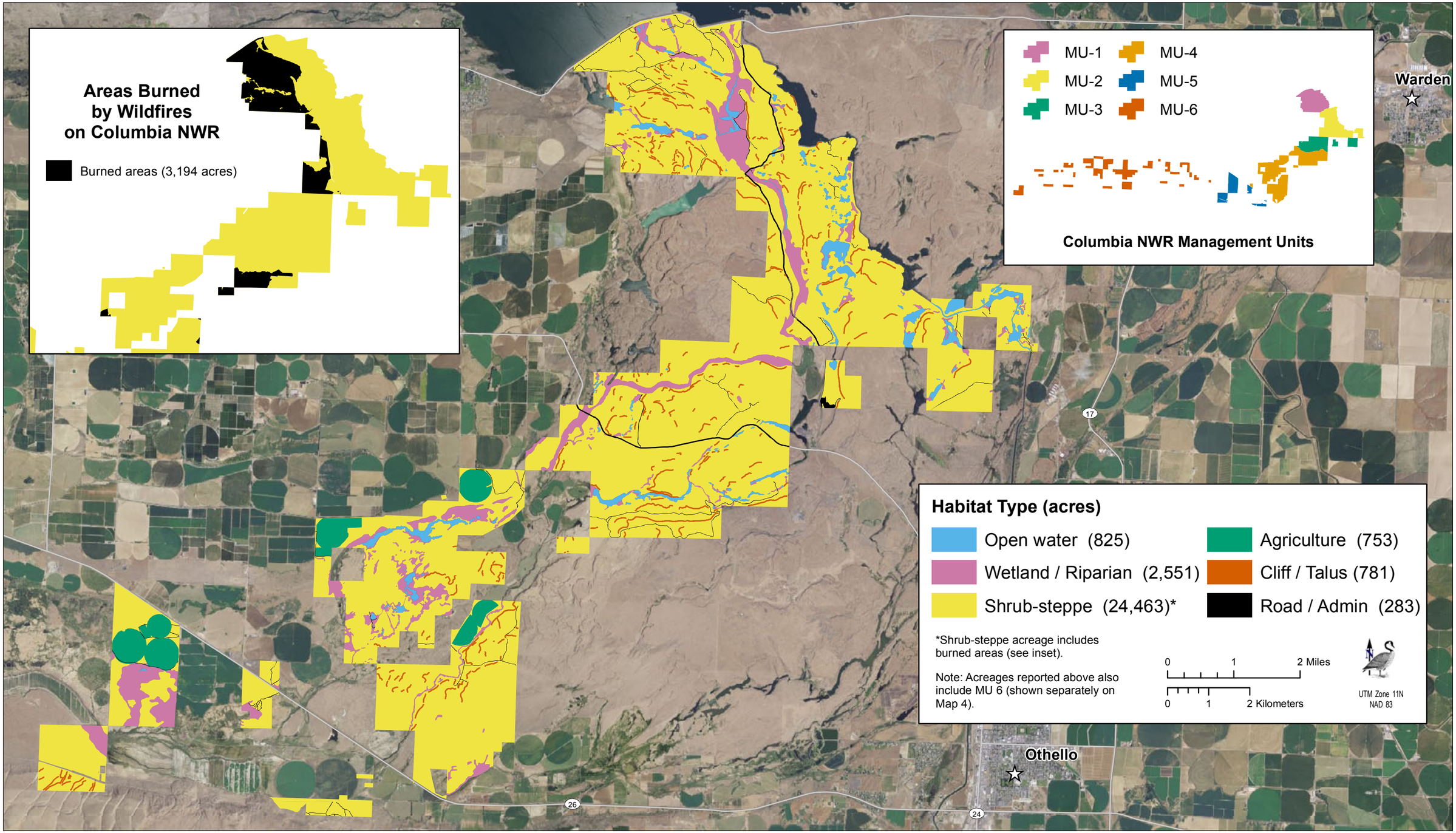
Map02_CMBCCP_Land_Ownership

U.S. Fish & Wildlife Service

Columbia National Wildlife Refuge

Adams and Grant Counties, Washington

Map 3 - Habitat Types, Management Units 1 - 5



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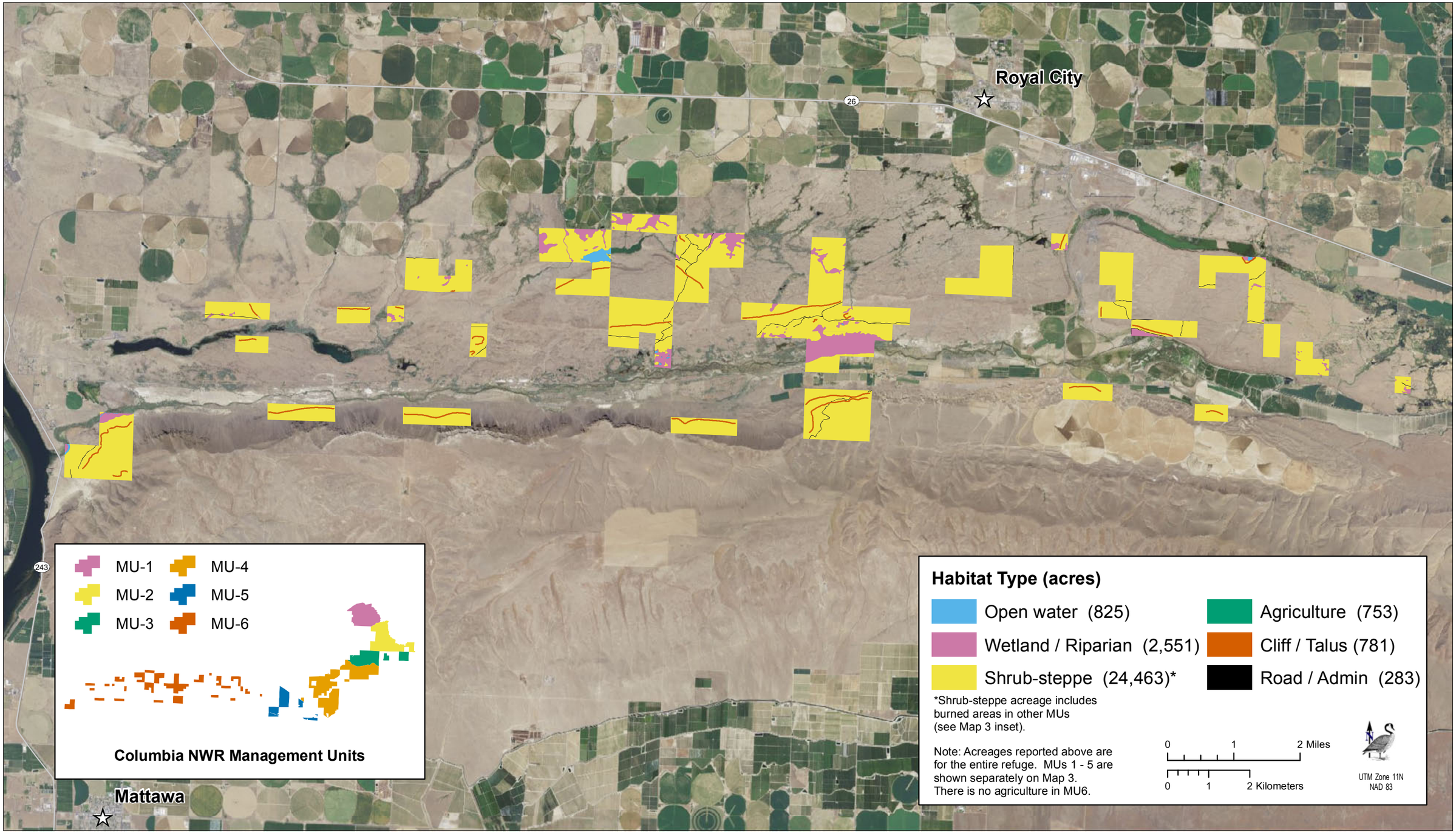
U.S. Fish & Wildlife Service

Columbia National Wildlife Refuge

Adams and Grant Counties, Washington

Map 4 - Habitat Types, Management Unit 6



Map04_CMBCCP_HabTypes_MU6

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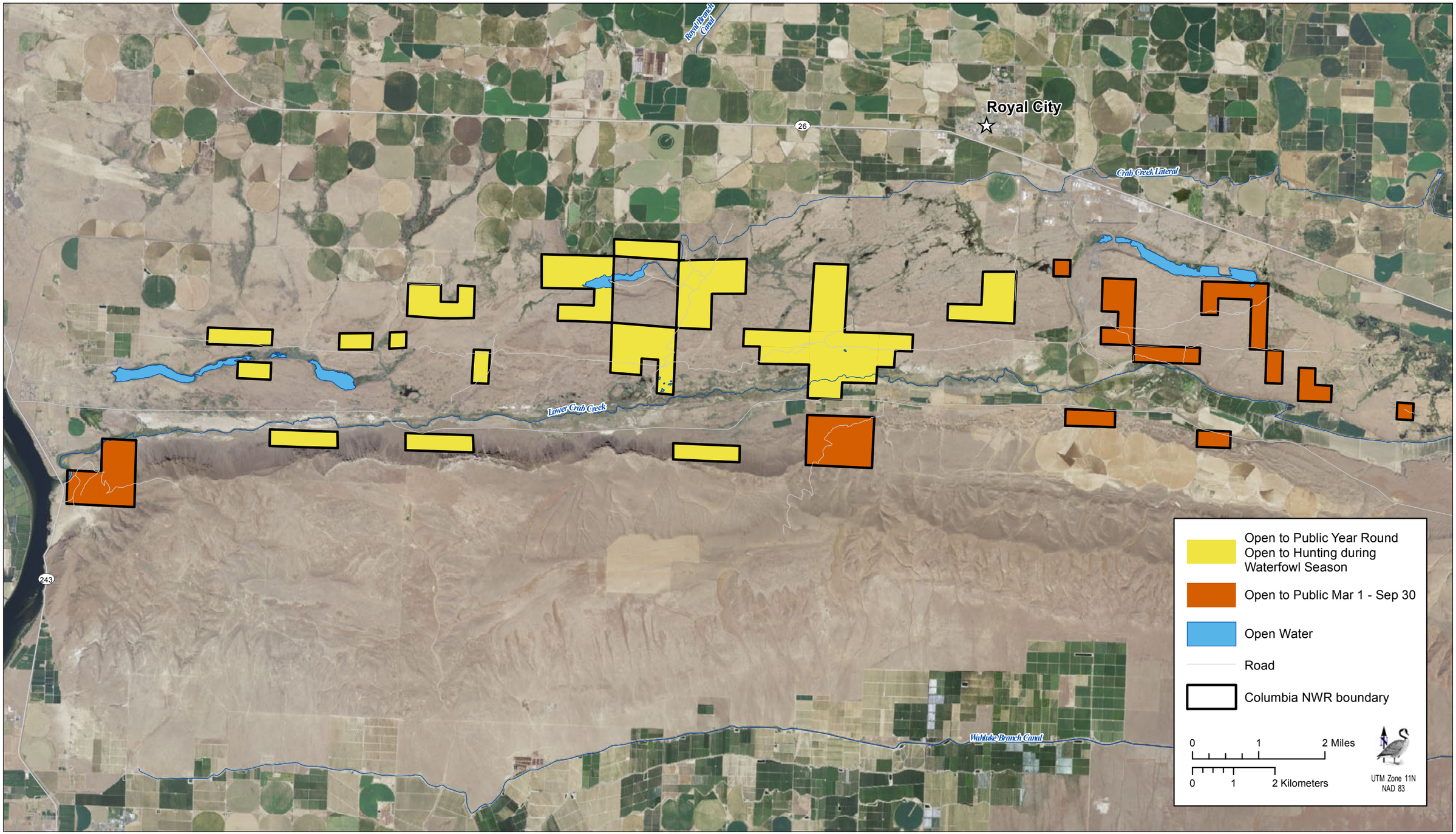
Columbia National Wildlife Refuge

Adams and Grant Counties, Washington

Map 5 - Selected Alternative, Management Unit 6

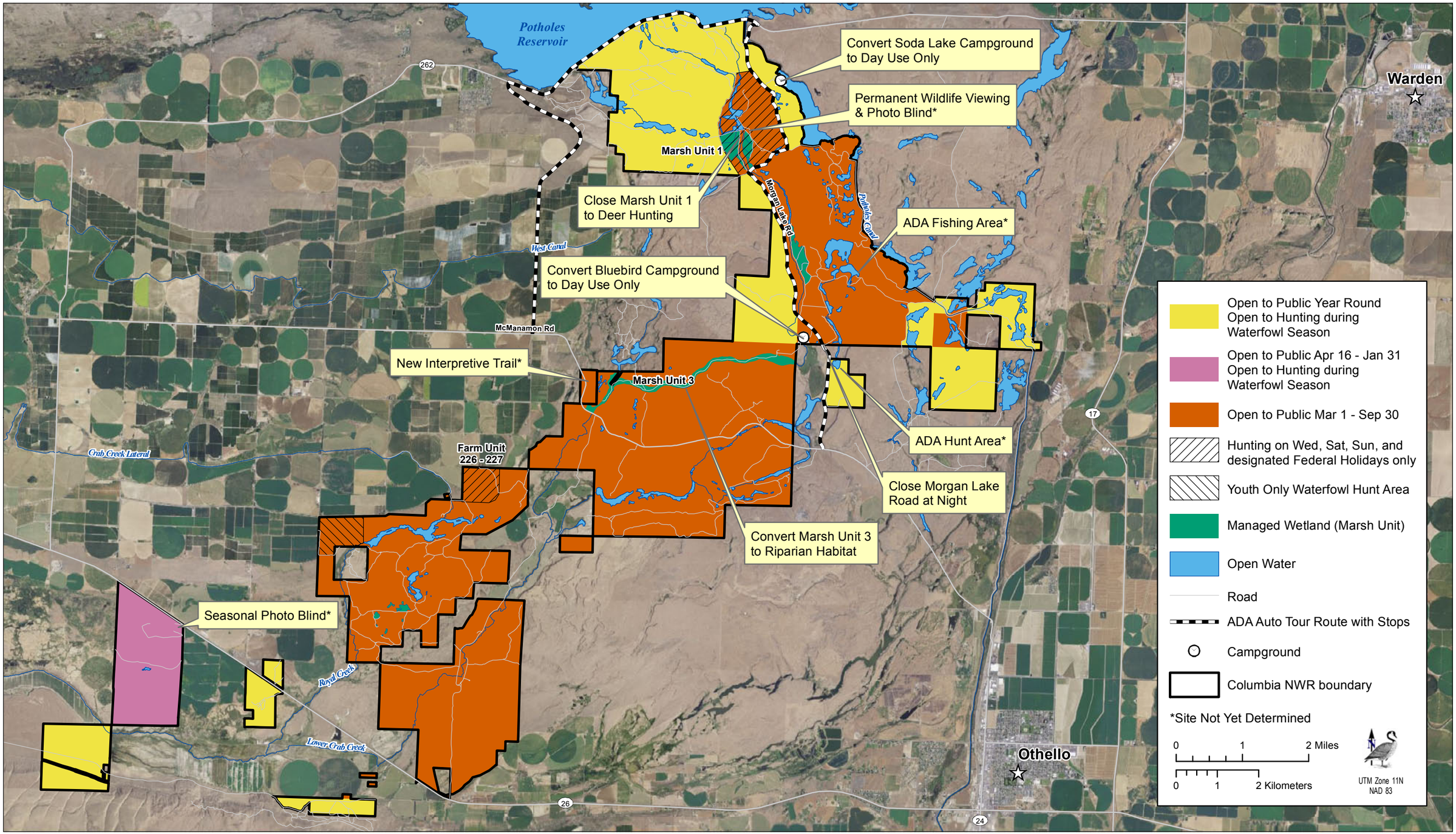


Map05_CMBCCP_Sel_Alt_MU6

Columbia National Wildlife Refuge

Adams and Grant Counties, Washington

Map 6 - Selected Alternative, Management Units 1 - 5



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Chapter 1

Introduction and Background

Chapter 1. Introduction and Background

1.1 Introduction

Surprising to most people outside the Northwest, the landscape of eastern Washington is that of a desert. In its natural state, almost all of Columbia National Wildlife Refuge (CNWR) would be considered desert, with the exception of the naturally ephemeral Crab Creek. However, rather than a desert of cacti and mesquite, eastern Washington's desert is that of a shrub-steppe, with sagebrush and bunchgrasses.

Like most of eastern Washington, much of CNWR is no longer in its natural state. The construction of the Columbia Basin Irrigation Project (CBIP) forever altered the landscape, bringing water to the desert. On CNWR, seepage from irrigation structures and reservoirs has created wetlands, riparian areas, and small lakes. The once-seasonal Crab Creek has become perennial, even providing habitat for endangered salmonids.

The creation of these lakes and wetlands has been augmented by the area's geologic history. During the last Ice Age, sheets of ice spreading down from Canada blocked rivers with dams of ice. Occasionally—or perhaps hundreds of times—the dams failed, sending floodwaters greater than the flow of all the world's rivers combined tearing across eastern Washington's lava fields, gouging coulees, redistributing boulders, depositing massive sand and gravel bars, scraping the land bare in some areas, leaving behind rich soils elsewhere. Nowhere are these depressions and geologic nooks more prevalent than on CNWR. The Drumheller Channeled Scablands formed just the right topography to capture the new hydrology created by the CBIP and were designated a National Natural Landmark.

Water in the desert means an abundance of life. In its original state, the land supported coyotes, rattlesnakes, mule deer, horned larks, sage sparrows, and other creatures of the shrub-steppe, although densities were limited. Water has changed all this, however. Many of the naturally occurring species can be found at higher densities (e.g., mule deer). Other species are newcomers, totally dependent on the artificial water; black-necked stilts and American avocets are some of the flashier ones. Still more species that may have made an occasional appearance can now be found in great numbers—Canada geese, northern pintails, and the Refuge's most famous visitors, lesser sandhill cranes. It was because of this newly created wildlife oasis, and the need to provide suitable mitigation for the CBIP, that CNWR was created in 1944 "for migratory birds and other wildlife."

The CBIP did more than create the need for, and provide water to, CNWR. It also created irrigated farmland, which secondarily provided a food source for many of CNWR's species. For example, the great concentration of sandhill cranes found on the Refuge in the spring is a recent event, beginning in earnest in the late 1980s. Before then, the cranes likely passed through the area on their way to breeding grounds in south-central Alaska without more than a brief stop, if that. Now, leftover grain in farmers' fields has become an important food source for migrating cranes, concentrating them by the thousands for several weeks in late winter and early spring. Other wildlife, most notably migrating waterfowl, mule deer, and numerous rodent species, also take advantage of the harvest.

While much of the habitat found on CNWR (most of the lakes, wetlands, springs, and perennial streams) is there as the result of an artificial situation, it is important to note that the habitats themselves are not artificial. Natural wetlands and shallow lakes can be found within the Columbia

Basin, and those on the Refuge function the same way as naturally occurring ones found elsewhere within the area. So, while many of the habitat types on CNWR would naturally be found in far smaller acreages, if at all without seepage water from the CBIP, the only non-natural habitat types present are farm fields and moist soil management areas.

Another thing that water brings is recreational use. Without water, there wouldn't be any fishing, waterfowl hunting, or boating. It's likely that there would be less hiking, biking, horseback riding, or sightseeing; visitors are drawn to water and the vegetation and wildlife it fosters. Water brings the sandhill cranes, the migrating songbirds, and the waterfowl that people come to see and learn about and collect on their "life-lists." It provides the serenity and the visual contrasts that draw the eye, and then the feet, of visitors. Without water, recreation and visitor use would be dramatically different on CNWR and certainly at a dramatically reduced level.

1.2 Proposed Action

The U.S. Fish and Wildlife Service (Service) is adopting and implementing a Comprehensive Conservation Plan (CCP) for CNWR. The CCP sets forth management guidance for a refuge for a period of 15 years, as required by the National Wildlife Refuge System Administration Act (Administration Act) of 1966 (16 U.S.C. 688dd-688ee), as amended by the National Wildlife Refuge System Improvement Act (Improvement Act) of 1997 (Public Law 105-57). The Improvement Act mandated that CCPs be developed for all refuges in the National Wildlife Refuge System (NWRS).

In order to adopt and implement this CCP, the Service followed and fulfilled the requirements of the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321-4347). The Service met NEPA requirements through an environmental impact analysis in an environmental assessment (EA), which the Service has adopted as final and has issued a Finding of No Significant Impact (FONSI) in order to select the final management alternative described here as its CCP for CNWR.

1.3 Purpose and Need for Action

The purpose of the CCP is to provide reasonable, scientifically grounded guidance for improving CNWR's shrub-steppe, riparian, wetland, and cliff-talus habitats for the long-term conservation of native plants and animals and migratory birds. The CCP identifies appropriate actions for protecting and sustaining the cultural and biological features of CNWR; the Refuge's wintering waterfowl populations and habitats; the growing migratory shorebird populations that use the Refuge; and threatened, endangered, or rare species. A final purpose of the CCP is to provide guidance for providing high-quality public use programs in hunting, fishing, wildlife observation, photography, environmental education, and interpretation.

The CCP is needed for a variety of reasons. Primary among these are the need to establish improved habitat conditions on the Refuge's shrub-steppe, riparian, wetland, and cliff-talus habitats, many of which are highly degraded by invasive plants and animals, and to identify and deal with key threats to these habitats, including altered fire regimes and fragmentation. There is a need to address CNWR's contributions to state-listed species that rely on the Refuge, such as Washington ground squirrels. There is a need to analyze wildlife-dependent public use programs and to determine what

improvements or alterations should be made in the pursuit of higher-quality programs.[1] There is a need to determine whether and how CNWR should continue to offer camping and other nonwildlife-dependent uses, including horseback riding and boating. There is a need to address strategies to better prevent use of Refuge lands and waters for illegal uses, including off-road use, trash dumping, vandalism, and graffiti. Finally, there is a need to describe the steps that should be taken to better protect cultural resources.

1.4 CNWR Purposes and Establishment History

The Service's interest in the "Lower Crab Creek" as a wildlife area existed by the 1930s, although more than a decade passed until any action took place. Field representatives for the Service first approved the concept of the Refuge on January 23, 1942. During January through August of 1943, the Migratory Bird Conservation Commission, composed of the Secretary of the Interior as chairman, the Secretary of Agriculture, the Secretary of Commerce, two senators, and two congressmen, approved the acquisition of 2,336 acres of land for a refuge. The CNWR became established with the first purchase of land (120 acres) on June 13, 1944.

While there have been many individual land acquisitions for the Refuge, very few administrative actions have been involved in the form of executive orders, public land orders, etc. Initially, Executive Order 9337 (April 24, 1943) authorized the Secretary of the Interior to withdraw and reserve lands of the public domain and other lands owned or controlled by the United States, granting the base authority for establishment and growth of CNWR.[2] Pursuant to that Executive Order, Public Land Order 243 (September 6, 1944) directed that " … the following-described public lands in Washington are hereby withdrawn … for the use of the Department of the Interior as a refuge … " thereby more than quintupling the new Refuge created less than three months earlier.[3] The withdrawal accompanying this order added 12,365 acres, fully 42 percent of the present-day Refuge. Since then, 89 separate land transactions have brought CNWR to where it is to today.

The September 1944 withdrawal specified that the land was to be " … a refuge and breeding ground for migratory birds and other wildlife" under the Migratory Bird Conservation Act (16 U.S.C. § 715d) " … for use as an inviolate sanctuary, or for any other management purpose, for migratory birds."[4] Most subsequent land transactions have been for this same purpose, i.e., migratory bird protection and enhancement.

1.4.1 Management Agreements

By a Memorandum of Agreement (MOA) between the Bureau of Reclamation (BOR) and the Service, approved by the Secretary of the Interior on September 6, 1955, the BOR agreed that the withdrawal of certain public lands for its CBIP would be reserved for use by the Service. The BOR

[1] This includes the "Big Six" wildlife-dependent uses identified in the Improvement Act: hunting, fishing, wildlife observation, photography, environmental education and interpretation.

[2] In 1952 (May 26), Executive Order 10355 superseded Executive Order 9337 and delegated to the Secretary of the Interior " … the authority of the President to withdraw or reserve lands of the United States for public purposes."

[3] The reservation made by this order was/is " … subject to Federal Power Project Number 510 of June 19, 1924" (i.e., the CBIP). It is a project feature of the CBIP.

[4] The meaning of the phrase "inviolate sanctuary" has been modified over the years. An inviolate sanctuary means that migratory game birds may not be hunted in more than 40 percent of the area acquired, reserved, or set apart as a refuge.

further consented to the Service administering certain right-of-way lands, subject to the primary jurisdiction of the BOR. These lands under agreement with the BOR amount to 1,524 acres of CNWR's 29,656 acres. An additional 6,000+ acres between Corfu and the Columbia River are managed under agreement with the Washington Department of Fish and Wildlife (WDFW) as scattered parcels.

1.5 Legal and Policy Mandates

The Service is the primary Federal agency responsible for conserving and enhancing the nation's fish and wildlife populations and their habitats. Although the Service shares this responsibility with other Federal agencies; Tribal, state and local governments; and private entities, the Service has specific responsibilities for migratory birds, threatened and endangered species, and certain anadromous fish. The Service also has similar management responsibilities for refuge lands and waters to support the conservation and enhancement of fish and wildlife.

Refuges are guided by various Federal laws, executive orders, Service policies, and international treaties (see Appendix B for a more complete list and discussion of relevant mandates). Fundamental to the management of every refuge are the mission and goals of the NWRS and the designated purposes of the individual refuge as described in establishing legislation, executive orders, or other documents establishing, authorizing, or expanding a refuge.

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

In addition to the mandates discussed below, many other laws apply to the Service and management of NWRS lands. Examples include the Endangered Species Act of 1973, as amended, and the National Historic Preservation Act of 1966 (NHPA), as amended. A list and brief description of each can be found at laws.fws.gov and in Appendix B.

1.5.1 National Wildlife Refuge System Improvement Act

The Improvement Act amends the Refuge System Administration Act of 1966 by defining a unifying mission for all national wildlife refuges, including a new process for determining compatible uses on refuges and requiring that each refuge be managed under a CCP. The Improvement Act expressly states that wildlife conservation is the priority of NWRS lands and that the Secretary of the Interior shall ensure that the biological integrity, diversity, and environmental health of refuge lands are maintained. Each refuge must be managed to fulfill the NWRS mission and the specific purposes for which the refuge was established. The first priority of each national wildlife refuge is to conserve, manage, and, if needed, restore fish and wildlife populations and habitats according to its purpose.

The Improvement Act requires that a CCP be completed for each refuge by the year 2012 and that the public have an opportunity for active involvement in plan development and revision. It is Service policy that CCPs are developed in an open public process; the agency is committed to securing public input throughout the process.

1.5.2 National Wildlife Refuge System Mission and Goals

The mission of the NWRS is:

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

The NWRS has grown to include more than 150 million acres and 553 national wildlife refuges. The NWRS is the largest collection of lands specifically managed for fish and wildlife conservation in the nation. The needs of wildlife and their habitats come first on refuges, in contrast to most other public lands, which are managed for multiple uses.

The administration, management and growth of the NWRS are guided by the following goals.

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

1.5.3 Tribal Rights and Interests

The Service believes that defining the application of treaty rights is outside the scope of this CCP. At their request, the Service will meet with area Tribes independent of the CCP process to develop Memorandums of Understanding (MOUs) and other instruments that are respectful of the rights and needs of the Tribes, in accordance with Service Tribal policies and consistent with preserving the natural and cultural resources of CNWR.

The Confederated Tribes and Bands of the Yakama Nation (Yakama Nation), Confederated Tribes of the Umatilla Indian Reservation (CTUIR), and Nez Perce Tribe all have treaties negotiated with the United States government (see Appendix B). The Confederated Tribes of the Colville Reservation (CCT) are a federally recognized Tribe, some of whose constituent Tribes or bands are descendants of people who used the area. In addition, the Wanapum, who did not negotiate a treaty with the United States, also historically occupied and used this area and maintain traditional connections to the Refuge to this day.

Through these treaties, the Tribes retained certain lands for exclusive use (the four reservations) and also retained the rights to continue traditional activities outside the reservations. These reserved

rights include those to hunt, gather foods and medicines, and pasture livestock on open and unclaimed lands.

Tribal access to the Refuge for gathering and other traditional practices is guided by the Service Native American Policy. The existing Service Native American Policy, Executive Order (EO) 13175, and legislation provides guidance for directing ongoing consultation. The Native American Policy, in particular, assists the Service in accomplishing its mission of resource protection while also guiding the Federal government's interactions with Tribes to:

> *… assist Native Americans in protecting, conserving and utilizing their reserved guarantee of statutorily identified trust resources. The Service will consult with Native American governments on fish and wildlife resource matters of mutual interest and concern to keep Native American governments involved in such matters from initiation to completion of related Service activities … The Service will continue to involve Native American governments in all Service actions that may affect cultural or religious interests, including archaeological sites. The Service is guided by such legislation as the American Indian Religious Freedom Act, the Native American Graves Protection Act, the National Historic Preservation Act, the Native American Graves Protection and Repatriation Act, and Archaeological Resources Protection Act.*

1.5.4 State of Washington Wildlife Management

The Service has primary jurisdiction of fish and wildlife on refuge lands as established through a variety of laws, policies, and directives related to migratory and resident fish and wildlife resources on Federal lands. However, the Improvement Act states in part, "Nothing in this Act shall be construed as affecting the authority, jurisdiction, or responsibility of the several States to manage, control, or regulate fish and resident wildlife under State law or regulations in any area within the [NWRS]. Regulations permitting hunting or fishing of fish and resident wildlife within the [NWRS] shall be, to the extent practicable, consistent with State fish and wildlife laws, regulations, and management plans."

CNWR is part of the NWRS; Federal management activity involving migratory birds and other wildlife residing on units of the NWRS is a Federal function specifically authorized by Congress. It is, therefore, for the Secretary of the Interior to determine whether units of the NWRS shall be open to public uses, such as hunting and fishing, and on what terms such access shall be granted. However, in recognition of the existing jurisdictional relationship between the states and the Federal government, Congress has directed that, to the maximum extent practicable, such public uses shall be consistent with state laws and regulations (43 Code of Federal Regulations [CFR] 24.4). Consistent with the Improvement Act, the Director of the Service will "interact, coordinate, cooperate and collaborate with state fish and wildlife agencies in a timely and effective manner on the acquisition and management of national wildlife refuges" (Director's Order Number 148).

1.5.5 Public Uses of CNWR

Two of the priorities of the NWRS are to protect the biological resources entrusted to the Service and the irreplaceable cultural resources found within the NWRS. However, wherever possible and compatible with resource protection, a national wildlife refuge should be open and available to the public for its use and enjoyment. Consistent with the National Wildlife Refuge System

Administration Act, the Service makes a special effort to provide wildlife-dependent public use opportunities across the NWRS. Balancing these often-conflicting goals is accomplished through a variety of means, including the development of CCPs.

To determine what uses can be allowed on a national wildlife refuge, the Service first determines whether the use is appropriate. 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. For this CCP, Service staff applied a series of questions/standards to determine whether a use was appropriate (see Appendix C). If the activity was determined to be an appropriate use of CNWR, the Service developed a compatibility determination (CD). A CD determines whether the proposed activity is compatible with the refuge's purposes and the mission of the NWRS. Only if the activity is determined compatible with resource protection by the Mid-Columbia River National Wildlife Refuge Complex (MCRNWRC) Project Leader with concurrence by the Region 1 National Wildlife Refuges Chief is it allowed to occur. The CDs for CNWR are presented in Appendix D.

1.6 Relationship to Other Planning Efforts

When developing a CCP, the Service considers the goals and objectives of existing national, regional, and ecosystem plans; state fish and wildlife conservation plans; and other landscape-scale plans developed for the same watershed or ecosystem in which the refuge is located. To the extent possible, the CCP is expected to be consistent with the existing plans and assist in meeting their conservation goals and objectives (602 FW 3.3). This section summarizes some of the key plans reviewed by members of the core team while developing the CCP.

1.6.1 Columbia River/Basin Region

Wintering Waterfowl Redistribution Plan: This plan, a partnership effort between WDFW, Oregon Department of Fish and Wildlife (ODFW), and the Service, modified hunting areas and regulations in the Columbia Plateau area with the purpose of "redistributing" waterfowl (mainly from the Umatilla/Boardman area to the Yakima subbasin area). Because basin-wide numbers of wintering waterfowl have dropped sharply since the plan was first implemented (possibly due to area-wide cropping changes, climate change, and habitat improvements in California), the Columbia Basin Wintering Waterfowl Plan is currently being updated.

Subbasin Plans: The Northwest Power and Conservation Council (NPCC) has overseen the development of plans for each of the 60 interior tributary subbasins of the Columbia River. Subbasin plans are expected to assess the biological potential of the subbasin and to describe opportunities for restoration. Plans also describe the amount of habitat change that has occurred within the subbasin and limiting factors (analogous to stresses/sources in this plan). The plans will be the basis for review of proposals for the Bonneville Power Administration (BPA) each year by the fish and wildlife agencies and Tribes, the Independent Scientific Review Panel, and the NPCC. All of CNWR is situated within the Lower Mid-Columbia Mainstem Subbasin. Focal habitats included in the subbasin plan occurring on CNWR include interior riparian wetlands and shrub-steppe/interior grasslands. These habitats include a set of focal species selected for the subbasin plan. Quantitative objectives were written for each focal habitat, based on the needs of selected focal species. The CNWR will have the opportunity every five years to submit project proposals for BPA funding that are consistent with the subbasin plan.

The Nature Conservancy Columbia Plateau Ecoregional Assessment: This assessment identified a portfolio of sites that, collectively and with appropriate conservation action, could maintain all viable native species and communities within the analysis area. In addition, it provides an assessment of threats to the sites and develops multi-site strategies to conserve the biodiversity of the ecoregion. The document and assessment are in the process of being updated.

Interior Columbia Basin Ecosystem Management Plan: This project was an ambitious effort covering the majority of the Inland Northwest and is one of the best sources of broad-scale ecosystem analysis for the region. The scientific assessment which underlies the plan identified numerous threats to the ecological integrity of the basin. Within the vicinity of CNWR, the report lists the primary opportunities to address the risks to ecological integrity as: 1) maintenance or restoration of riparian condition; 2) restoration of productive aquatic areas; and 3) conservation of fish strongholds and unique aquatic areas.

1.6.2 Migratory Bird Plans

Birds of Conservation Concern: Based on the efforts and assessment scores of three major bird conservation efforts (Partners In Flight, the United States Shorebird Conservation Plan and the North American Waterbird Conservation Plan), this report identifies, by Service Region and by Bird Conservation Region (BCR), the bird species most in need of conservation attention. CNWR is located within BCR Region 9, for which 29 species are listed.

Partners in Flight (PIF), Columbia Plateau Plan: The primary goal of the *Conservation Strategy for Landbirds in the Columbia Plateau of Eastern Oregon and Washington* is to ensure long-term maintenance of healthy populations of native landbirds. Specific management activities and strategies are recommended.

North American Waterfowl Management Plan: The North American Waterfowl Management Plan, signed by the United States and Canada in 1986 and by Mexico in 1994, provides a strategy to protect North America's remaining wetlands and to conserve waterfowl populations through habitat protection, restoration, and enhancement. The plan contains population goals for several species and groups of species by season or life stage. The plan was updated in 2004 with an emphasis on strengthening the biological foundation, using a landscape approach and expanding partnerships. Additional strategic guidance was provided in a 2004 update, with specific population objectives by species. Implementation of this plan is accomplished at the regional level through partnerships, within 11 Joint Venture areas. CNWR is located within the area of the Intermountain West Joint Venture.

Pacific Flyway Plans: Flyway management plans are the products of Flyway Councils, developed to help state and Federal agencies cooperatively manage migratory game birds. These plans typically focus on populations. The Pacific Flyway Council has prepared 26 management plans to date in either draft or final form available at pacificflyway.gov/Abstracts.asp#rmts. The following flyway management plans pertain to CNWR and the CCP:

- *Canada Geese:* Lesser and Taverner's, Pacific Western, Rocky Mountain, Western, Depredation Control
- *Greater White-fronted Geese:* Pacific, Tule
- *Snow Geese:* Wrangel Island Lesser, Western Canadian Arctic Lesser
- *Ross' Geese*

- *Swans:* Pacific Trumpeter, Rocky Mountain Trumpeter, Western Tundra, Eastern Tundra
- *Sandhill Cranes:* Pacific Coast, Central Valley
- *Mourning Dove:* National Mourning Dove Plan

Intermountain West Regional Shorebird Conservation Plan: According to this plan, the Intermountain West is North America's most important inland area for maintaining the continent's shorebird populations. The plan identifies major shorebird issues in the region and outlines regional goals and objectives in the areas of habitat management, monitoring and assessment, research, outreach, and planning. Key issues identified in the plan include water quality and quantity; maintenance and enhancement of populations of long-billed curlew, mountain plover and upland sandpiper; depredation of eggs and young; regional coordination; agriculture/shorebird interface; and wintering sites. Concern ranking scores are provided for each of the 34 shorebird species breeding or moving through the region. Species ranked as "critically important" include snowy plover, black-necked stilt, American avocet, long-billed curlew, long-billed dowitcher, and Wilson's phalarope.

Intermountain West Region Waterbird Conservation Plan: This plan identifies the 41 waterbird species inhabiting the Intermountain West. The plan provides detailed background information for each species by BCR, including population estimates, identification of important areas, and an itemization of threats. For each BCR, species were categorized as high, moderate, or low concern, or as "not currently at risk." Specific objectives are provided, usually framed in terms of overall population goals. Some habitat objectives are provided as well. The plan provides a useful section on research and education/outreach needs.

1.6.3 Other Service Plans

Several Service plans address management on either the MCRNWRC or CNWR:

1.6.3.1 CNWR Master Plan

The CNWR Master Plan, completed in January of 1986, outlined the direction for the Refuge through goals and objectives based on the establishing legislation and Refuge purposes. The primary goals were to: 1) enhance wildlife diversity through habitat management, with a focus on sensitive, threatened, and endangered species; 2) meet migratory bird objectives by providing adequate wintering habitat, primarily for waterfowl; 3) respond to existing public demand for resource and Refuge information; 4) provide quality hunting and fishing opportunities with maximum administrative efficiencies; 5) increase waterfowl production, with an emphasis on mallards, redheads, and Canada geese; 6) improve the quality of Refuge-related interpretation, wildlife observation, and environmental education programs; and 7) cooperate with other agencies, institutions of higher education, and private individuals to provide appropriate technical assistance and research opportunities. Through the Master Plan, step-down plans were created to outline how these goals and objectives would be completed. After the Improvement Act, the CCP became the vehicle through which to update all Master Plans throughout the NWRS.

1.6.3.2 Cooperative Farming Management Plan

This plan identifies crops to be planted and farming methods to be used on CNWR to benefit waterfowl and other migratory birds; the primary crops are grains and green browse. The current farming program is administered through cooperative farming agreements, split 75/25 between the cooperative farmer and CNWR. Crop selection and rotations are based on numerous factors,

including wildlife and soil needs, nutrient cycling, preventing pest cycles, and current market value. On average, the rotation is green browse for three to four years, followed by corn, and then a small grain. With this type of administration, the cooperator pays for water, maintenance of infrastructure, approved herbicide/pesticide application(s), and any additional costs associated with the farming.

1.6.3.3 Refuge Hunting Plan

In order for hunting to be allowed on a national wildlife refuge, a hunting plan must be approved. The CNWR Hunting Plan outlines the species that may be hunted, the general regulations that must be followed, the areas available for hunting, and the compatibility of hunting with Refuge resources. Following completion of this CCP, it is likely the hunting plan will be revised.

1.6.3.4 CNWR Fire Management Plan

The *2009 Mid-Columbia River National Wildlife Refuge Complex Fire Management Plan* (U.S. Fish and Wildlife Service 2009) details how the Refuge will respond to the threat of wildfire and determines under what circumstances to use fire as a management tool. This plan will remain as is, and no changes to fire management capabilities or opportunities are proposed in this CCP.

1.6.4 Other Federal Agency Plans

Several other Federal agencies undertake actions and/or have planning efforts that could impact CNWR. Among these are BOR irrigation and water storage efforts, Federal Energy Regulatory Commission hydropower licensings and power transmission activities, Federal Highways Administration transportation actions, etc. It is almost certain that at some point throughout the life of the CCP, one or more of these agencies will undertake or propose actions that will impact the Refuge.

1.6.4.1 NOAA-Fisheries Salmon and Steelhead Recovery Plan

The *Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan* was developed for the recovery of Upper Columbia River Spring Chinook (endangered), Upper Columbia River steelhead (threatened) and bull trout (threatened). The mission for the Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan is to:

> *To restore viable and sustainable populations of salmon, steelhead, and other at-risk species through collaborative, economically sensitive efforts, combined resources, and wise resource management of the Upper Columbia region.*

The plan is an outgrowth and culmination of several conservation efforts in the Upper Columbia Basin, including current efforts related to the Endangered Species Act (ESA), state and Tribal-sponsored recovery efforts, subbasin planning, and watershed planning. It is to be used to guide Federal agencies charged with species recovery and to inform state and local agency planning and land use actions. The goal of this plan is to offer options for future actions that strive to secure the survival of species.

1.6.5 Washington State Plans

The Service is committed to participating in Washington State planning efforts and assisting in their implementation, where feasible and affordable.

1.6.5.1 Washington Natural Heritage Plan

This plan describes Washington State programs, especially the Natural Areas Program, for conservation of the State's biological diversity. Species and ecosystem types (habitat associations) are ranked in terms of conservation priority. Of approximately 800 plant and wetland communities located within the State, 250 are considered priorities for conservation. Lists of rare animals, rare plants, and priority communities are located at www.dnr.wa.gov/nhp/.

1.6.5.2 Washington Greater Sage-Grouse Recovery Plan[5]

This plan identifies specific recovery areas and select recovery methods for the Washington population of greater sage-grouse. CNWR is located within an area for implementation of one of the state's top five priorities, mainly by providing a connection between the Yakima Training Center (YTC) through the Hanford Reach National Monument (Monument) and on to northern Grant and Douglas Counties.

CNWR will participate in the *State of Washington Sage-Grouse Recovery Plan* to the extent possible and practical to establish a new population of sage-grouse on the Refuge and surrounding lands within the Columbia Basin. The Refuge could serve as a corridor to link the sage-grouse populations of the YTC and Douglas/Grant Counties.[6] This participation will mainly focus on evaluating the importance of the Refuge to state restoration efforts, assessing the current condition of habitats which might support sage-grouse by conducting vegetation surveys in sagebrush and riparian habitats, and creating partnerships with other landowners to promote sage-grouse restoration if feasible. The Service is also open to discussions of translocating sage-grouse to CNWR in the future if recovery proceeds to that point.

1.6.5.3 Washington Pygmy Rabbit Recovery Plan[7]

Currently, there are no known naturally occurring pygmy rabbit areas remaining in Washington, although a pygmy rabbit reintroduction project is currently occurring on the Sagebrush Flats area in Grant County. Due to its limited distribution and fragile population size at the time, the pygmy rabbit was listed as a threatened species by the Washington Wildlife Commission in 1990; it was reclassified as endangered in 1993. The Columbia Basin distinct population segment of the pygmy rabbit is listed as endangered by the Service (66 FR 59734, 66 FR 5967).

The pygmy rabbit is the only rabbit native to North America that digs its own burrows. It is also uniquely dependent upon sagebrush, which constitutes up to 99 percent of its winter diet. Dense sagebrush and relatively deep, loose soil are important characteristics of pygmy rabbit habitat. The

[5] Much of this description was taken or summarized from the *State of Washington Greater Sage-Grouse Recovery Plan* (Stinson et al. 2004).

[6] Part of the CNWR is in the Potholes Management Unit identified in the Washington recovery plan.

[7] Much of this description was taken or summarized from the *Washington State Recovery Plan for the Pygmy Rabbit* (WDFW 1995).

primary factor contributing to the decline of the pygmy rabbit in Washington has been loss of habitat due to agricultural conversion.

As one of the last remaining large areas of sagebrush, together with the Monument and other Federal/state lands, CNWR may be able to play a role in recovery efforts. Whether any lands on CNWR are suitable for pygmy rabbits would need to be assessed, but an area known to be suitable for habitation has been identified on the nearby Wahluke Slope of the Monument. In any event, CNWR will take any active role it can in recovery efforts.

Recovery strategies for this species include protection of existing habitat, identification and management of lands for creation of new habitat, monitoring of the pygmy rabbit population, and research to better understand the effects of management actions. Grazing, if it occurs in pygmy rabbit areas, should be managed to be compatible with pygmy rabbit habitat needs. In all pygmy rabbit areas, steps should be taken to reduce the risk of range fire. To increase the extent of pygmy rabbit habitat, efforts should be directed at identifying lands where soil conditions are suitable for pygmy rabbits. If necessary, lands with appropriate soil conditions should be restored or enhanced to provide pygmy rabbit habitat. Pygmy rabbits should be introduced to selected vacant habitat. Other strategies, including enforcement, data management, cooperative work with landowners and other agencies, research, and public information should all play a role in pygmy rabbit recovery efforts.

1.6.5.4 Washington Leopard Frog Recovery Plan[8]

In Washington, records indicate that the leopard frog once inhabited at least 18 general areas in eastern Washington, many of these along the Columbia River and its major tributaries. However, sightings of leopard frogs in Washington since 1970 have been from just three counties: Grant, Whitman, and Pend Oreille. Field surveys conducted since 1992 confirmed the species in only two areas in the state, both of which are in the Crab Creek drainage in Grant County.[9] Four separate leopard frog sites at one area in the Crab Creek drainage, and two separate occupied sites at the other area in the Crab Creek drainage, have been located. The number of leopard frogs at each of these localities is not known. The number of occupied sites within areas appears to change over time, with surveys indicating some sites disappearing and some newly located.

There are a variety of factors that have the potential to adversely affect or extirpate the remaining leopard frog populations in Washington: agricultural chemicals: vehicles on roads are a significant mortality source as frogs travel between breeding ponds and larger summer, fall and overwintering water bodies; bullfrogs and introduced fish are known to eat amphibians and are thought to cause significant declines in leopard frog populations; and use changes, including irrigation projects and development have contributed to changes in the hydrology of many areas; disease may also have contributed to the decline witnessed in Washington. Research, monitoring and evaluation of the factors potentially causing the decline of leopard frogs are essential to their conservation.

As noted above, the Crab Creek drainage is one of the few remaining sites in Washington where northern leopard frogs are found. The northern leopard frog ranges into a wide variety of habitats, even hay fields and grassy woodlands, but apparently requires a high degree of vegetative cover for

[8] Much of this description was taken or summarized from the *Washington State Status Report for the Northern Leopard Frog* (McAllister et al. 1999).

[9] One historical but unsurveyed area, on the campus of Washington State University, may still be populated by frogs most likely liberated from laboratory experiments.

concealment. Leopard frogs require permanent deep water for overwintering, in proximity to seasonal ponds and wetlands for breeding. These are conditions that can be found or replicated on the Refuge.

As part of CNWR's efforts to support the state in its recovery plan, the Service will protect and, where feasible, restore wetland and open water habitats to meet the life-history needs of the northern leopard frog.[10] Other actions might include:

- Assessing the current condition of habitats which might support northern leopard frogs.
- Discontinuing fishing and fish stocking on selected lakes, removing existing fish, and controlling bullfrogs.[11]
- Translocating northern leopard frogs to CNWR.

1.6.5.5 Washington Ground Squirrel Recovery Plan

Loss of habitat as a result of conversion of shrub-steppe to cropland may be the greatest negative factor affecting the Washington ground squirrel population; the CBIP is responsible for much of the habitat loss in the squirrel's range in Washington. Agriculture has focused on the same arable, deep soil communities used by Washington ground squirrels, and the species is unable to persist in soils that are regularly cultivated. Some researchers estimate that nearly two-thirds of the species' historical range has been converted to agriculture. Other factors likely contributing to the species decline include predators, disease, overgrazing, and historical destruction by ranchers, farmers and varmint hunters; the species was finally protected by State law in 1997.

The Washington ground squirrel is a candidate for Federal listing under the Federal Endangered Species Act. It is listed as state endangered in Oregon and became a state candidate species in Washington in the early 1990s. One of the factors hindering its listing in Washington is that relatively little knowledge concerning the species exists for Washington. For example, population estimates do not exist for Washington, although peripheral range contractions have been reported for every decade since the 1970s, presumably reflecting a declining population trend.

While the Washington ground squirrel is not an endangered or threatened species within the State of Washington, because CNWR currently supports Washington ground squirrels, this CCP lays out protection and recovery objectives and strategies (see Goal 4).

1.7 Step-Down Plans

CCPs are intended to provide a framework for management direction. As such, they often take a broad view of a refuge, leaving finer details to other subsequent plans. Additional plans stemming from a CCP are known as step-down plans (Refuge Manual 602 FW 4) (U.S. Fish and Wildlife Service 2000c). The CCP provides the framework and priorities for management, and the step-down

[10] Northern leopard frog habitat on the CNWR is characterized by:

- Permanent deep water for overwintering.
- Breeding ponds (semipermanent or seasonal) with a maximum depth of 5-6.5 feet.
- No fish or bullfrog populations.
- No connection to any other body of water.
- Periodic (every 4-5 years) dewatering.

[11] As noted in the 2000 CNWR Biological Review.

plans provide management detail, allowing the process to be tiered and broken into manageable efforts.

The Service considers this CCP to be a landscape-scale plan, whereby general management direction is set but details for the management of programs are left to be determined in subsequent step-down plans.

Several resource areas and issues will be addressed in the step-down plans. A few of these plans currently exist in some form, although the selection of the management direction may necessitate their revision; a review of the existing plans will be needed. For example, the MCRNWRC's Fire Management Plan (U.S. Fish and Wildlife Service 2009) may need to be revised based on changes in visitor use patterns, new areas open, or additional land acquisitions. The Cooperative Farming Management Plan for CNWR may need revisions, depending on the alternative chosen. In addition to the Cooperative Farming and Wildland Fire Management Plans, existing, likely and possible step-down plans include, but are not limited to:

- Cultural Resources Management
- Fisheries (Including Fishing and Fish Stocking)
- Habitat Management
- Hunting
- Interpretation and Education
- Landscape Design Standards/Aesthetics
- Law Enforcement and Emergency Response
- Inventory and Monitoring
- Visitor Services
- Mosquito Management

When these plans are developed, the public will be invited to assist in their development, in most instances directly through public scoping and/or workshops (to the extent legally allowed), and in all instances through public review of the plans and all supporting NEPA documentation.

1.8 CCP Review, Amendment, and Revision

The CCP is intended to be a dynamic plan based on the concept of adaptive management. Consistent with this concept, the CCP will be reviewed annually to determine whether it requires amendment or revision. The Service will document and make minor plan modifications whenever this review, or any other monitoring or evaluation process, suggests that changes are needed to achieve the Refuge's purpose, vision, and goals. Modifications will be coordinated with partners and subject to appropriate NEPA compliance.

More extensive revisions of the CCP will occur when significant new information becomes available, ecological conditions change, a significant boundary change occurs, or when the need for major changes has been identified during annual plan reviews. Service guidelines state that a review should occur every 15 years, or sooner if necessary. All plan revisions will follow the procedures outlined in Service planning policies for preparing CCPs and will require NEPA compliance. When the CCP requires a major revision, the CCP process will start anew at the preplanning phase.

1.9 Issues, Concerns, and Opportunities

Much of a CCP is driven by the issues identified by the Service, or raised by the public and other organizations/agencies/governments, that affect the refuge.

1.9.1 Issues Addressed in the CCP

The following issues were considered by the Service to be the major issues to address in this planning process.

1.9.1.1 Habitats

- Which, if any, areas should be restored and to what habitat types?
- What habitat conditions should be targeted and restored on CNWR's shrub-steppe, riparian, riverine, wetland, and cliff-talus habitats, many of which are highly degraded by invasive plants and animals?
- How can CNWR best prevent wildfires fostered by highly flammable invasive cheatgrass in the shrub-steppe?
- What are the best methods for maintaining productivity and diversity in wetlands?
- What actions should be taken to sustain and restore priority species and habitats over the next 15 years?

1.9.1.2 Waterfowl

- Which specific waterfowl management tools and techniques—including providing crop and sanctuary areas—should be used on the Refuge? Where?
- What role should CNWR play in providing wintering waterfowl habitat and hunting areas within the Columbia Basin?

1.9.1.3 Sandhill Cranes

- What role will CNWR play in supporting the population of this species?

1.9.1.4 Shorebirds and Other Birds

- How will CNWR best manage a thriving shorebird migration and breeding area?
- Should more attention be paid to migrating and resident songbirds, raptors, and game birds?

1.9.1.5 State-Listed, Federally Listed, and Candidate Species

- What actions should the Refuge take to protect and enhance habitat for ground squirrels?
- What, if any, role can the Refuge play in sage-grouse and northern leopard frog recovery?
- What actions can be taken to protect and restore habitat values for other declining species?

1.9.1.6 Wildlife-Dependent Uses

- Which "Big Six" activities are appropriate and compatible at CNWR and what, if any, level of resources should be committed to them?

- What, if any, improvements to these activities can be provided to enhance public enjoyment and ensure quality experiences for visitors?
- What information should be provided to visitors, both to enhance their experience and to protect Refuge resources? How? What media?

1.9.1.7 Nonwildlife-Dependent Uses

- Is camping appropriate on CNWR? What should be done with camping areas?
- Should the Refuge continue to offer additional nonwildlife-dependent recreational opportunities, such as horseback riding and biking? Should those opportunities be expanded?
- What facilities and program support should be offered?

1.9.1.8 Cultural Resources

- What steps should be taken to better protect and interpret cultural resources?

1.9.1.9 Law Enforcement and Resource Damage Prevention

- Should there be an officer located at CNWR?
- Should Morgan Lake Road remain open 24 hours/day?
- How can the Refuge better prevent illegal uses, including trash dumping, littering, off-road vehicle use, target shooting, marijuana growing, underage drinking, visitor use in closed areas, cattle trespass, vandalism, and hunting and fishing violations?

1.9.2 Issues Outside the Scope of the CCP

The Refuge manages several tracts of BOR lands as part of CNWR. Similarly, adjoining tracts of lands to those managed by CNWR are managed for the BOR by WDFW, in particular the lands encompassing Upper and Lower Goose Lakes. These lands may be better managed as part of CNWR, primarily because the Service has personnel working in close proximity and the state does not. Management by the Service would potentially solve road access issues. This would require a change to the Refuge's approved boundary and the likelihood of the Service taking over management of the area is low. Since there are no discussions on this issue at present, it is deemed to be outside the scope of this CCP.

Chapter 2

Management Direction

Chapter 2. Management Direction

2.1 Overview

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

The Service planning team reviewed and used available scientific information (reports and studies) to better understand ecosystem trends and the latest scientific recommendations for species and habitats. The team met with staff from local, state, and Federal agencies and elected officials to ascertain priorities and problems as perceived by others. Refuge staff also met with Refuge users, nonprofit groups, and community organizations to solicit their comments and ideas, which were considered during CCP development. Public participation details can be found in the *Columbia National Wildlife Refuge Comprehensive Conservation Plan Scoping Report* (www.fws.gov/columbia/).

After gathering as much information as possible, the planning team, with considerable assistance from the Service's Pacific Regional Office, combined these data with CNWR's purposes and determined the conservation targets (areas of management focus) that were to be included in the CCP process. From this flowed the goals, objectives, and strategies that the planning team felt should be included in the CCP. Each goal, objective, and strategy was carefully evaluated for how it benefitted, augmented, and "fit" with Service trust resources; CNWR's purposes; identified conservation targets; key Refuge and state species; and the principles of "biological diversity, integrity, and environmental health" (BIDEH). Once the range of acceptable management goals and objectives was determined, the objectives and strategies were logically organized into reasonable alternatives. For CNWR, the reasonable range of acceptable actions could be described and covered through three alternatives: a 'no action' alternative and two alternatives involving changes in some programs.

2.2 Description of Management Direction

Based on our comprehensive review and analysis in the CCP and the comments received during the public review of the draft CCP, we selected a management direction that:

- Achieves the mission of the National Wildlife Refuge System, as well as the purposes, vision, and goals of the Refuge.
- Maintains and restores the ecological integrity of the Refuge's habitats and populations.
- Addresses the important issues identified during the CCP scoping process.
- Addresses the legal mandates of the Service and the Refuge.
- Is consistent with the scientific principles of sound wildlife management and endangered species recovery.
- Facilitates priority public uses appropriate and compatible with the Refuge's purposes and the Refuge System mission.

Under this management direction, Refuge management will continue much as is, consistent with available funding and staffing, except that 175 acres of emergent wetlands in Marsh Unit III will be

converted to riparian habitat; the Crab Creek channel will be restored; specialized habitats (e.g., rock outcroppings) will receive more planned attention; farming will emphasize low-impact techniques; and management of state and Federal species of concern will be emphasized. Refuge lands will continue to be managed using a mix of natural processes and substantial management intervention. For example, many wetland areas are mainly allowed to follow natural succession—although noxious weed control, prescribed fire, and other "maintenance" actions are undertaken—but several moist soil management areas require water level manipulation, dike maintenance, extensive soil preparation, planting, and other treatments. Considerable attention is provided to waterfowl habitat, while little active management is undertaken for state or Federal species of concern, such as the greater sage-grouse.

Public use will be a blend of active and passive. Horseback riding and bicycling will continue, but camping will be eliminated; however, the Soda Lake Campground will be converted to day-use facilities, and the area around the Bluebird Campground will be available by permit for day use as an educational site. Morgan Lake Road will be closed to overnight travel. ADA-compliant facilities will be developed to promote hunting and fishing. Waterfowl and big game hunting opportunities will be expanded by opening new areas; providing for additional weapons; and implementing additional youth hunt days, areas, and seasons. The waterfowl hunting lottery will be discontinued in favor of first-come, first-served hunting. A new hiking and interpretive trail will be developed within the Drumheller Channel National Natural Landmark. Seasonal and permanent wildlife observation blinds will be provided. New interpretive and educational programs will be developed, as will new brochures to aid visitors. The Sandhill Crane Festival will remain a priority. Fish stocking by the WDFW will continue with an approved Fish Management Plan, but will be discontinued in the lakes with the highest likelihood of success for northern leopard frog recovery.

The existing plans that direct Refuge management will continue to do so, and new step-down plans on informational and interpretive signs, cultural resource management, habitat management, and other management areas related to the goals and objectives in this CCP will be developed. Water rights and/or agreements will be pursued to ensure the availability of water for moist soil management.

2.3 Features of the Management Direction

The main features of the management direction are presented below.

2.3.1 Compliance and Cooperation with State Plans

To the extent possible, the CCP will support and complement the Washington State recovery plans for Washington ground squirrels, greater sage-grouse, northern leopard frogs, and any other relevant species. Where feasible, the CCP and its implementation will mesh with other Washington State plans and programs, e.g., hunting and fishing regulations.

2.3.2 Implementing Policies on "Closed Until Open"

By policy, all national wildlife refuges are considered closed when created. Then, as appropriate and compatible uses are identified, areas are opened to the public for those uses. This process was never followed at CNWR. Instead, the Refuge has historically been considered open, and then closures were implemented to benefit wildlife and habitats. With completion of the CCP, the Service will

"open" the appropriate areas to the appropriate uses; the process needs to be followed in order to ensure that "wildlife comes first."

2.3.3 Implementation Subject to Funding Availability

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

2.3.4 Refuge Revenue Sharing Payment

Annual payments to Adams and Grant Counties under the Refuge Revenue Sharing Act (16 U.S.C. 715s) will continue according to the established formula and subject to payments authorized by Congress.

2.3.5 Tribal Coordination

Regular communication with Native American Tribes that have an interest in the Refuge (Yakama Nation, CTUIR, Nez Perce, CCT) will continue for issues of shared involvement. Currently the Service seeks assistance from Tribes on issues related to cultural resources education and interpretation, special programs, and the National Historic Preservation Act (NHPA).

2.3.6 Wilderness and Wild and Scenic Rivers Review

The Wilderness Act of 1964 (16 U.S.C. 1131-1136), as amended, 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 untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act 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 Wilderness Act directed the Secretary of the Interior, within 10 years, to review every roadless area of 5,000 acres or more within Department of the Interior (DOI) lands and to recommend to the President the suitability of each qualifying area for inclusion in the National Wilderness Preservation System. Service policy (Part 602 FW 3.4 C.(1) (c)) requires that wilderness reviews be completed as part of the CCP process. 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 an initial wilderness review and found that currently there are no lands on CNWR that meet wilderness criteria.

A Secretarial Directive requires that all DOI agencies complete a wild and scenic rivers eligibility assessment when conducting land planning. The only stream on CNWR is Crab Creek, which does not meet the standards of free flow, as defined by Section 16 of the Wild and Scenic Rivers Act, and thus is not eligible for designation.

2.3.7 Integrated Pest Management

In accordance with 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 Refuge lands. IPM will involve using methods based upon effectiveness, cost, and minimal ecological disruption, which considers minimum potential effects to non-target species and the Refuge environment. Pesticides may be used where physical, cultural, and biological methods, or combinations thereof, are impractical or incapable of providing adequate control, eradication, or containment. If a pesticide is needed on Refuge lands, the most specific (selective) chemical available for the target species will be used, unless considerations of persistence or other environmental and/or biotic hazards will preclude it. In accordance with 517 DM 1, pesticide usage will be further restricted because only pesticides registered with the Environmental Protection Agency (EPA), in full compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), and as provided in regulations, orders, or permits issued by the EPA may be applied on lands and waters under Refuge jurisdiction.

Environmental harm by pest species will refer to a biologically substantial decrease in environmental quality as indicated by a variety of potential factors, including declines in native species populations or communities, degraded habitat quality or long-term habitat loss, and/or altered ecological processes. Environmental harm may be a result of direct effects of pests on native species, including preying and feeding on them; causing or vectoring diseases; preventing them from reproducing; killing their young; out-competing them for food, nutrients, light, nest sites, or other vital resources; or hybridizing with them so frequently that within a few generations few, if any, truly native individuals remain. Environmental harm also can be the result of an indirect effect of pest species. For example, decreased waterfowl use may result from invasive plant infestations reducing the availability and/or abundance of native wetland plants that provide forage during the winter.

Environmental harm may involve detrimental changes in ecological processes. For example, cheatgrass infestations in shrub-steppe can greatly alter fire return intervals, displacing native species and communities of bunch grasses, forbs, and shrubs. Environmental harm may also cause or be associated with economic losses and damage to human, plant, and animal health. For example, invasions by fire-promoting grasses that alter entire plant and animal communities, eliminating or sharply reducing populations of many native plant and animal species, can also greatly increase fire-fighting costs.

See Appendix G for the Refuge's IPM program documentation to manage pests for this CCP. Along with a more detailed discussion of IPM techniques, this documentation describes the selective use of pesticides for pest management on Refuge lands, where necessary.

Throughout the life of the CCP, most pesticide uses on CNWR lands will be evaluated for potential effects to biological resources and environmental quality. These potential effects will be documented in "Chemical Profiles" (see Appendix G). Pesticide uses with appropriate and practical best management practices (BMPs) for habitat management, as well as cropland/facilities maintenance, will be approved for use on Refuge lands where there likely will be only minor, temporary, and localized effects to species and environmental quality based on non-exceedance of threshold values in Chemical Profiles. However, pesticides may be used on Refuge lands where substantial effects to species and the environment are possible (exceed threshold values) in order to protect human health and safety (e.g., mosquito-borne disease).

Response to Mosquito-Borne Diseases

Mosquito populations on Refuge lands will be allowed to fluctuate and function unimpeded unless they pose a threat to wildlife and/or human health. The Service recognizes mosquitoes are native invertebrates inhabiting aquatic habitats and provide a forage base for fish and wildlife, including migratory birds. To protect human and wildlife health and safety, state or local Mosquito Control Districts will be allowed to control mosquito populations on Refuge lands. However, pesticide treatments (larvicides, pupacides, and/or adulticides) will be allowed on Refuge lands only if local, current population monitoring and/or disease surveillance data indicate Refuge-based mosquitoes pose a health threat to humans and/or wildlife. (See Appendix D for the CD providing details regarding mosquito population monitoring, disease surveillance, and treatments.) As previously described, mosquito treatments will be allowed on Refuge lands in accordance with IPM principles applicable to all pests (see Appendix G). Pesticide uses for mosquito control will use appropriate and practical BMPs, where possible, given the potential effects documented in Chemical Profiles.

After approval of the CCP, a disease contingency plan (DCP) will be prepared addressing response to mosquito-borne disease outbreaks on and/or adjacent to CNWR lands. Much of the information in the previously mentioned CD (e.g., IPM treatment options) will be incorporated, with additional specificity, where necessary, into this plan. The DCP also will include other information, such as the history of mosquito-borne diseases on and/or adjacent to CNWR, as well as measures to protect Refuge visitors, Service-authorized agents, and Service employees when a health threat or emergency is identified by health officials.

2.3.8 Monitor Effects of Visitor Use on Wildlife

Monitoring to assess effects of visitor use on wildlife will be conducted. Monitoring will be needed to ensure that permitted uses remain compatible over time and that the visitor uses do not materially interfere with, or detract from, the biological integrity of the Refuge, meeting the Refuge's purposes, or fulfilling the mission of the NWRS. If necessary, the areas and/or timing of visitor use will be modified or eliminated to provide secure and adequately sized sanctuary areas for migratory birds and trust species.

2.3.9 Regulatory Compliance

All activities requiring review, permits, and clearances (e.g., Section 106 of the NHPA, consultation under Section 7 of the Endangered Species Act, 401 water quality permits) will undergo the appropriate review and obtain the necessary permits and/or clearances.

2.3.10 Maintaining/Upgrading Existing Facilities

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

2.3.11 State Coordination

The Service will continue to maintain regular discussions and partnership with the appropriate agencies within the State of Washington. This includes coordination to implement Washington State plans and programs as outlined above and in Chapter 1.

2.3.12 Volunteer Opportunities

Volunteer opportunities occur in the management direction. These are recognized as components of successful management of public lands and may become vital to the implementation of refuge programs, plans, and projects, especially in times of declining budgets.

2.3.13 Adaptive Management

Adaptive management is a management philosophy and decision process that incorporates flexibility and continual learning. It involves monitoring and evaluation of refuge accomplishments, comparing accomplishments to objectives, and changing management strategies or objectives, as necessary, to achieve desired results. It is not a "trial and error" process; instead, adaptive management emphasizes learning-while-doing. It is based on available scientific information and the best professional judgment of refuge staff while considering site-specific biotic and abiotic factors on the refuge. In the presence of accelerated climate change, adaptive management is an increasingly important management-decision process. The Refuge will employ adaptive management as a standard operating procedure.

2.3.14 Planning and Review of Development Activities

The Service will actively participate in planning and studies for ongoing and future development projects, water pollution and other potential concerns that may adversely affect CNWR's wildlife resources, habitats and/or environmental quality. The Service will cultivate working relationships with pertinent county, state, and Federal agencies and other governments to stay abreast of current and potential developments. The Service will use outreach and education as needed to raise awareness of CNWR's resources and dependence on the local environment.

2.3.15 Biological Integrity

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 CNWR's purposes and the NWRS mission. It provides for the consideration and protection of the broad spectrum of native fish, wildlife, and habitat resources found on the Refuge. When evaluating the appropriate management direction for the Refuge (e.g., in compatibility determinations), the Service will use sound professional judgment to determine CNWR's contribution to biological integrity, diversity and environmental health at multiple landscape scales. Sound professional judgment will incorporate field experience, knowledge of CNWR's resources, an understanding of the Refuge'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 historical conditions."[1]

[1] There is one caveat, however. Management for a refuge's purpose(s) is the highest priority, so maintenance and/or restoration of biological integrity, diversity, and environmental health cannot compromise or conflict with refuge purpose(s).

2.3.16 Natural Processes

Wherever possible, natural processes will be protected and allowed to occur on CNWR. In other words, the idea is to "let nature take its course," to the extent possible. Among the natural processes that will be encouraged:

- Natural succession will be allowed to occur where it doesn't interfere with other purposes (e.g., maintaining moist soil management area functionality).
- Natural recolonization of disturbed areas by plants and animals will be emphasized when feasible.
- Beavers will be allowed to manipulate the landscape when not interfering with Refuge operations or damaging private or government property.
- The natural fire cycle (i.e., mainly fire reoccurrence) will be recreated to the extent possible. The paradox is that fire suppression actions (e.g., construction of fire breaks) and biological actions (e.g., replanting of native grasses following a fire) will be needed to achieve a more natural fire regime overall.

Obviously, an entirely hands-off approach to the Refuge is not feasible, or even desirable, but actions taken will be aimed at maintaining and/or restoring natural processes. For example, livestock will be fenced out of riparian areas to allow natural succession. Certain animal populations may need to be controlled to keep the ecosystem in balance. As mentioned, fire suppression will be needed to allow for natural processes. Controlling invasive species through chemical and mechanical means will occur. Stream restoration may be needed, but soft techniques (e.g., willow bundles) will be emphasized over hardened structures. In short, there will be active management, but that management will be aimed at mimicking, as well protecting and fostering, natural processes.

The physical methods to promote more natural ecosystems just described will be augmented, and may even be offset in some instances, by soft management techniques. Social engineering will be employed to protect habitats and promote natural processes. Instructive materials will be developed and widely distributed to educate the public on how to interact with the environment (e.g., Leave No Trace). There may be a need for seasonal, or even complete, closures of certain areas. Law enforcement will be emphasized. Partnerships will be a priority to accomplish everything from ensuring appropriate land access to educating the public on resource use. Volunteers will be needed to accomplish the same needs. Establishing official trails can lessen impacts of social trailing, steer people away from critical resources, and provide a venue for education. The overall idea is to make anticipation of problems a priority and head those problems off before physical means are needed to correct the problem.

2.3.17 Best Management Practices

In order to avoid or mitigate environmental impacts from planned actions, the Service will use numerous well-accepted BMPs when implementing this CCP.

2.3.17.1 Avoidance of Sensitive Resources

Visitor activity centers, visitor facilities, and both non-vehicular and vehicular travel routes will be sited to minimize effects by avoiding sensitive natural and cultural resources. Potential adverse effects from visitor use will be further minimized through closures or special restrictions at sites with

seasonal protection needs or sites vulnerable to or experiencing resource damage. Group size limitations may be used for specific sites or activities as needed to protect sensitive resources. Visitor use will be managed using informational signs, educational materials, trails, protective devices, and law enforcement patrols. Because threatened, endangered, or sensitive (TE&S) species migrate through CNWR, construction projects and public use patterns will be scheduled seasonally to avoid adverse effects.

2.3.17.2 Proper Use of Chemicals in Controlling Non-native Invasive Species

The use of chemicals to control non-native invasive species will be conducted in accordance with Washington State Department of Ecology (WDOE) and EPA laws and regulations, Service policy, and label directions. Pesticide Use Proposals (PUPs) will be completed annually and approved at the local, regional, or national level as required by Service policy. These PUPs also constitute the IPM Plan under current standards.

2.3.17.3 Implementation of Integrated Pest Management Plan

An IPM Plan for invasive plant species control prescribes a methodology for treatment that includes inventories and population mapping, assessments of risk, prioritization of treatments, integrated treatment implementation, and effective monitoring. This approach considers direct effects on soils, vegetation, watershed function, and biodiversity in all treatment recommendations. In sensitive plant communities, the use of multiple tools (e.g., chemical, biological, cultural, mechanical) may be necessary to prevent weed invasion and spread, as well as disturbance of soils and plant community structure and function. Use of biological control agents (e.g., insects, microorganisms, pathogens) for control of non-native invasive plant species will be implemented in accordance with Service policies only after such organisms have been subjected to testing and evaluation by the U.S. Department of Agriculture (USDA) and approved for release.

Established populations of non-native invasive plants, such as yellow star-thistle, rush skeletonweed, and knapweed, will require extensive integrated treatments to control. Each weed treatment will be conducted in accordance with the IPM Plan and in accordance with stipulations set forth in annual PUPs. Additionally, special use permits (SUPs) for activities, such as research projects and commercial tours, will include stipulations designed to prevent the spread of invasive species.

Because many components of resource management incorporate methods of invasive species control, some of which are highly visible and potentially controversial (e.g., controlled burns, aerial spraying), information and education will be used to inform the public about the IPM program.

2.3.17.4 Restoration Activities

Native seeds and/or plants derived from the Columbia Basin will be used as a priority for all planting/restoration projects on CNWR.[2] Providers of native seed or native plants to the Refuge will provide documentation for the origin of seed or plants and will also, in the case of seed, provide certification that the seed provided to CNWR is free of noxious weed contamination. These requirements will be included in any scope of work prior to contracting the production and supply of

[2] Depending upon the amount of seed required and specific project needs, either seed or plants may be used in restoration activities.

plant materials. Plant materials may be refused if they do not meet these requirements. Occasionally, small amounts of seed may be collected from CNWR to be provided to plant nurseries and grown into seedling plants to be replanted onto the Refuge. In these cases, Service staff will supervise the selection of species for collection and the actual collection of seed from plants on CNWR. Seed collection needs for species and amounts will be based on annual restoration and rehabilitation needs. Seeds will be collected during the appropriate season as dictated by plant species phenology, and the parent plant will not be damaged or harmed in any way during seed collection. Seed will be collected from no more than 20 percent of individuals within a population, and no more than 50 percent of the total seed production from individual plants will be collected annually.

2.3.17.5 Natural Resource Data Collection and Monitoring

Inventories will be conducted to obtain data related to habitat conditions; wildlife populations and habitat requirements; restoration treatment locations, timing, and effectiveness; resource protection measures; invasive species control; TE&S species; and other areas of management concern. Resource information will be collected using global positioning system (GPS) technology, permanent monitoring plots, point counts, and pedestrian transect surveys. The information collected will be used to improve existing data sets, mapping, and scientific knowledge concerning species, habitats, restoration needs, treatment effectiveness, land disturbance events, and other areas of concern.

Existing and new fish, wildlife, water, and vegetation monitoring programs will be conducted by Service staff, volunteers, or cooperators to support adaptive management. These programs will entail monitoring and evaluation of habitat management and restoration activities, TE&S species, and public uses. Periodic monitoring (every five to seven years) of priority sensitive plant communities will be conducted in permanent monitoring plots.

2.3.17.6 Cultural Resource Inventories

Prior to implementation of any ground-disturbing projects, the applicable cultural resource compliance investigation will be undertaken. This investigation may entail a literature review, records search, field survey, and Tribal consultation. If cultural resources are present, appropriate procedures will be implemented to protect them per Federal laws and Service policies and guidelines.

2.3.17.7 Fire Management

Fire management activities will conform to guidelines set forth in Service policy and the Fire Management Plan for the MCRNWRC. Wildland fire will be suppressed when possible; suppression techniques will be employed that minimize surface disturbance in the vicinity of sensitive resources. Fire control policies will be implemented to reduce the risk of human-caused wildland fire.

2.3.17.8 Facility Design/Aesthetic Considerations

Landscape design standards will be developed to protect CNWR’s natural beauty, scenic vistas, and cultural heritage and to ensure that all site developments and facility improvements contribute to, rather than detract from, aesthetic appeal. Facility design and placement will be carefully planned with landscape integrity in mind. Future interpretive sites and signs will be designed to have an unobtrusive profile, with framing and supports that blend with the environment. Visitors will be encouraged to use natural-colored equipment where appropriate.

2.4 Goals, Objectives, and Strategies

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

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

The goals for CNWR for the next 15 years under the CCP are presented on the following pages. Each goal is followed by the objectives that pertain to that goal. Some objectives pertain to multiple goals and have simply been placed in the most reasonable spot. Similarly, some strategies pertain to multiple objectives. The order of goals does not imply any priority in this CCP. Below each objective statement are the strategies that will be employed in order to accomplish the objectives.

Goal 1: Protect, maintain, and, where feasible, enhance and restore upland habitats, plant communities, and wildlife species representative of the Columbia Basin.

Objective 1.1. Protect, Maintain, and Enhance Native Bunchgrass Habitat
Protect, maintain, and conduct enhancement on 4,250 acres of native bunchgrass habitat for the benefit of a diverse assemblage of native species, including western meadowlarks, long-billed curlews, and other native wildlife. This native bunchgrass habitat will be characterized by: • A >15% cover of native grasses (e.g., bluebunch wheatgrass) and native forbs. • A <5% cover of native shrubs. • A <10% cover of invasive species. • Minimal human disturbance.
Strategies for Achieving Objective
Bunchgrass habitat acres: 4,250
A. Protect and maintain high-quality bunchgrass habitats, using natural processes wherever possible.
B. Plant native bunchgrasses and forbs, especially after a major disturbance event, through mechanical means and by hand-planting in select circumstances.
C. Use appropriate IPM strategies to control or eradicate invasive species through mechanical, physical, biological, and chemical means.

D. Where appropriate, use minimal mechanical means and prescribed fire treatments to create conditions that are protective from catastrophic wildfire and to achieve habitat objectives.

Rationale

The large expanses of native bunchgrass on CNWR are a unique habitat and provide foraging, nesting, and resting areas for a number of native species. Bunchgrass habitat is used for foraging by a variety of raptors, including Swainson's hawks, golden eagles, prairie falcons, short-eared owls, red-tailed hawks, ferruginous hawks, sharp-shinned hawks, and rough-legged hawks, among others. Meadowlarks, horned larks, and grasshopper sparrows are some of the ground-nesting birds that are commonly found in bunchgrass habitat on CNWR. Burrowing owls and northern harriers have been documented nesting and feeding in bunchgrass habitat. Long-billed curlews also prefer grassland habitats for nesting and foraging.

The Refuge contains many native plant communities and species that have been lost or reduced throughout all or a substantial portion of their range. Native grasslands of the Columbia Basin Ecoregion have experienced more than an 85 percent decline since European settlement and have been described as an "endangered ecosystem" (Noss 1995). These plant communities have been ranked as important, either locally or statewide, or globally significant because of their rarity, or due to other factors that make them vulnerable to extirpation and/or extinction. These communities have been significantly diminished throughout their range due to catastrophic wildfire events and past/present management actions (e.g., grazing, agricultural development, urbanization). They serve as important habitat for resident and migratory wildlife species and could be significantly damaged or lost through major disturbances (e.g., wildfire), thereby warranting additional protection. These plant communities may serve as potential reintroduction sites for federally and Washington State–listed species.

Additionally, significant disturbance within these plant communities lead to the rapid spread of non-native invasive species that further threaten their ecological integrity and importance as effective wildlife habitat.

Key Species Benefitted: Washington ground squirrel, badger, mule deer, prairie falcon, ferruginous hawk, burrowing owl, long-billed curlew.

Objective 1.2. Protect and Maintain Greasewood Habitat

Protect and maintain 1,273 acres of greasewood habitat for landbirds (e.g., loggerhead shrike) and other native wildlife (e.g., sagebrush lizard).

This greasewood habitat will be characterized by:

- A <30% canopy cover of mature tall shrubs (>3 feet tall) with patchy distribution.
- A <20% cover of native herbaceous species.
- A >20% cover of bare ground.
- A <10% cover of invasive plants.
- Minimal human disturbance.

Strategies for Achieving Objective
Greasewood habitat acres: 1,273
A. Protect and use natural processes whenever possible.
B. Use mechanical removals or prescribed fire to reduce the canopy cover to achieve targets.
C. Use appropriate IPM strategies to control or eradicate invasive species through mechanical, physical, biological, and chemical means.
D. Reduce human disturbance in core areas by limiting access.
E. Supplement natural regeneration and colonization with shrub planting.
Rationale Greasewood and associated plants are able to use soils (alkaline soils) that will not support other vegetation. Thus it provides food and cover to several species (e.g., black-tailed jackrabbits) in areas that otherwise would be barren. It is especially valuable to loggerhead shrikes, which use greasewood's spines for impaling prey. Greasewood habitats are easily invaded and replaced by non-native species (e.g., cheatgrass) due to unpredictable disturbances, such as severe drought (every 70 years), flooding (every 100 years), infrequent fire (150 to 1,000 years), and an altered distribution of alkaline soils modified by changes in Crab Creek connectivity and hydrology from the CBIP and other human-made causes. Significant disturbance within these plant communities can lead to the rapid spread of non-native invasive species, which threatens their ecological integrity and importance as effective wildlife habitat. Once lost or severely degraded, this habitat type requires a long time to regenerate, often on the order of 50-60 years. *Key Species Benefitted:* Washington ground squirrel, black-tailed jackrabbit, short-eared owl, loggerhead shrike, sagebrush lizard, striped whipsnake.

Objective 1.3. Protect, Maintain, and Enhance Sagebrush Habitats
Protect, maintain, and conduct enhancement on 19,101 acres of sagebrush habitat for the benefit of a diverse assemblage of native species, including migratory songbirds and other native wildlife. Where feasible, protect and/or establish minimum 400-acre blocks of mixed shrub-steppe habitat with interconnecting corridors. This native shrub habitat will be characterized by: • Corridors >100 feet connecting blocks of shrub-steppe. • A >10% cover of native grasses (e.g., bluebunch wheatgrass) and native forbs. • A >15% cover of native shrubs (e.g., sagebrush, bitterbrush, rabbitbrush, hopsage, greasewood). • A range of sagebrush heights from 10-40 inches tall.

- Microbiotic crust.
- A <10% cover of invasive species.
- Minimal human disturbance.

Strategies for Achieving Objective

Sagebrush habitat acres: 19,101

A. Protect, maintain, and use natural processes when possible.

B. Where appropriate, use minimal mechanical means and prescribed fire treatments to create conditions that are protective from catastrophic wildfire and to achieve habitat objectives.

C. Use appropriate IPM strategies to control or eradicate invasive species through mechanical, physical, biological, and chemical means.

D. Conduct regular hazardous fuels treatments to reduce the risk of wildfire.

E. Protect previously burned areas from future wildfire by methods such as constructing fire breaks.

F. Seed after wildfire with native seed.

G. Use cooperative agreements, land exchanges, and conservation easements to maintain or establish buffers and connectivity with other large tracts managed for wildlife diversity (e.g., lands managed by the State of Washington).

H. Establish public-private partnerships (e.g., with The Nature Conservancy) for habitat rehabilitation and restoration.

I. Participate in the *Washington State Recovery Plan for the Greater Sage-Grouse* to possibly establish a new population of sage-grouse on the Refuge and surrounding lands within the Columbia Basin.

J. Participate in the *Washington State Recovery Plan for the Pygmy Rabbit* to possibly establish a new population of pygmy rabbits on the Refuge and surrounding lands within the Columbia Basin.

Rationale

Remaining shrub-steppe habitats are threatened and/or remain in a degraded condition due to an extensive history of wildfires, habitat fragmentation, poor native plant recruitment and recovery following fires, and ground-disturbing activities (e.g., roads, trails, use of heavy equipment). Limiting/eliminating ground-disturbing activities and reducing fire starts and/or decreasing fire sizes through fire suppression and aggressive initial attacks will benefit habitats. An altered fire regime is one of the key ecological attributes affecting the viability of the shrub-steppe system. The historical fire regime was much less intense and less frequent. The current more intense and frequent fires create a cycle of habitat modification and degradation that needs to be reversed, and better post-fire rehabilitation

and stabilization project planning will lead to on-the-ground success.

The disturbances described have resulted in massive losses of connectivity in the Columbia Basin, which affects migration, dispersal mechanisms, and gene flow for ground-dwelling vertebrates. The Crab Creek corridor through CNWR is an important tie between the larger Hanford Monument and Washington's Potholes area. While a challenge, multiple landownership throughout these areas provides opportunities for habitat rehabilitation and restoration partnerships, especially with other governmental agencies.

Habitat fragmentation creates or exacerbates other impacts to sage-grouse, in addition to the issues of demographic and genetic isolation. This includes increased predation in habitat patches, increased potential for encroachment by noxious weeds, and increased impacts of herbicides and insecticides sprayed on adjacent cropland. Management efforts in the State of Washington have focused on maintaining the existing populations and distributions of sage-grouse. Recovery efforts will require increasing the numbers and distribution of the species in Washington. Expansion into adjacent areas, unassisted by translocations, will likely require an increase in the existing populations to supply dispersing individuals that could colonize unoccupied areas and habitat improvements within occupied and adjacent units.

Management efforts in the State of Washington have focused on augmenting the existing populations and distributions of endangered pygmy rabbits using rabbits from Idaho. Recovery efforts will require maintaining existing habitats and restoring degraded ones. Expansion into adjacent areas, unassisted by translocations, will likely require an increase in the existing populations to supply dispersing individuals that could colonize unoccupied areas and habitat improvements within occupied and adjacent units.

Key Species Benefitted: Washington ground squirrel, badger, mule deer, black-tailed jackrabbit, burrowing owl, greater sage-grouse, short-eared owl, ferruginous hawk, loggerhead shrike, sage sparrow, Brewer's sparrow, sage thrasher, striped whipsnake, sagebrush lizard.

Objective 1.4. Protect and Maintain Scrub-Shrub Habitats

Annually protect and maintain 636 acres of scrub-shrub habitat for the benefit of landbirds (e.g., Lazuli bunting, willow flycatcher) and other native wildlife.

Scrub-shrub habitats will be characterized by:

- A dense shrub layer (e.g., Wood's rose, golden currant) with inclusions of greasewood or basin big sagebrush.
- Small patches of native herbaceous vegetation (e.g., basin wild rye, fescues).
- A <2% cover of invasive/undesirable plants (e.g., cheatgrass, pepperweed, Russian thistle).
- Scattered overstory trees (e.g., peachleaf willow).
- No Russian olive or saltcedar.

Strategies for Achieving Objective

Scrub-shrub habitat acres: 636

A. Use appropriate IPM strategies to control or eradicate invasive species through mechanical, physical, biological, and chemical means.

B. Use periodic prescribed fire to eliminate undesirable plants and plant assemblages and to "reset" the scrub-shrub community.

C. Supplement natural regeneration and colonization with native species plantings.

Rationale

The scrub-shrub area represents the interface between the moist wetland and riparian areas and the much drier shrub-steppe areas that cover much of CNWR. As such, this area is limited in size throughout the Columbia Basin, yet it provides important habitat for a variety of migratory birds. It provides the nesting habitat structure required by many species (e.g., Lazuli bunting), while allowing for easy access to water and the much more abundant food sources found in wetland areas.

Key Species Benefitted: Black-tailed jackrabbit, mule deer, badger, short-eared owl, Lazuli bunting, willow flycatcher.

Objective 1.5. Protect and Maintain Talus and Rock Outcropping Habitats

Annually protect and maintain 781 acres of unique habitats (e.g., cliffs, talus, rock outcroppings, caves) for the benefit of migratory birds (e.g., raptors, owls, rock wren) and other wildlife (e.g., reptiles, bats).

Strategies for Achieving Objective

Talus and rock outcropping habitat acres: 781

A. Control (e.g., through restricted travel corridors) or limit visitor use and access to special habitat areas to reduce or minimize impacts.

B. Use appropriate IPM strategies to control or eradicate invasive species through mechanical, physical, biological, and chemical means.

C. Increase awareness of the value of these specialized habitats through signs, brochures, direct education, and other means.

Rationale

On CNWR the ecological attributes of cliff/rimrock/talus and rock outcroppings are characterized by cliff dominance (high cliffs), the variety of rock features, and the amount of talus with larger rocks and deeper masses. Maintaining the size and composition of rocky habitats was identified as a key conservation target. The rock outcroppings represent a comparatively small but important portion of Refuge lands, and were highlighted as a National Natural Landmark in 1986 as a spectacular example of Columbia Plateau biophysiographic province of "butte-and-basin" scabland. These areas provide habitat for cliff nesting birds (ferruginous and red-tailed hawks, peregrine and prairie falcons, white-throated

swifts, and golden eagles) and other unique species (common night snakes and rattlesnakes [hibernacula]). CNWR has received requests for rock collection and quarrying of basalt columns, increasingly being used in home landscaping, with at least one incidence of theft/vandalism occurring on the Refuge. Signage, law enforcement, and education may help prevent illegal activities and theft.

Key Species Benefitted: Various bat species, yellow-bellied marmot, bushy-tailed woodrat, great horned owl, barn owl, red-tailed hawk, American kestrel, prairie falcon, ferruginous hawk, peregrine falcon, common raven, canyon wren, rock wren, violet-green swallow, cliff swallow, Say's phoebe, white-throated swift, western skink, night snake, western rattlesnake.

Objective 1.6. Provide Small Grain Crops

Annually provide approximately 203 to 550 acres of small grains (e.g., corn, wheat, barley, buckwheat) as forage for migratory birds (e.g., waterfowl, lesser sandhill cranes) and other resident wildlife.

These agricultural lands cropped in small grains will be characterized by:

- Completing the fall harvest (permittee's share) prior to waterfowl hunting season.
- Completing the fall harvest (permittee's share) in non-hunt units before November 15 to make grain available for migratory birds.
- Staged knock downs of the Refuge's harvest share during February to April for migrating sandhill cranes.
- Making approximately 63 acres available to wildlife as short-stature small grains (e.g., wheat) during the period from mid-fall to mid-winter.
- Making approximately 55 acres available to wildlife as spring grains (e.g., corn), especially for cranes, from February through mid-April.
- A limited presence of invasive plants (e.g., kochia).

Strategies for Achieving Objective

Farm acres providing small grains: 203-550

A. Use cooperative farmers (see rationale below) to provide small grains. The cooperative faring program will have share ratios of 75% to 25%.

B. Farming will follow BMPs.

C. Use irrigation (e.g., center pivot, wheel line).

D. Use crop rotations as a mechanism to improve soil tilth and as an IPM strategy to control invasive and/or undesirable plant species in agricultural lands.

E. Use heavy equipment to conduct a staged knock down of crops after the hunting season.

Rationale

Approximately 753 acres of Refuge lands are currently farmed under cooperative agreements.[4] Under the Cropland Management Plan for CNWR, croplands are managed for the benefit of waterfowl, but many other species benefit (e.g., lesser sandhill cranes). Refuge crop shares are generally 25 percent of what is grown (118 acres of the 470 under cultivation) and are limited to: 1) cereal grains, preferably corn, to meet the high energy demands of migrating and wintering waterfowl; and 2) green winter forage and cover crops which provide for Canada goose populations. Small grain acres could be converted to green forage acres, and vice versa, when necessary for the benefit of wildlife. In addition, harvested areas provide foods for waterfowl, including waste grains and green forage such as alfalfa and grasses. Traditionally, the Refuge reserved the standing crop to be knocked down during severe winter weather and/or immediately after the close of hunting season in late January to mid-February. Providing grain crops in a scheduled, staged manner throughout the season will help provide for fall and spring migrants, as well as the wintering population. This action also helps attract waterfowl to the Refuge, thereby reducing depredation on neighboring farm fields, which is a Refuge purpose.

The type of crops, crop rotations, and management of crops for wildlife (timing and amount staged knock down of crops) will be evaluated and appropriate adjustments made to maximize forage availability for migratory birds and other wildlife. Based on annual management goals and decisions, wildlife population trends, etc., cropland acres could be increased or decreased, along with modifications of cropping types and rotations, to meet the future needs of migratory birds and other wildlife. If the total acres of croplands are reduced based on the analysis of need/management goals, croplands will be restored to the appropriate habitat(s) based on soil and site conditions (e.g., shrub-steppe, riparian) and availability of funds.

Crops attract wildlife, which in turn attracts visitors. Wherever and whenever possible, the location of crops within Refuge farm units will be managed so as to benefit wildlife observation, subject to other Refuge priorities.

Key Species Benefitted: Lesser sandhill crane, western and lesser Canada goose, Taverner's cackling goose, mallard, redhead, song sparrow.

Objective 1.7. Provide Green Forage Crops

Annually provide 203 to 550 acres of green forage (e.g., timothy hay, alfalfa, winter wheat) for migratory birds (especially geese and long-billed curlews) and other resident wildlife.

These agricultural lands as green forage crops will be characterized by:

- Short vegetation heights (<6 inches) achieved by mid-October.
- A limited presence of invasive plants (e.g., kochia).
- Minimal human disturbance from late January to April.

[4] Altogether there are 753 acres farmed on CNWR. However, this includes the acres farmed for green forage. In any given year, the acres devoted to small grains falls within the range of 203 to 550 acres, as noted in the Objective. The difference between 753 acres and the 203-550 acres would then be green forage.

Strategies for Achieving Objective
Farm acres providing green forage: 203-550
A. Continue to use cooperative farmers to maintain green forage at current levels. The cooperative farming program will have share ratios of 75% to 25%.
B. Farming will follow BMPs.
C. Use irrigation (e.g., center pivot, wheel line).
D. Enforce crop rotations as a mechanism to improve soil tilth and as an IPM strategy to control invasive and/or undesirable plant species in agricultural lands.
E. Use two to five cuttings from May to October to maintain palatability and achieve short heights (<6 inches) by mid-October.
F. Allow grazing by domestic animals (e.g., livestock) to maintain palatability and achieve short heights (<6 inches) by mid-November.
Rationale Please refer to the rationale under Objective 1.6. See also the associated footnote; the same description of the allocation of farmed acres applies. *Key Species Benefitted:* Mule deer, lesser sandhill crane, western and lesser Canada goose, Taverner's cackling goose, mallard, long-billed curlew.

Objective 1.8. Protect, Establish New, or Augment Existing Colonies of Washington Ground Squirrels
Establish new and/or augment existing populations of Washington ground squirrels (*Spermophilus*) with sufficient genetic diversity to sustain the population. Washington ground squirrel habitat on CNWR is characterized by: • Deep soils, often adjacent to rocky outcroppings. • Sparse vegetation with unobstructed views to detect avian predators. • Nearby escape cover (e.g., rocks, sagebrush, shrub) for protection from avian predators and digging mammalian predators. • A <5% cover of invasive/undesirable plants (e.g., cheatgrass, Russian knapweed). • Native forbs and grasses providing seeds and green forage. • Corridors to promote dispersal to suitable habitats.

Strategies for Achieving Objective
A. Ensure genetic diversity through periodic translocations as determined by subject matter experts.
B. Trap and relocate from unprotected, off-Refuge lands (e.g., golf courses) to both protect populations and remove animals from where they are a nuisance.
C. Assess Refuge lands to determine suitable habitats for relocation.
D. Provide artificial escape cover (e.g., rocks, boards) and corridors to promote dispersal to colonize new areas with suitable habitats.

Rationale

Washington ground squirrels are most common in shrub-steppe habitats over silty loam soils, particularly Warden Sagehill soils. Vegetation preferences of the species are not fully understood, but other *Spermophilus* are usually food-limited, requiring high-quality vegetation and seeds. Recent research on Washington ground squirrels indicates high use of bluegrass (*Poa* sp.) in mid-season followed by a late season diet of forbs (vegetative matter and seeds) and grass seed.

Loss of habitat as a result of conversion of shrub-steppe to cropland may have been the greatest negative factor affecting the Washington ground squirrel population to date. It is estimated that nearly two-thirds of the species' historical range has been converted to agriculture. The CBIP, which resulted in the irrigation of about 550,000 acres of arid land for crop production, is responsible for much of the habitat loss in the squirrel's range in Washington. Agricultural development has focused on the arable, deep-soil communities preferred by Washington ground squirrels, but the species is unable to persist in soils that are regularly cultivated (i.e., once or twice per year).

Goal 2: Protect, maintain and, where feasible, enhance and restore a diverse assemblage of open-water and riparian habitats and wildlife species characteristic of the Columbia Basin.

Objective 2.1. Protect and Maintain Seep Streams and Channels

Annually protect and maintain 27.3 miles of seep streams and channels for the benefit of migratory birds and other wetland-dependent wildlife (e.g., native amphibians).

These seep streams and channels will be characterized by:

- Ephemeral to permanent water flows supplied by subsurface seepage.
- Typically narrow bands of native emergent cover (e.g., bulrushes) bordering some segments of streams and channels.
- A $\leq$10% cover of non-native *Phragmites* sp. (any of several perennial reeds found in marshes and wetlands).

Strategies for Achieving Objective
Miles of seep streams and channels: 27.3
A. Use appropriate IPM strategies to control or eradicate invasive species through mechanical, physical, biological, and chemical means.
B. Allow beavers to create wetlands where they do not impede other habitat management objectives.
Rationale Arid land streams and channels support extensive riparian areas that provide breeding habitat for flycatchers, warblers, orioles, and other neo-tropical migrants. *Key Species Benefitted:* Mule deer, yellow-breasted chat, willow flycatcher, song sparrow, Bullock's oriole, Lazuli bunting, yellow warbler, ash-throated flycatcher, tiger salamander, long-toed salamander.

Objective 2.2. Protect and Maintain Lakes
Annually protect 732 acres of shallow- and deep-water lakes for the benefit of fish, migratory birds and a diverse assemblage of other wetland-dependent wildlife (e.g., native amphibians). CNWR lakes will be characterized by: • Desirable submergent vegetation (e.g., sago pondweed) covering >90% of suitable substrate. • Shallow lakes (<10 feet in depth) having emergent vegetation along the shore or throughout the water body, dependent upon bottom topography. • Deep lakes (>10 feet in depth) being mostly open water with little to no emergent vegetation, except along the shoreline. • Shallow lakes often not supporting permanent fish populations as a result of over-heated water or other water quality issues. • Deep lakes supporting permanent fish populations (e.g., warmwater and/or trout). • Shallow lakes being indirectly supplied with water by seep streams or subsurface seepage. • Deep lakes being directly supplied with water from canals or indirectly by seep streams or subsurface seepage. • Minimal populations of bullfrogs and carp. • A ≤10% cover of non-native *Phragmites* sp. or purple loosestrife.
Strategies for Achieving Objective
Shallow water lake habitat acres: 732
A. Use appropriate IPM strategies, including mechanical, physical, biological, and chemical means, to control or eradicate invasive species.
B. Where possible, manage water levels to maintain desired characteristics and vegetation.

Rationale

Although shallow lakes generally cannot support fish populations due to their shallow depths and increased water temperatures, they provide an important source of food for migratory birds and other wildlife through desired aquatic vegetation. Shallow water lakes are also important breeding and rearing areas for native aquatic amphibians. Water for these lakes is provided through seep streams or subsurface seepage. (See also Goal 4 for study needs.)

Deep water lakes provide food and rest areas for migratory birds and other wildlife. They provide habitat for native fish, as well as for non-native, introduced species. Many of these introduced species are stocked by the WDFW; both the resident fish and those stocked annually provide good fishing opportunities on CNWR. Several of the deep-water lakes (e.g., Royal, Crescent) directly receive water from the CBIP. This presents problems as the water is often contaminated with agricultural runoff; Royal Lake has had an ongoing problem with DDT/DDE and other chemicals, which in turn poses a threat to wildlife. However, the value of these lakes to wildlife outweighs the potential threat from contaminants, especially since many wildlife species have only a short contact with the lakes (i.e., they stop over on migration routes).

All of the lakes are in need of bullfrog and/or carp control, although money and staff limitations mean that such control must be selective.

Key Species Benefitted: American bittern, American avocet, black-necked stilt, Wilson's phalarope, mallard, redhead, blue-winged teal, lesser scaup, northern pintail, canvasback, western and lesser Canada goose, Taverner's cackling goose, northern leopard frog, Columbia spotted frog, tiger salamander, long-toed salamander.

Objective 2.3. Rehabilitate In-stream and Riparian Habitats

Rehabilitate 10 miles of in-stream and 211 acres of associated riparian habitats in Lower Crab Creek for the benefit of a diverse assemblage of native plants and wildlife (e.g., native amphibians, invertebrates).

Functional stream and floodplain (periodic inundation at 10-year intervals) is characterized by:

- Variable stream sinuosity based on elevation from cross sections.
- Appropriate channel widths (width:depth ratios) based on elevation from cross sections.
- Fish passage at all culverts and wetland units.
- A canopy cover of native overstory trees (e.g., peachleaf willow, cottonwoods).
- Understory shrubs (e.g., Wood's rose, coyote willow).
- Bank stabilizing herbaceous cover (e.g., native sedges, rushes, bunch grasses).
- <5% cover of invasive/undesirable species (e.g., Canada thistle, pepperweed, reed canarygrass, *Phragmites* sp.).
- Minimal Russian olive or saltcedar.

Strategies for Achieving Objective

In-stream miles/riparian habitat acres: 10/211

A. Rehabilitate in-stream habitat and geomorphology, using proven bioengineering techniques as the preferred technique, to facilitate fish passage and benefit other wildlife.
B. Elevate the stream channel in Management Unit 2.
C. Develop a restoration plan for Management Unit 4 to replace a culvert and raise the stream channel to restore an active floodplain on 36 acres.
D. Restore 175 acres of Marsh Unit III from emergent marsh to riparian habitat.
E. Arrange for periodic flood releases for stream vegetation management.
F. Use appropriate IPM strategies, including mechanical, physical, biological, and chemical means, to control or eradicate invasive species.
G. Plant native species to establish woody vegetation.
H. As necessary, protect plantings from wildlife (e.g., beavers, mule deer).
I. Develop funding through partnerships.
J. Participate in the *Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan* by improving habitat and fish passage on the Refuge.
K. Remove natural and human-made barriers to fish passage in Red Rock Creek through mechanical means.
L. Remove downed or blocking vegetative growth through mechanical means if necessary for fish passage in Crab Creek.
Rationale Rehabilitation of CNWR's in-stream habitat will restore what was inadvertently destroyed in a 1980 flood event. The quantity and velocity of water incised the channel, preventing fish passage through water control structures, as well as increasing erosion and degradation of habitats. Rehabilitation will allow for proper channel depth and sinuosity for flows under current hydrologic conditions. Periodic floodplain inundation will help maintain natural biotic and abiotic conditions. Restoration and enhancement efforts are needed to improve overall habitat conditions for migratory birds. Restoring the riparian floodplain habitats will: 1) provide lost/degraded habitat for riparian-dependent landbirds; 2) encourage woody species through periodic out-of-channel flooding; and 3) mimic natural processes (to some extent) and help recreate a biological structure required by riparian obligate/dependent wildlife species. The upper Columbia River steelhead is listed as a threatened species under the Endangered Species Act, and is already known to occur in Red Rock Creek on the Refuge. By law and policy, we are required to support recovery actions on the portions of the creek on the Refuge. However, much of Red Rock Creek

flows through private or state lands. In those instances, the Service will coordinate with the land owner(s) to facilitate recovery efforts.

Key Species Benefitted: Mule deer, beaver, yellow-breasted chat, willow flycatcher, song sparrow, Bullock's oriole, Lazuli bunting, yellow warbler, ash-throated flycatcher, downy wooodpecker, tiger salamander, long-toed salamander, Upper Columbia River steelhead, redband trout.

Objective 2.4. Support Northern Leopard Frog Recovery

Annually protect, maintain, and where feasible, restore 100 acres of wetland and open water habitat to meet the life-history needs of the northern leopard frog.

Northern leopard frog habitat on CNWR is characterized by:

- Permanent deep water for overwintering.
- Breeding ponds (semipermanent of seasonal) with a maximum depth of 5-6.5 feet.
- No fish or bullfrog populations.
- No connection to any other body of water.
- Periodic (every 4-5 years) dewatering.

Strategies for Achieving Objective

A. Discontinue fish stocking on selected lakes, remove existing fish, and control bullfrogs to determine the feasibility of further reintroduction.

B. Assess the current condition of habitats which support northern leopard frogs.

C. If appropriate, translocate northern leopard frogs to CNWR.

Rationale

The northern leopard frog is one of the most widely distributed amphibians in North America. However, severe declines in the populations of this species have been reported throughout North America, including the Pacific Northwest. In Washington, records indicate that the leopard frog once inhabited at least 18 general areas in eastern Washington, many of these along the Columbia River and its major tributaries. However, sightings of leopard frogs in Washington since 1970 have been from just three counties—Grant, Whitman, and Pend Oreille—and field surveys conducted since 1992 confirmed the species in only two areas in the State, both of which are in the Crab Creek drainage in Grant County.[5] Four separate leopard frog sites at one area in the Crab Creek drainage, and two separate occupied sites at the other area in the Crab Creek drainage, have been located. The number of leopard frogs at each of these localities is not known. The number of occupied sites within areas appears to change over time, with surveys indicating some sites disappearing and some newly located.

[5] One historic but unsurveyed area, on the campus of Washington State University, may still be populated by frogs, most likely liberated from laboratory experiments.

There are a variety of factors that have the potential to adversely affect the remaining leopard frog populations in Washington. It is not known for certain what factors alone may trigger extirpation of leopard frogs from a site. Agricultural chemicals have been implicated in the decline of amphibians in other areas. Rotenone, used to control unwanted fish, can kill leopard frog tadpoles. Because leopard frogs move from breeding to summer to overwintering habitats, vehicles on roads are a significant mortality source; roads built between breeding ponds and larger summer, fall, and overwintering water bodies can result in large numbers of vehicle-killed leopard frogs. Bullfrogs have the potential to displace native frogs, including northern leopard frogs, and have been documented to eat them. Introduced fish are known to eat amphibians and are thought to cause significant declines in leopard frog populations. Land use changes, irrigation projects, and development have contributed to changes in the hydrology of many areas, potentially affecting amphibians through rapid changes in water levels during critical embryonic and larval periods. Disease may also have contributed to the decline witnessed in Washington. Research, monitoring, and evaluation of the factors potentially causing the decline of leopard frogs are essential to their conservation.

Future population declines are likely to occur in Washington without management effort. Due to the significant reduction in range and abundance of leopard frogs, and the continued threats to the remaining occupied sites, the State of Washington has recommended that the leopard frog be classified as an endangered species in Washington.

As noted above, the Crab Creek drainage is one of the few remaining sites in Washington where northern leopard frogs are found. The northern leopard frog ranges into a wide variety of habitats, even hay fields and grassy woodlands, but apparently requires a high degree of vegetative cover for concealment. Leopard frogs require permanent deep water for overwintering, in proximity to seasonal ponds and wetlands for breeding. These are conditions that can be found or replicated on CNWR.

Key Species Benefitted: Northern leopard frog, tiger salamander, long-toed salamander, Columbia spotted frog.

Goal 3: Protect and maintain a diverse assemblage of wetland habitats characteristic of the Columbia Basin.

Objective 3.1. Protect Natural Seasonal Alkali Wetlands

Protect and maintain 7 acres of natural, seasonal alkali wetlands for the benefit of aquatic migratory birds (e.g., waterfowl, sandhill cranes) and a diverse assemblage of other wetland-dependent wildlife.

These mostly natural, seasonal wetlands will be characterized by:

- A 0-10% cover of desirable/native plants (e.g., saltgrass, bulrushes), restricted to higher wetland elevations.
- An alkali basin lacking vegetation.
- Water depths ranging from saturated soils to 10 feet.
- A <2% cover of invasive/undesirable plant species (e.g., pepperweed, *Phragmites* sp., purple loosestrife).
- No saltcedar or Russian olive.

Strategies for Achieving Objective
Seasonal alkali wetland habitat acres: 7
A. Use appropriate IPM strategies, including mechanical, physical, biological, and chemical means, to control or eradicate invasive species.
Rationale These acres are limited to management using appropriate IPM strategies. Alkali wetlands provide loafing sites for pelicans in the larger units and are used by shorebirds and waterfowl during spring migration. *Key Species Benefitted:* Lesser sandhill crane, American bittern, American avocet, black-necked stilt, Wilson's phalarope, long-billed curlew, mallard, redhead, blue-winged teal, lesser scaup, northern pintail, canvasback, western and lesser Canada goose, Taverner's cackling goose.

Objective 3.2. Protect and Maintain Emergent Marsh
Protect and maintain 1,736 acres of emergent marsh for the benefit of aquatic nesting, wintering, and loafing migratory birds (e.g., American bittern, redheads, tundra swans) and a diverse assemblage of other wetland-dependent wildlife (e.g., northern leopard frog, tiger salamander). Emergent marsh will be characterized by: • Water depths from 1 to <6 feet in open water areas. • Depending upon bottom topography, approximately a 50% cover of emergent vegetation (e.g., cattails, bulrush), creating a mosaic with open water. • Submergent plants (e.g., sago pondweed) present in open water areas. • Minimal presence of bullfrogs and rough fish (carp and bullhead). • Minimal human disturbance.
Strategies for Achieving Objective
Emergent marsh habitat acres: 1,736
A. Manage water levels through flood-ups and drawdowns.
B. Use prescribed fire, herbicides, and mechanical techniques (e.g., discing, scraping) to create/maintain mosaics of emergents and open water and set back succession.
C. Maintain the existing infrastructure (e.g., dikes, water control structures).
D. Use appropriate IPM strategies, including mechanical, physical, biological, and chemical means, to control or eradicate invasive species.
E. Convert Marsh Unit III to riparian habitat (see Objective 2.3).

F. Use drawdowns to control bullfrogs and rough fish.

G. Minimize human disturbance through seasonal access by humans.

Rationale

There are two types of emergent wetlands on CNWR, based on height. Within tall emergent habitats, cattail-dominant areas provide herbaceous forage and tubers for a limited array of wildlife species, as well as invertebrates and vertebrates. Bulrush-dominant areas provide herbaceous forage, tubers, and seeds, in addition to being a source of invertebrates and vertebrates. Both areas provide dense cover for a variety of wildlife species.

Short emergent habitats are typically flooded to an average depth of less than one foot for at least three months, although the timing and duration of flooding may vary from year-to-year. Short emergent habitats are characterized by soils that are saturated year-round. Vegetation is generally less than two-feet tall. Probable associates in short emergent habitats include spikerush, Baltic rush, alkali bulrush, creeping foxtail, reed canarygrass, and various sedges. Dense, continuous, short emergent habitats provide vertical and horizontal cover for many species of wildlife. When flooded, these sites provide herbaceous material, tubers, seeds, and abundant invertebrate foods. When standing water is absent, these sites continue to yield herbaceous and seed resources; however, invertebrates diminish somewhat and terrestrial vertebrates may become more abundant.

A 1997 biological review (U.S. Fish and Wildlife Service 1997b) recommended that Marsh Unit III be managed for biological diversity by controlling exotic plants (e.g., Russian olive and *Phragmites*) and planting native riparian vegetation and repairing/replacing water control structures to maintain the series of linear impoundments along part of the old Crab Creek channel. Considering the Service's guidance on ecological integrity, it was decided that the control structures will be removed and the old Crab Creek channel be restored to a more natural flowing system.

Riparian habitats in the arid West have been severely modified and degraded and are important in maintaining biological integrity in most western ecoregions. Intact riparian areas are one of the least represented habitat types in the steppe region of eastern Washington. Most riparian areas have been severely degraded by grazing and the conversion of surrounding shrub-steppe to agricultural. In the lower end of Marsh Unit II and throughout Marsh Unit III, Lower Crab Creek provides some of the best riparian habitat on the Refuge, as well as the surrounding area. Most of the natural channel of Crab Creek on the Refuge has been developed into a series of impoundments. However, beaver damage compounded by malfunctioning water control structures has resulted in only limited water control. Therefore, most impoundments are choked with emergent vegetation. In addition, much of the riparian vegetation consists of exotics (e.g., perennial pepperweed, Russian olive), further reducing the integrity of existing riparian habitat. Restoring Crab Creek to a natural free-flowing channel will significantly contribute to biological integrity of this ecoregion. Exotic vegetation will be removed, and a natural riparian corridor will be encouraged by planting of native trees and shrubs. Removal of the road which runs through the middle of this unit was discussed. Flooding of the road bed as a result of beavers plugging water control structures is a constant problem. However, because restoration and maintenance of this unit is labor intensive (e.g., noxious weed control), access will be required for many years in future. Removal of this road will be considered as the last restoration strategy.

Key Species Benefitted: Lesser sandhill crane, western and lesser Canada goose, Taverner's cackling goose, northern pintail, lesser scaup, mallard, redhead, canvasback, blue-winged teal, American

bittern, American avocet, black-necked stilt, Wilson's phalarope, long-billed curlew, tiger salamander, long-toed salamander, northern leopard frog, Columbia spotted frog.

Objective 3.3. Provide Moist Soil Management Areas

Protect and maintain 154 acres of managed, seasonal wetlands for the benefit of aquatic migratory birds and a diverse assemblage of other wetland-dependent wildlife.

These managed wetlands are characterized by:

- A 50% cover of desirable, native wetland plants (e.g., smartweeds, spike rushes, barnyardgrass).
- A <30% cover of desirable, native emergents (e.g., cattail, bulrushes) creating a mosaic with open water.
- Optimal water depths (saturated soils to 10 inches) considering variable bottom morphology to maximize availability of food resources during October through April.
- A complete drawdown by the end of May for moist soil plant production.
- A <5% cover of invasive or undesirable plant species.
- Minimal salt cedar or Russian olive.
- Minimal impacts of beavers.
- Minimal woody encroachment.

Strategies for Achieving Objective

Managed wetland acres: 154

A. Use appropriate IPM strategies, including mechanical, physical, biological, and chemical means, to control or eradicate invasive species.

B. Use staged flood-up to provide differing food availability.

C. Conduct a staggered drawdown in April and May to promote staggering of seed germination.

D. Use drawdowns to control bullfrogs and carp.

E. Use prescribed fire, herbicides and soil disturbance (e.g., discing) to set back succession.

Rationale

An extensive discussion and review of the moist-soil management program was conducted during a 1997 biological review. In general, the review recommended that development and enhancement of Marsh Units I, II, and IV will focus on the production of migrating and wintering habitat for aquatic birds. Although the management for nesting aquatic birds is of secondary importance, opportunities to maintain or develop nesting habitat while maintaining an emphasis on migrating and wintering habitat will be implemented. This is consistent with the objectives of the current Refuge management plan.

Marsh Unit I: The current objectives for this unit are primarily the production of a moist-soil marsh for

migrating and wintering waterfowl and waterbirds and secondarily to maintain waterfowl production on the Refuge. When the interspersion of open water/emergent vegetation becomes approximately equal, the units will be redisced to reduce emergent vegetation and to stimulate the production of moist-soil plants.

Marsh Unit II: The current primary objective for this unit is the production of a moist-soil marsh for migrating and wintering waterfowl. When the interspersion of open water/emergent vegetation becomes approximately equal, the units will be redisced to reduce emergent vegetation and to stimulate the production of moist-soil plants.

Marsh Unit III: This unit will be converted to riparian habitat. (See the rationale under Section 3.2.)

Marsh Unit IV: This unit consists of Royal Lake, Royal Slough, and six associated impoundments. This unit has been managed as a sanctuary for wintering aquatic migratory birds and supports one of the largest concentrations of waterfowl in the North Columbia Basin (peak numbers up to 45,000 ducks, geese, and swans) during the early winter months. It is also the best waterfowl nesting unit on CNWR.

Managing water in the marsh units requires a substantial dedication of money and staff time due to topography, soil type, etc. As such, the effectiveness of the marsh units will be evaluated over a minimum 5-year period and appropriate adjustments made to maximize forage availability for migratory birds and other wildlife. Based on the analysis of need, and an evaluation of the Marsh Unit III conversion, moist soil management acres (Marsh Units I and II) could be further decreased, along with modifications in management, to meet the future needs of migratory birds and other wildlife. If the total acres of moist soil areas are reduced based on the analysis of need, these areas will be restored to the appropriate habitat(s) based on soil and site conditions (e.g., emergent marsh, riparian) and availability of funds.

Drawdowns (April and May) and floodups (October) will be staggered to maximize food availability for migrating birds. A staggered drawdown will allow seeds to germinate at different times, providing different cover opportunities, different browse options, and different seed ripening times, creating extended periods of food availability. Conversely, staggered floodups cover food in stages, also creating extended periods of food availability.[6]

Key Species Benefitted: Lesser sandhill crane, western and lesser Canada goose, Taverner's cackling goose, northern pintail, lesser scaup, mallard, redhead, canvasback, blue-winged teal, American bittern, American avocet, black-necked stilt, Wilson's phalarope, long-billed curlew, tiger salamander, long-toed salamander, leopard frog, Columbia spotted frog.

Objective 3.4. Protect and Maintain the Willow Woodland

Annually protect and maintain 22 acres of willow-climax woodland for the benefit of migratory birds and other native wildlife.

These woodlands are characterized by:

- Mature trees (30 years old), primarily that of peachleaf willow.
- Multi-layering through variable age classes.

[6] The full drawdown dewaters carp and bullfrogs, thereby helping to control their populations.

- A shrub or emergent marsh understory.
- Small stands with patchy distribution.
- Water supplied through seepage from irrigated channels or percolation from irrigation to agricultural lands.
- A <2% cover of invasive/undesirable plants (e.g., Russian knapweed, Canada thistle, Swainson pea).
- No Russian olives.

Strategies for Achieving Objective

Willow woodland habitat acres: 22

A. Increase emphasis on fire protection to protect old growth (e.g., create fire buffers through mechanical means).

B. Use prescribed fire to promote recruitment of willows.

C. Use appropriate IPM strategies, including mechanical, physical, biological, and chemical means, to control or eradicate invasive species.

Rationale

By protecting and maintaining a willow-climax woodland, mature trees will provide habitat for cavity nesting birds (e.g., downy woodpeckers), nesting habitat for herons and raptors, and nesting and foraging habitat for migratory landbirds (e.g., warblers, flycatchers). The understory shrubs provide habitat for high-priority landbirds (e.g., warblers, buntings, flycatchers).

Key Species Benefitted: Various bat species, mule deer, great horned owl, American kestrel, barn owl, red-tailed hawk, common raven, yellow-breasted chat, song sparrow, willow flycatcher, Bullock's oriole, Lazuli bunting, yellow warbler, ash-throated flycatcher, downy woodpecker, Say's phoebe.

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

Objective 4.1. Prioritized List of Inventories

Complete Refuge-wide inventories for tiger salamanders, other native amphibians and reptiles, fish species (e.g., redband trout), and Washington ground squirrels within three years of the CCP being adopted.

Initiate inventories of bats, raptor nesting, and individual species of concern within five years of the CCP being implemented.

Repeat a Refuge-wide plant species inventory within 5 years of the CCP being implemented.

Strategies for Achieving Objective
A. Determine vertebrate species by appropriate survey methodologies.
B. Conduct Refuge-wide sampling in all habitats.
C. Stratified sampling techniques to select for key species or guilds.
D. Develop a geodatabase that ties individual records to specific locations (GIS/GPS).

Rationale

Inventories, monitoring, research, and studies are essential to high-quality habitat and population management. Currently, CNWR has comprehensive species lists, but population numbers of numerous species are little more than estimates, albeit ones made on years spent on the Refuge. Inventorying populations of at least the target species in this CCP is a priority.

Monitoring habitat conditions provides valuable support and a basis for sound decision-making as applied to refuge resource management; it also contributes to the Service's ability to modify management practices (adaptive management). Wildlife populations, habitat conditions, and habitat management practices, including restoration efforts, must be monitored to evaluate their status and effectiveness. Population trends can be used to evaluate habitat effectiveness and guide management actions.

Refuges must collect site-specific information and conduct defensible research to provide information for devising, guiding, and adapting management practices. Research is valuable for protecting and understanding refuge resources, determining natural resource components and their interactions, and understanding the consequences of management actions. Research is also necessary for the overall advancement of science and scientific inquiry. Applied research on the refuge will help address management issues and questions and will result in improved management decisions on both the refuge and on a regional basis.

Objective 4.2. Prioritized List of Monitoring Activities

Use MAPS stations to monitor population trends of breeding landbirds at selected willow-woodland complex sites within five years of the CCP being implemented.

Monitor vegetation response to prescribed fire using vegetation transects within established control and rehabilitation sites.

Determine the condition and trend of managed upland, wetland, and riparian habitats to evaluate the progress toward achieving habitat objectives and informing management decisions over time.

Monitor impacts of actions affecting stream and riparian habitats (e.g., channel restoration efforts) in Lower Crab Creek to evaluate changes in habitats, as well as effects on birds, fish, etc.

Revisit all established photo points annually and expand to potential restoration sites (riparian and shrub-steppe) within 2 years of the CCP being implemented.

Reinitiate annual marsh bird surveys to establish population trends and responses to habitat management.

Continue vegetative monitoring in managed wetland units annually to determine the effectiveness of management actions.

Modify curlew and bird point counts to better assess priority sites, with surveys conducted every 3 years and routes selected every year.

Determine population trends of waterfowl and sandhill cranes on and off the Refuge and determine primary roost areas to evaluate sufficiency of rest/roost areas.

Strategies for Achieving Objective

A. Generally use well-established procedures.

B. Establish partnerships to assist in monitoring efforts.

C. Establish relationships with universities, etc., to assist in monitoring efforts.

Rationale

At this time, the relative value of the agricultural fields and the marsh units is unknown, and there is some question as to whether the land could better be used to enhance other trust species, such as migrating and nesting neotropical birds. This is especially true in light of the significant cost and staff time involved in management of water in the marsh units due to topography, soil type, etc. As such, over a minimum 5-year period after implementing the CCP, the Service will evaluate the effectiveness and desirability of continuing to maintain agricultural fields and other moist soil areas (Marsh Units I and II) to accomplish Refuge purposes. The Service will also assess the success of the Marsh Unit III conversion over that same period, and if successful, and in consideration of the value of the other marsh units, the Service could consider converting other marsh units to native habitats. For the agricultural fields, any conversion of these lands will be systematic, stepped, and gradual, with the results of one area of conversion being analyzed before proceeding to another area. If the agricultural fields are found to be exceptionally valuable, additional acres could be made available to wildlife, most likely through the implementation of force account farming.

Objective 4.3. Prioritized List of Research Projects

Continue the ongoing research project to determine curlew nesting and use of agricultural cropped lands, especially in alfalfa.

Define specific Washington ground squirrel limiting factors through behavioral, genetic, and dispersal patterns.

Determine species assemblages associated with seepage interconnecting waterways and streams.

Assess the populations and spread of bullfrogs, carp, and other undesirable open water invasive species.

Determine the effects of fish and bullfrog presence on native amphibian populations.

Determine predation rates and survival of nesting migratory birds.

Identify key elements for long-term cheatgrass suppression and shrub-steppe habitat restoration.

Identify appropriate management techniques to control reed canarygrass and *Phragmites* in seasonally managed wetlands.

Determine the efficacy and non-target effects of new herbicides to control invasive species (Russian knapweed, cheatgrass, Canada thistle, *Phragmites*, Russian olive).

Evaluate habitat and wildlife responses to Russian olive invasion and removal.

Strategies for Achieving Objective

A. Establish relationships with universities, etc., to assist in research efforts.

B. Science Support Program (SSP) and Joint Fire Science Program (JFSP) projects.

C. Develop cost-share cooperative projects with other agencies.

D. Whenever possible, conduct research on a basin-wide scale.

Rationale

Developing and maintaining partnerships is crucial in accomplishing this goal as funds and staff time are limited. The Refuge has maintained a close working relationship with several state, Tribal, and local agencies and universities to advance the knowledge base of a variety of habitats and plant and wildlife species. Applied research by universities and other entities will be encouraged and could help address management issues and answer questions, allowing an opportunity to improve management decisions. Invasive species are a major threat to high-quality wildlife habitat and pose a major problem in the restoration and recovery of rare and listed species. Efforts will be made to work with partners as much as possible in a combined effort to pinpoint infestations and plan and coordinate control efforts both on and off the Refuge.

Objective 4.4. Prioritized List of Scientific Assessments

Assess the current condition of habitats that support sage-grouse by conducting vegetation surveys in sagebrush and riparian habitats.

Assess the current condition of habitats that support pygmy rabbits by conducting vegetation surveys in sagebrush habitats.

Assess all work in stream channels and floodplains to ensure that projects do not contribute to siltation, channel blockage, and destruction of potential habitat and/or spawning sites.

Determine optimal stand characteristics for greasewood.

Determine an optimal grazing strategy in selected wetland areas.

Develop GIS layers (National Vegetation Classification System [NVCS]) for vegetation, soils, hydrology, hydrograph.

Map bottom contours in managed wetlands.

Establish criteria for sustainable willow woodland management.

Determine the current acreage and condition of all macro- and micro-habitat types within five years of the CCP being implemented.

Strategies for Achieving Objective

A. Link to the fire/fuels management program.

B. Look at large and small plot treatments.

C. Conduct both short- and long-term studies.

D. Establish relationships with universities, etc., to assist in research efforts.

Rationale

See Objective 4.1.

Goal 5: Provide access and opportunities for high-quality recreation compatible with resource protection.

Objective 5.1. Complete a Visitor Services Plan

Develop and implement a Visitor Services Plan within 4 to 6 years of the CCP being adopted.

Strategies for Achieving Objective

A. Develop a Visitor Services Plan to concentrate visitor use and place facilities only in appropriate areas.

B. Develop a monitoring component in the plan to assess visitor satisfaction, recreational demand, and the impacts of recreational activities on natural and cultural resources.

C. During plan development and review periods, seek the input of local, state, and Tribal governments; valid existing rights holders; and other interested parties.

D. Develop an outreach component within the plan to enhance visitor understanding and appreciation of the NWRS mission and CNWR resource values and teach visitors techniques they can use to minimize impacts and enhance experiences.
E. Develop a monitoring component in the plan to assess visitor satisfaction, recreational demand, and the impacts of recreational activities on natural and cultural resources.
Rationale A Visitor Services Plan is needed to provide detailed direction (e.g., trail placement, parking areas, restroom facilities, signs) for implementing the CCP. The plan will support natural and cultural resources management by integrating visitor use in a manner that is compatible with resource protection, while also supporting visitor understanding and appreciation of these resources. Plan components will: 1) include objectives and strategies to welcome and orient visitors; 2) help provide quality hunting, fishing, wildlife observation, wildlife photography, environmental education, interpretation and other appropriate recreational opportunities; and 3) direct communication, outreach, and partnership efforts. A monitoring component will be a critical part of the plan. Too many visitors, or visitor use in fragile locations, have the potential to cause unacceptable impacts to natural and cultural resources. Crowding and other social impacts degrade the quality of visitor experiences. Monitoring will provide objective data on the type and extent of visitor impacts to natural and cultural resources and on the quality of visitor experience. Such data will be valuable for decision makers, as well as visitors seeking to understand and minimize impacts.

Objective 5.2. Provide for General Public Access
Modify historical visitor access and use patterns to best protect Refuge resources while providing additional opportunities for compatible uses.
Strategies for Achieving Objective
A. Discontinue access through the Refuge via Morgan Lake Road to match the hours the Refuge is closed.
B. Monitor visitor use patterns and identify unused parking lots for closure.
C. Convert Soda Lake Campground to day use only.
D. Allow educational day use of the old Bluebird Campground by permit.
E. Maintain horseback riding on the Refuge on roads open to vehicular traffic.
F. Maintain bicycle riding on the Refuge on roads open to vehicular traffic.
G. Implement and evaluate seasonal openings of Marsh Units I and IV for public access to protect migrating sandhill cranes and waterfowl.

H. Provide general public access for activities like hiking, wildlife observation, fishing, etc., exclusive of hunting.

I. Provide access for hunting in some form. (Different areas will have different seasons, species hunted, etc.)

Rationale

To increase visitor safety and maximize the benefit of Refuge resources for wildlife, visitor access is being reviewed and modified. The existing public use areas on CNWR lands have evolved over the decades as byproducts of changing operational needs, without consideration of resource suitability, visitor impacts, quality of visitor experience, or management efficiency. This has resulted in some situations where recreation activities are concentrated in and around fragile resources, while other areas more suitable for recreation activities are closed. The strategies address this situation by identifying options for closing some areas and opening new areas to public access.

Marsh Units I and IV will be restricted to seasonal opening and overnight camping will be discontinued. Soda Lake Campground and the old Bluebird Campground will be converted to day use only. Under current Service policy, it is recognized that camping is usually inappropriate and may be incompatible with national wildlife refuge purposes and is generally only allowed in very specific circumstances.

Goal 6: Visitors will understand and appreciate the importance of the Channeled Scablands area within the Columbia Basin through interpretation, environmental education, and wildlife-dependent recreation.

Objective 6.1. Provide for Wildlife Observation and Photography

Provide visitors with the opportunity for self-guided wildlife observation and photography while limiting the impacts and disturbance to sensitive species and their habitats. Opportunities will focus on lesser sandhill cranes, wintering waterfowl (ducks, geese, and swans), raptors (including burrowing owls), and neotropical songbirds, while incorporating most of the habitat types found on the Refuge. Opportunities will be directly linked to the environmental education and interpretation programs.

Strategies for Achieving Objective

A. Develop design standards for trails, overlooks, and other structures to ensure a cohesive look.

B. Conduct wildlife observation and photography workshops and tours with a Friends group, volunteers, and staff.

C. Create and maintain one permanent wildlife viewing and photography blind.

D. Provide 1-2 temporary seasonal photography blinds.

E. Establish partnerships (e.g., Friends, Central Basin Audubon Society [CBAS]) and make use of

the Youth Conservation Corps (YCC) and volunteers to improve and maintain trails.

F. Coordinate and expand opportunities to work with partners, such as the city of Othello on the Sandhill Crane Festival and the CBAS on the Washington State Birding Trail, to further wildlife observation opportunities.

Rationale

Wildlife observation and photography are identified by the Improvement Act as priority visitor uses, as long as they are compatible with refuge purposes. With its diverse habitats and abundance of plant and animal species, CNWR offers excellent potential to provide high-quality wildlife observation and photography opportunities. The Refuge's ability to provide these opportunities will be expanded through partnership efforts with local and regional interest groups.

Objective 6.2. Provide Environmental Education and Interpretation

Provide environmental education and interpretation to enrich visitors' knowledge of wildlife, Refuge management, and the Channeled Scablands. The program will:

- Incorporate current conservation issues and concerns.
- Provide experiences that are hands-on and integrate the habitats and associated plants, fish, and wildlife species found on the Refuge.
- Use various types of facilities including wildlife observation structures, interpretive exhibits, trails, outdoor classroom shelters, etc.
- Include educational programs located both on and off the Refuge.

Strategies for Achieving Objective

A. Establish a loop trail within the Drumheller Channel National Natural Landmark that will interpret the surrounding wildlife habitats, Ice Age Floods, and refuge management.

B. Establish partnerships (e.g., Friends, CBAS) and make use of the YCC and volunteers to improve existing and develop new trails.

C. Create an interpretive sign plan that provides both interpretive information about wildlife and refuge management, as well as rules and regulations.

D. Develop a series of resource-specific brochures, fact sheets, and other personal interpretive materials in both Spanish and English.

E. Continue to partner with the CBAS in conducting the environmental education program and facilitate the expansion of the program with additional partners.

F. Survey the needs and interests of local teachers for program subject material and align K-12 programs with state and national education standards.

G. Create new interpretive programs with differing themes.

H. Incorporate information on proper use practices into signage at each interpretive site and trail.

I. Provide an ADA-compatible interpretive auto trail with corresponding interpretive brochure that includes stops to provide visitors with an opportunity to see various habitats and wildlife throughout the Channeled Scablands ecosystem.

Rationale

Environmental education and interpretation activities foster an understanding and appreciation for our natural resources. As such, environmental education is identified as one of the priority visitor uses of the NWRS. On CNWR, the Service has an opportunity to provide environmental education programs for local schools. The environmental education program will focus on integrating environmental concepts and concerns into structured activities on the Refuge, involving educators, students, and others in hands-on activities that promote discovery and fact-finding, developing problem solving skills, and helping students develop their own ways of personal involvement and action.

Interpretive trails are a popular component to the overall priority wildlife-dependent recreational program on the Refuge. Trails provide visitors with a designated route of travel to view and learn about the Refuge's natural resources, as well as providing protection for sensitive resources through proper routing and construction techniques. Through publications and signs, visitors will be encouraged to stay on trails, and the interpretive messages will educate them as to why.

The BOR owns the 80 acres of the Drumheller Channel National Natural Landmark. However, the Service has been managing this area for the past 20 years with the understanding that management of the area will formally be transferred to the Service when the management agreement between the two agencies was next updated.

Objective 6.3. Establish a Visitor Contact Station and Office

Design and build a visitor contact station and office facility on the Refuge within 14 years of completion of the CCP.

Strategies for Achieving Objective

A. Use "green," energy-efficient resources in construction and operation of the facility.

Rationale

Currently, CNWR does not adequately welcome and orient visitors or provide interpretation or educational facilities. The Refuge leases office space from the CBIP, located approximately 10 miles from the Refuge. It does not fulfill ADA and Department of Homeland Security requirements, is not energy efficient, and does not have a dedicated computer and telephone secure location. A new visitor contact station and office on the Refuge will allow staff to interact with visitors.

Objective 6.4. Promote and Support Friends Group and Refuge Volunteers
Develop and maintain an active and diverse volunteer program based at CNWR. Recruit an organization to support and champion our connection to the surrounding communities.
Strategies for Achieving Objective
A. Encourage additional volunteers to work on the Refuge by holding bi-annual volunteer recruitment events.
B. Seek a diversity of volunteers through targeted recruitment at local schools and community resources.
C. Pursue the option of formalizing a 501(c)3 Friends Group focused on CNWR.
D. Incorporate volunteer needs into MCRNWRC-wide volunteer needs and advertise opportunities.
Rationale Refuge volunteers and Friends members actively support the mission of the Service while completing on-the-ground tasks in support of CNWR. Volunteers and Friends advocate for the betterment of the NWRS and provide additional support in all areas of refuge management. Active programs recruit and maintain future conservationists, as well as provide visitors with the opportunity to give something back to their community.

Goal 7: Provide high-quality hunting and fishing programs on the Refuge that promote visitor appreciation and support for Refuge programs.

Objective 7.1. Provide for Waterfowl and Upland Bird Hunting
Provide hunting opportunities for waterfowl and upland bird hunting consistent with sound biological principles and in accordance with the hunting plan.
Strategies for Achieving Objective
A. Implement additional youth hunts, areas, and/or seasons to encourage youth to participate in hunting.
B. Create an ADA-compliant waterfowl hunting blind/spot.
C. Discontinue the lottery system for hunting blinds and create a first-come, first-served system for blinds.
D. Remove permanent blinds (excluding ADA-compliant blinds) and allow temporary blinds, restricted to designated locations in Farm Units 226-227 Farm Units 35-36, if opened to hunting.

E. Open Farm Unit 35-36 to permit-only waterfowl hunting for youth.

F. Coordinate rules and regulations at CNWR with other MCRNWRC refuges to the extent possible.

G. Coordinate waterfowl hunt seasons with WDFW seasons to the extent possible.

Rationale

Hunting is identified as a priority wildlife-dependent recreational activity by the Improvement Act, when it is compatible with a refuge's purposes. Public input during the CCP scoping period identified hunting-related issues that included access, facilities, weapons and species restrictions, and the quality of information available on waterfowl and general hunting opportunities.

Through participation in the hunting program, hunters will understand the Refuge's purposes and resource management activities. Providing opportunities for youth is an important initiative in the Service and helps address a public desire to see more hunting opportunities for youth.

Providing a high-quality hunt on the Refuge promotes visitor appreciation and support for Refuge programs. According to draft policy on hunting on NWRs, issued in the January 16, 2001, *Federal Register* (Vol. 66, No. 10) a quality hunting experience is one that:

1) Maximizes safety for hunters and other visitors;

2) Encourages the highest standards of ethical behavior in taking or attempting to take wildlife;

3) Is available to a broad spectrum of the hunting public;

4) Contributes positively to or has no adverse effect on population management of resident or migratory species;

5) Reflects positively on the individual Refuge, the NWRS, and the Service;

6) Provides hunters uncrowded conditions by minimizing conflicts and competition among hunters;

7) Provides reasonable challenges and opportunities for taking targeted species under the described harvest objective established by the hunting program;

8) Minimizes the reliance on motorized vehicles and technology designed to increase the advantage of the hunter over wildlife;

9) Minimizes habitat impacts;

10) Creates minimal conflict with other priority, wildlife-dependent recreational uses or Refuge operations; and

11) Incorporates a message of stewardship and conservation in hunting opportunities.

Objective 7.2. Provide for Big Game Hunting
Hunters will have the opportunity to participate in a quality, safe, big game hunt (deer) program that provides a variety of hunting experiences.
Strategies for Achieving Objective
A. Evaluate an expansion of potential hunting opportunities and establish area-specific regulations as lands are acquired.
B. Allow for the use of muzzleloader hunting on Refuge lands and expand the hunting season to allow an early season muzzleloader hunt.
C. Close Marsh Unit I to deer hunting.
Rationale See Objective 7.1, the waterfowl and upland game bird hunting rationale.

Objective 7.3. Provide for Fishing and Fish Management
Provide opportunities for high-quality fishing on the Refuge in a manner that minimizes conflicts between fishing and biological resources, particularly migratory birds.
Strategies for Achieving Objective
A. Allow targeted stocking of rainbow trout with an agreed-upon Fisheries Management Plan.
B. Allow fishing on specified lakes only.
C. Coordinate fishing regulations and seasons with WDFW to the extent possible.
D. Designate specific fishing access points for the potholes area of Refuge.
E. Develop a fishing brochure or tear sheet for the public, including information such as parking, roads, boat launches and accessibility for people with disabilities.
F. Manage carp within water bodies as necessary for a healthy biological system.
G. Create an ADA-compliant fishing area.
Rationale Fishing is identified as a priority wildlife-dependent recreational activity by the Improvement Act, as long as it is found compatible with a refuge's purposes. Fishing is a popular visitor activity on the Refuge, contributing thousands of visitor days annually. Currently, fishing is allowed on all waters open

to public access with the exception of Marsh Units I and II.

Fishing on the Refuge is dispersed, and managing fishing has been more low-key than other Refuge recreational programs. Many who come to fish are probably unaware that they are even on a national wildlife refuge. There is an opportunity for enhancing communications with anglers, to provide greater information to these users about CNWR and the NWRS, and to create greater awareness of good fishing practices.

See the Fishing and Fish Stocking CD in Appendix D for a discussion of fish stocking impacts.

Goal 8: Manage cultural and geological resources for their educational, scientific, and cultural values for the benefit of present and future generations of Refuge users and communities.

Objective 8.1. Provide Historic/Prehistoric Cultural Resources Management

Implement cultural resource management programs that meet the requirements of the NHPA and that provide for consultation, identification, inventory, evaluation, and protection of all cultural resources.

Strategies for Achieving Objective

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

B. Evaluate the eligibility for proposal to the National Register of archaeological sites that are potentially important and that may be affected by management activities, other human activities, erosion, and other natural processes.

C. Protect cultural resources through law enforcement patrols.

D. Develop a Cultural Resources Management Plan to further define management and protection of resources.

E. Develop and implement a plan for the inadvertent discovery and repatriation of human remains with affected Tribes.

Rationale

Cultural resource surveys mandated by Section 106 of the NHPA will be conducted prior to any ground-disturbing activities on CNWR. Since many historic properties have been removed over time, those that remain, including buildings, structures, and historic and prehistoric archeological sites, will be evaluated for listing on the National Register. If eligible, these sites will be monitored and efforts made to protect and stabilize them as historic properties.

There are many cultural resources on CNWR, identified or not, that are at risk of damage and/or loss from a variety of sources. Vandalism of cultural resources is another threat that has negative impacts on both cultural resources and relations with the Tribes. Once destroyed, these resources are irretrievable, hence the need for implementation of a strategy for protection.

Objective 8.2. Identify and Protect Geologic Resources

Throughout the life of the CCP, create a comprehensive mapping of, and protect, the unique, rare, and exemplary geological resources of CNWR.

Strategies for Achieving Objective

A. Heighten visitor awareness of the importance of the geologic features, including the Drumheller Channel National Natural Landmark, through new brochures, signs, and inclusion in interpretive programs.

B. Seek partnerships for Ice Age Floods features surveying, cataloging, and interpretation.

C. Contract with universities or consultants to conduct a literature review and field assessment of geologic resources.

D. Add information/data regarding geologic resources to the GIS database as they become available from other agencies (e.g., National Park Service) and through the partnerships and programs noted above.

E. Protect geologic resources through law enforcement patrols.

F. Promote geologic resources through interpretive materials that incorporate Leave No Trace ethics and highlight their importance.

Rationale

CNWR has a number of striking geological resources, especially the Drumheller Channels National Natural Landmark. Threats to this resource include erosion following fire, landslides aggravated by irrigation waters, disturbance through trespass, and vandalism. To fully protect this resource, a thorough mapping of known geologic resource will be necessary, as well as the identification of as yet unknown resources. Additionally, to mitigate for current and potential threats, corrective actions will include signs, education, increased patrols, new or modified regulations, and routing of visitors away from sensitive areas.

Goal 9: Contribute to the protection of the long-term environmental health of the Columbia Basin ecosystem through land exchanges, agreements, acquisition, and disposal of Refuge lands and/or interests.[7]

Objective 9.1. Changes in Land and Water Protection
To further habitat conservation, acquire easements or fee title lands, coordinate land exchanges, and facilitate new agreements for lands both within and outside the Refuge boundary that improve the Refuge's environmental health, facilitate Refuge operations, and contribute to other Refuge programs, such as visitor use. In addition, interests in lands that do not significantly contribute to the health of the Refuge will be divested.
Strategies for Achieving Objective
A. Changes in land ownership will be evaluated within 5 years of the CCP being signed. Prior to any changes in land ownership, a land protection plan will be written, if necessary. A land protection plan will allow for the acquisition of lands outside Refuge boundaries in order to connect habitats.
B. Acquire management authority of the Upper Goose Lake area through a cooperative agreement with the BOR.
C. Divest interest in the Lower Crab Creek scattered tracts.
D. Investigate trading management of Pitt, Canal, and Teal Lakes (east of Seep Lakes Road) for management of the entire Goose Lake area (including Lower Goose Lake).
E. Pursue an exchange of BOR lands to acquire inholdings.
F. Acquire lands north of Management Unit IV.
G. Acquire inholdings in Management Unit IV near Barton Road surrounded by Refuge property.
H. Acquire lands within Management Unit II near Para Lake.
I. Update the agreement between the BOR and the Service over management of lands, including management of the Drumheller Channel National Natural Landmark.
J. Investigate the desirability of acquiring other lands both within and outside the Refuge boundary and acquire those lands as appropriate and as opportunity arises.

[7] All actions are dependent on a willing-seller, willing-buyer basis. Service policy does not allow acquiring land outside the approved acquisition boundary. There are acreage restrictions and a planning process that must occur prior to any acquisition.

Rationale

Management operations and the ecological potential of the Refuge are seriously compromised by the presence of private inholdings and adjacent land parcels. Lawsuits over access and fencing issues involving various inholdings have tied up Refuge resources for decades, and the negative impact on the Refuge purposes is ongoing. Acquiring selected tracts of land will improve the Service's ability to provide more high-quality migratory bird sanctuary areas and reduce disturbance to current areas. Other acquisitions will also provide additional acres of important shrub-steppe and improve habitat management capability. Some of this shrub-steppe needs rehabilitation, but is important in providing contiguous area and connectivity of quality habitats. Other acquisitions will complete the acquisition boundary, minimize adjacent use conflicts, and adjoin isolated tracts into contiguous Refuge property.

Objective 9.2. Changes in Water Rights, Quantity, and Quality

To further habitat conservation, over the course of the CCP, acquire water rights for migratory bird habitat management and trust species protection, mitigate for poor water quality from point and nonpoint source pollution, and obtain water for use during appropriate seasons.

Strategies for Achieving Objective

A. Purchase water rights to be used for habitat management.

B. Secure the use of water from the Quincy Irrigation District during the fall for Marsh Unit II when they test their water control structures.

C. Formalize an agreement with the BOR regarding the quantity and quality of water available for Royal Lake.

Rationale

The contamination and availability of water resources throughout eastern Washington continues to be of concern. Water quality within Grant and Adams Counties contains approximately 20% higher concentrations of nitrate than allowable levels, according to the EPA. Surface water available for Refuge resources comes from the Quincy Irrigation District and the BOR. Additional water on the Refuge is due to the rise in groundwater tables following installation of dams on the Columbia River and seepage from those dams. Currently, the Refuge has an agreement with the BOR for water; however, the quality and quantity of the water is not specified, which does not provide for the long-term security of Refuge resources. To maximize the management of Refuge resources, the Refuge will need to acquire additional water rights, as well as determine the quality of all water passing through the Refuge. (See Section 3.4.2 for a further discussion of water quality.) It should be noted that water is generally available at no cost through BOR water; the purchase of water rights is simply to provide an assurance of water in the future.

2.4.1 Habitat Type Summary

The following table summarizes the amount of habitat targeted for the management direction.

Table 2.1-1. Habitat types and acres on Columbia National Wildlife Refuge.

Habitat Type	Management Direction
Grassland	4,250
Greasewood	1,273
Sagebrush	19,101
Scrub-Shrub	636
Talus and Rock Outcroppings	781
Small Grain Farmlands	203-550
Green Forage Farmlands	203-550
Seep Streams and Channels	27.3 (miles)
Shallow Water Lakes	732
In-stream and Streamside	211
Seasonal Alkali Wetlands	7
Emergent Marsh	1,736
Moist Soil Management	154
Willow Woodland	22
Total	**29,656**

Chapter 3

Affected Environment

Chapter 3. Affected Environment

3.1 Geographic/Ecosystem Setting

As noted earlier, Columbia National Wildlife Refuge (CNWR) is located ecologically within the Columbia Plateau and artificially within the CBIP. The CBIP's expansive area of agricultural lands with numerous scattered water bodies has become a focal point for a large segment of the Pacific Flyway waterfowl migrating and wintering populations. CNWR and its objectives support the management of this resource.

Built as part of the CBIP, Potholes Reservoir lies immediately upstream of CNWR in the Lower Crab Creek Basin. The reservoir's main water supply is operational waste and irrigation return flow from northern CBIP lands irrigated from the East Low and West Canals. Reservoir inflows originate from Moses Lake through the Crab Creek channel on the north side, from the Lind Coulee Wasteway on the east side, and from the Winchester and Frenchman Hills Wasteways on the west side. Irrigation water for the southern part of the CBIP is distributed via the Potholes Canal, which begins at Potholes Reservoir. A series of "seep" lakes just south of the reservoir are sustained by underground drainage from the reservoir and the Potholes Canal.

Prior to construction of the CBIP, CNWR and surrounding lands consisted primarily of semiarid vegetation associated with the shrub-steppe vegetation zone described by Franklin and Dyrness (1988). This is predominately a semiarid vegetation type, dominated by sagebrush and bitterbrush, but also containing areas of dune vegetation, cliff and talus, and local riparian and wetland vegetation types. Since the CBIP began operations, agricultural lands have also become a substantial fraction of the landscape. Wetland and aquatic habitats have become much more widespread as semiarid habitats have become restricted and fragmented. The current landscape predominately reflects human influences on hydrology and land use, and wildlife has adapted to this situation: the Refuge now hosts large numbers of migratory and overwintering waterfowl. Conversely, native vegetation and wildlife have declined and become more restricted in distribution in response to habitat reduction, fragmentation, and invasion by non-native plants within semiarid habitats.

3.2 Climate

Climate data for the weather station at Othello indicate a typical Columbia Basin semiarid climate. Data for the period 1994-2002 (no newer data are available) from the Western Regional Climate Center (WRCC) indicate an average annual rainfall of 8.2 inches and an average annual temperature of 62 degrees Fahrenheit (°F), varying from an average January minimum of 22°F to an average July maximum of 88°F. Snow may occur from November to March, but averages only 4.3 inches per year. Precipitation mainly occurs in the winter, with almost half the annual total falling from November to February; less than an inch usually falls from July to September, the driest months (WRCC 2011). Slightly drier and warmer conditions are encountered for the weather station at Smyrna, which lies a few miles west of CNWR and may more accurately portray conditions on the westernmost portions of CNWR.

Climate change model forecasts for the Pacific Northwest are reviewed by Salathé et al. (2009) for a variety of different models. Their review presents forecasts of changes between the 1970-1999 and 2030-2059 periods. Generally the forecast changes are small, compared with changes forecast for

other regions of the Pacific Northwest. Most models forecast increases in precipitation of 0.2 to 0.4 inches per month in the spring and fall months. Forecasts show monthly average temperature increases of 0.9°F to 2.7°F, with the greatest increases in the summer months. This may result in more fires, a longer fire season, and the area becoming one of the last strongholds for sagebrush.

3.3 Geology and Soils

3.3.1 Geology

CNWR is within the Columbia River Plateau, which was formed by the extrusion of lava throughout a large part of eastern Washington, eastern Oregon, and western Idaho during the Tertiary Period. Most bedrock in CNWR area consists of these Columbia River basalts; the total thickness of the basalt is not known, but it is likely more than ten thousand feet in at least some areas (Walters and Grolier 1960).[1] These basalts are the most common surficial material on CNWR. They form a mostly rolling countryside with basalt outcroppings forming cliffs, mesas, box canyons, and potholes. Many of the canyons and potholes are filled with water that has seeped from the Potholes Reservoir (U.S. Bureau of Reclamation [BOR] 2001).

Since their eruption, the Columbia River basalts on CNWR and in the vicinity have been deformed into a regional structural basin, defined by the lower limb of the Grand Coulee Monocline to the north/northwest and the northern limb of the Frenchman Hills Anticline to the southwest; the region to the northeast is subjected to a zero to five degree dip in the southwest direction. The effect of these structural features is the formation of a regional sediment and groundwater basin. In addition to groundwater, this structural low has been the deposition location for silt and sand carried by the southwest prevailing wind, making the area an aeolian depositional basin as well (BOR 2001).

During the Quaternary Period, topography on the Refuge and its vicinity was transformed by the Missoula Floods, which occurred anywhere from a handful to several hundreds of times during the last ice age. These floods occurred when a large glacial lake (Lake Missoula in what is now Montana, formed by ice sheets blocking the Clark Fork River) broke through its ice dam and emptied into the Columbia River Basin. Each of these floods carried a peak flow volume of 10 to 15 cubic miles of water per hour at speeds of up to 80 miles per hour. The floods spread over much of eastern Washington, eroding hundreds of cubic miles of basalt bedrock and depositing enormous gravel bars and silt beds in their wake. These flood deposits are now the second-most common parent material found on CNWR and are particularly widespread in Management Units (MU) 4 and 5 (BOR 2001).

CNWR also contains some areas of recent alluvium. These are sediments laid down by water, and they occur within and along the margins of lakes and streams on CNWR.

3.3.2 Soils

Nearly all of the soils on the Columbia Plateau and in the Columbia Basin have been formed under grassland or shrub-grassland vegetation, or have been carried in on the waters of the Missoula Floods. Soil parent materials in this region include basalt, volcanic ash, sedimentary deposits, glacial outwash and alluvial, fluvial and colluvial deposits. The predominant soil types found on each

[1] Older granitic and metamorphic rocks underlying the basalt are exposed in areas bordering the CBIP area and are thought to underlie the basalt under all or much of CNWR.

Refuge management unit are identified in Table 3.3-1. Caliche (deposits of leached calcium carbonate) layers occur in most of the soils and are generally at a depth of about seven feet. Loess-dominated subsoils are moderately saline and contain a moderate amount of exchangeable sodium.

The most recent and comprehensive soils data available for the study area were obtained from the Web Soil Survey prepared by the Natural Resources and Conservation Service (NRCS) (NRCS 2011); the web soil survey presents an inventory and evaluation of all soils in the United States. The survey can be used to adjust existing land uses and land use plans to the limitations and natural potentials of soil resources and their environments (BOR 2001).

Table 3.3-1. Principal soil types present on Columbia National Wildlife Refuge.

Management Unit	Principal Soil Types
MU1	Schawana Complex, 0-15% slopes. Starbuck-Bakeoven-Rock Outcrop Complex, 0-45% slopes.
MU2	Starbuck-Bakeoven-Rock Outcrop Complex, 0-45% slopes.
MU3	Prosser-Starbuck Complex very rocky, very fine sandy loams, 0-20% slopes.
MU4	Prosser-Starbuck Complex very rocky, very fine sandy loams, 0-20% slopes. Scooteney Complex stony loam, 0-15% slopes. Umapine Complex silt loam, 0-2% slopes.
MU5	Kiona Complex cobbly very fine sandy loam, 25-65% slopes. Starbuck-Prosser Complex, 0-25% slopes.

3.4 Hydrology and Water Quality

CNWR lies within the Lower Crab Creek watershed, HUC 17020015. Water bodies on CNWR are closely interconnected with groundwater resources due to high water tables resulting from the CBIP and extensive fracturing of the basalt bedrock. Most of the lakes have steep and rocky shorelines with very little wetland habitat.

3.4.1 Hydrology

With precipitation of only eight inches per year, most surface water on CNWR is derived either directly via surface flow or indirectly via groundwater flow from CBIP irrigation runoff. Some lakes in MU 3 are actually wide spots in the Potholes Canal. Lower Crab Creek and runoff from irrigated areas form the principal sources of surface water on the Refuge. Numerous water bodies occur on CNWR. Among the larger ones are Lower Crab Creek, Corral Lake, Blythe Lake, Chukar Lake, Goldeneye Lake and Marsh Unit I in MU 1; Potholes Canal, the Hampton Lakes, the Teal Lakes and Crescent Lake in MU 2; Lower Crab Creek, Hays Creek and Hutchinson Lake in MU 3; and Lower Crab Creek and Royal Lake in MU 4. Most of MU 5 has no surface water, but a few areas have portions of Lower Crab Creek or minor tributaries.

Crab Creek itself was historically and by nature an ephemeral stream that was dry for most of the year, running only in the late winter/early spring period, or in the event of major precipitation events

(see Section 3.2 for a description of annual precipitation patterns). However, with construction and operation of the CBIP, Crab Creek has become a permanent stream flowing throughout the year. The source of this water is primarily groundwater seepage rather than outflow from the dam. Flows are typically low throughout the year, except in the event of a need to spill water from O'Sullivan Dam to make room for large inflows into the reservoir. This is a rare occurrence, but when it does happen, Crab Creek can see extensive erosion with significant down-cutting of the channel.

Upper Goose Lake, located outside the approved Refuge boundary just south of MU 1 and just west of MU 2, is typical of the lakes on the Refuge and was studied in some detail by Dion et al. (1980). They found that the principal water source for the lake was irrigation runoff water. The lake is in an old coulee, cut by the Missoula Floods, and soils are mostly deep sands of Missoula Floods age. The lakebed material is mostly rock, sand, and gravel with local mucks. The lake averages 45 feet deep, with a maximum depth of 95 feet. It has little aquatic vegetation, with less than 10 percent cover on both the lake bed and the shoreline, including sedges (*Cyperaceae*), pondweed (*Potamogeton* sp.), cattail (*Typha* sp.), waterweed (*Elodea* sp.), bulrush (*Scirpus* sp.) and water milfoil (*Myriophyllum* sp.). The water is moderately hard and alkaline. In spring, the water is clear, cool and well-oxygenated, but by September the water is murky, with Secchi disk[2] depths as low as 6.5 feet, high chlorophyll content, presence of blue-green algae, and thermally stratified with zero dissolved oxygen at depth. Nonetheless, the lake supports gamefish and is heavily used by recreational anglers.

3.4.2 Water Quality

In general, given the agricultural runoff that serves as a water source for most of CNWR, it is likely that variable concentrations of many agricultural chemicals occur in waters on the Refuge; that invasive plants, such as water-milfoil, occur in many lakes that are accessible to recreational fishing boats; and that water quality parameters such as temperature and dissolved oxygen show naturally occurring seasonal limitations during the late summer low flow period.

Significant contaminant concentrations (primarily pesticides and nitrates) have been documented in CNWR waterways, most notably in Royal Lake, Potholes Reservoir, and Crab Creek. There are issues related to organochlorine pesticides (primarily DDE) in Royal Lake and organophosphate/carbamatepesticides in lower Crab Creek/Crab Creek Lateral at concentrations that exceed Ambient Water Quality Criteria. The transport pathway of the pesticides onto CNWR is thought to be from runoff/soil transport from agricultural fields, especially fields that are flood irrigated. Fish tissue studies conducted on the Refuge have documented elevated concentrations of DDE, above wildlife health thresholds, in whole-body carp in Royal Lake (Gruber and Munn 1996).

The most recent Contaminants Assessment Process (CAP) was completed for CNWR in January 1999. The CAP report indicated that the primary contaminant issue on the Refuge is agricultural pesticides transported by the several wasteways entering Potholes Reservoir. Much of the water in Crab Creek is irrigation return water; water enters Potholes Reservoir from Lind Coulee, Winchester and Frenchman Wasteways, and Upper Crab Creek and is stored prior to release. Crab Creek Lateral is likely the primary transport route of agricultural chemicals onto the Refuge. Several sites are listed in the CAP report as potential sources of contamination to the waterways/wasteways that flow onto CNWR; all sites are outside of the Refuge area of influence. The CAP report further notes that steelhead and Chinook salmon have been documented spawning in lower Crab Creek drainage below the Refuge and recommends pursuing investigation of water quality issues, particularly related to

[2] Secchi disks measure water transparency.

pesticides, in Crab Creek. Any major changes in regional water management and agricultural practices could affect contaminant transport and loading to CNWR.

The WDOE, in its 2008 303(d) list of Water Quality Limited Waters (WDOE 2009), has listed several lakes on CNWR and vicinity. Listings include:

- Long Lake, located on the Potholes Canal on the east edge of MU 2, is listed as Category 5 (polluted waters) for dieldrin contamination of tissue. Numerous other agricultural chemicals have also been detected in tissue tests in Long Lake, but do not exceed applicable regulatory standards.
- Hutchinson Lake is listed as Category 4C (waters impaired by a non-pollutant) for invasive exotic species, specifically Eurasian water-milfoil (*Myriophyllum spicatum*).
- Royal Lake, which is along the Crab Creek Wasteway, is listed as Category 5 for tissue concentrations of the pesticides 4,4-DDE and dieldrin based on one composite sample (five fillets of smallmouth bass) taken in 1995.

In addition, water quality and habitat within Crab Creek from just below Potholes Reservoir to the Columbia River is poor throughout, and contaminants include PCBs and dieldrin (Weaver 1999, as cited by Quinn et al. 2001). Temperatures sometimes reach lethal levels for salmonids. Soil-laden irrigation return flows, the activities of carp and occasional flooding preclude good water clarity during the warm months and have left much of the streambed downstream of Highway 26 (i.e., closely downstream of CNWR) buried in muck (Quinn et al. 2001).

3.5 Air Quality

Ambient air quality is a result of the type and amount of pollutants emitted into the atmosphere, the meteorological conditions, and the size and topography of the affected air basin. Federal and State governments have developed ambient air quality standards (AAQS), which when exceeded are considered harmful to public health and the environment.

WDOE's Eastern Regional Air Pollution Control Authority Office and the EPA monitor air quality in the Columbia Basin region under the provisions of the Clean Air Act, as amended. Washington has developed a State Implementation Plan in part to maintain AAQS. The status of criteria pollutants, the six principal pollutants regulated by the EPA, is tracked statewide. The six criteria pollutants are particulate matter 10 microns or smaller in diameter (PM10), sulfur dioxide (SO_2), oxides of nitrogen (NOx), carbon monoxide (CO), ozone (O_3), and lead (Pb).

Grant and Adams Counties do not have permanent or mobile air quality monitoring stations. Therefore, air quality information in the area is limited. The closest monitoring sites to CNWR are Spokane to the northeast and Yakima to the west. These cities also are the nearest non-attainment areas for CO and PM10. Although air quality information for the region is limited, WDOE and EPA have designated Grant and Adams Counties as currently in attainment for all standards (BOR 2001).

In addition to the six criteria pollutants, Air Quality Areas are designated by the EPA under Prevention of Significant Deterioration guidelines. Class I Air Quality Areas have land and resource use restrictions to prevent damage to visibility, plant, soil, and other resources under the SIP for the Clean Air Act. These areas include all international parks, wilderness areas, memorial parks which exceed 5,000 acres, national parks which exceed 6,000 acres, and some Tribal lands. All other areas

are Class II Areas. CNWR is in a Class II Area. Class I Air Quality Areas within a 100-mile radius of the Potholes Reservoir are Glacier Peak and Alpine Lakes Wilderness Areas to the west and the Spokane Indian Reservation to the east (BOR 2001).

3.5.1 Particulate Emissions Sources

Locally, particulates are generated from area sources such as dirt roads, plowed fields, and food processing plants. Wind erosion is a significant factor in particulate distribution, particularly in the spring and fall when high winds and dry soil conditions create dust storms. The agricultural practice of burning field residue following harvest can also produce high levels of particulate matter. The burning season lasts about a month in late August and September. Although the typical management practice directs smoke away from population centers, total emissions within the airshed are not reduced (BOR 2001).

3.6 Adjacent Land Uses

Lands affected by the CCP are mostly managed by the Service, although the underlying ownership is varied but primarily that of the Service and BOR. The CCP does include the Lower Crab Creek scattered tracts, managed by the WDFW, but no significant changes are proposed for these areas.

Surrounding land uses are under several authorities that can generally be allocated to recreation and resource management, or to agriculture. To the north are BOR lands in and around Potholes Reservoir. These lands are managed for recreation and habitat by the State of Washington under an MOA with BOR. The BOR Ephrata Field Office is responsible for providing the oversight and approval of proposed land use activities on BOR properties within the Potholes Reservoir area. The Washington State Parks and Recreation Commission (SPRC) and WDFW are the State agencies currently responsible for most of the day-to-day activities and decisions that directly affect the Potholes Reservoir area; WDFW manages most of the land base, while several specific areas, such as Potholes State Park, are managed by the SPRC.

Other lands surrounding CNWR are zoned by Grant County as agriculture (mostly to the west), public open space (CNWR and adjacent Federal and State of Washington lands), and rural village (lands to the east of CNWR near Othello). Several units of the WDFW Columbia Basin Wildlife Area adjoin CNWR, including Seep Lakes Wildlife Area just east of MU 2 and MU 3, Goose Lakes Wildlife Area just west of MU 2 and just north of MU 3, and Lower Crab Creek Wildlife Area west of MU 5.

Specific management plans have been developed by Federal, State, and local agencies to assist in the management of resources and land use activities within and adjacent to the study area (see also Chapter 1). The relevant plans include:

- *Columbia Basin Wildlife Area Management Plan.* As part of WDFW's public holdings, the Columbia Basin Wildlife Area incorporates many scattered tracts of land developed as a result of the CBIP. The plan (Fitzgerald 2006) provides guidance for the management of these tracts.
- *Grant County Comprehensive Plan.* The Grant County Comprehensive Plan was adopted in September 1999, pursuant to the Washington State Growth Management Act (RCW 36.70A). The plan addresses land use, critical areas and resource lands, housing, transportation, capital

facilities, and utilities within county boundaries. Specific to the "Open Space and Recreation" designation which encompasses CNWR, the Growth Management Act goal for these lands encourages retention of open space, development of recreational opportunities, conservation of fish and wildlife habitat, and access to natural resource lands and water.

- *Grant County Shorelines Management Master Program.* Several waters within CNWR are listed as shorelines of statewide significance in the Grant County Shorelines Management Master Program (WAS 173-20-290). To the extent practicable, shorelines under CNWR jurisdiction are managed consistent with Grant County guidelines (e.g., lakes on CNWR are designated for public land access in Grant County).
- *Groundwater Management Area.* In 1998, under recommendation of the Washington State Interagency Ground Water Committee, a Columbia Basin Groundwater Management Area (GWMA) was established that encompasses Adams, Franklin, and Grant Counties. The State of Washington, in cooperation with the county health districts, monitors nitrate levels throughout the groundwater management area to identify areas of particular concern for implementing additional agricultural BMPs. Groundwater in areas to the north and south of CNWR have elevated nitrate levels, and there is no known reason why the connected groundwater under the Refuge would not also exhibit elevated levels. However, at this time, the GWMA does not have any monitoring sites on or immediately adjacent to CNWR.

3.7 Vegetation and Habitats

CNWR is within the *Artemisia tridentata/Pseudoroegneria spicata* shrub-steppe vegetation zone described by Franklin and Dyrness (1988). This is the driest of the nine vegetation associations recognized in the Columbia Basin Province. Upland vegetation in this zone is dominated by big sagebrush (*Artemisia tridentata*), bitterbrush (*Purshia tridentata*), and large perennial bunchgrasses, such as bluebunch wheatgrass (*Pseudoroegneria spicata*) and Idaho fescue (*Festuca idahoensis*). Community composition depends upon many factors, including substrate, topography, wind action, and human disturbances (Franklin and Dyrness 1988).

Statewide, a majority of this vegetation association has been converted to agriculture, and those natural areas remaining have been highly altered by fire and grazing. Grazing most seriously affects the larger perennial grasses because they are preferred forage and are not adapted to withstand grazing. Heavy grazing tends to eliminate bluebunch wheatgrass, Idaho fescue, and Cusick's bluegrass (*Poa cusickii*) and to favor annual grasses, particularly invasive cheatgrass (*Bromus tectorum*). Fire is very harmful to sagebrush, which is often completely killed by range fires. Although it can regenerate from rootstocks, it generally must re-occupy the site by invasion and gradual expansion, which is a relatively slow process (Franklin and Dyrness 1988). Cassidy et al. (1997) indicated that only 5.9 percent of the lands of central arid steppe zone are in conservation status (managed by Federal, State, or private agencies/groups to conserve natural resource values). The four national wildlife refuges in this zone (Columbia, Saddle Mountain/Hanford Reach National Monument, Toppenish, and Umatilla) constitute 16 percent of the conservation status lands, where CNWR and Saddle Mountain/Hanford Reach National Monument provide the majority of this land.

Before the construction of O'Sullivan Dam, which impounds Potholes Reservoir at the northern edge of CNWR, vegetation within the area was arranged in zones along a moisture gradient. These zones from dry to wet were: 1) no vegetation on high, dry, areas; 2) rabbitbrush (*Chrysothamnus* sp.), sagebrush, spiny hopsage (*Grayia spinosa*), cheatgrass, Indian ricegrass (*Achnatherum hymenoides*), and alkali cordgrass (*Spartina gracilis*) on higher grounds; 3) Baltic rush (*Juncus balticus*)-sedge

(*Carex* sp.) meadows; 4) bulrush (*Scirpus* sp.)-cattail (*Typha* sp.) wetlands; and 5) submerged aquatic plants. Permanent and temporary pothole lakes, flooded flats, creeks from spring-fed potholes, and extensive marshlands covered the area (Harris 1954, as cited in BOR 2001).

Overgrazing in the early part of the century resulted in the destruction of native plant cover and the formation of a broad area of active sand dunes (Zook 1978, as cited in BOR 2001). Fire also likely impacted the native shrub-steppe plant communities. Due to the area's arid climate and sandy soils, native plant community recovery is slow. As indicated by Franklin and Dyrness (1988), such recovery is further hampered in the fragile uplands due to their susceptibility to invasive plant establishment on disturbed sites.

Upland vegetation currently found on the Refuge is dominated by introduced annual grasses and some native shrubs. There are only remnant patches of native vegetation (as described by Franklin and Dryness 1988) remaining (i.e., shrubs with interspersed bunchgrasses). Since the creation of Potholes Reservoir, the aerial extent of riparian habitat, particularly riparian shrub and riparian forest, has increased considerably and is dominated by woody species such as willow (*Salix* sp.). Large areas of emergent herbaceous wetlands are also present, while some areas have only minimal vegetative cover.

See Section 3.10 for discussion of invasive vegetation and its management.

3.7.1 Grasslands

Grasslands on CNWR are early seral stage communities of the sagebrush/shrub-steppe communities described below and are generally comprised of the same grass species. They are the result of disturbance, generally from fire. Historical fires were mostly cool (i.e., of low intensity) and patchy, which resulted in the mortality of only a few of the shrubs that characterize the area. But given the more frequent and hot fires resulting from the invasion of cheatgrass, coupled with greater human intrusion, open grasslands relatively free of shrubs are now much more frequent on the Refuge. These resultant expanses of grass are not all undesirable, and in fact will be maintained in many areas through the methods described in Chapter 2. Sparrows, long-billed curlews, and horned larks are a few of the species that thrive in this habitat. Given an adequate fire-free time interval, this habitat would become re-established as shrub-steppe.

3.7.2 Sagebrush/Shrub-Steppe

Sagebrush/shrub-steppe is comprised of five plant community types: big sagebrush/bluebunch wheatgrass, big sagebrush/Sandberg's bluegrass, big sagebrush/needle-and-thread, big sagebrush/cheatgrass, and spiny hopsage/Sandberg's bluegrass.

3.7.2.1 Big Sagebrush/Bluebunch Wheatgrass

This potential community type is characterized by big sagebrush; bluebunch wheatgrass; Sandberg's bluegrass (*Poa secunda*); diverse forbs, such as several species of buckwheat (*Eriogonum* sp.), purple sage (*Salvia dorrii*), yarrow (*Achillea millefolium*), and members of the mustard and pea families; and, where relatively undisturbed, a robust microbiotic crust. As the climatic community, it is widespread in many (loamy) soil types, although frequently with a high cheatgrass cover if disturbed by livestock grazing. Idaho fescue, a highly palatable native and frequently found in this community, has largely disappeared as a result of livestock grazing. In recently burned areas,

sagebrush is generally absent and slow to reestablish itself; in these cases green rabbitbrush (*Chrysothamnus viscidiflorus*) and grey rabbitbrush (*Chrysothamnus nauseosus*) may fill the void, at least temporarily. Under more mesic conditions, such as north facing slopes, bluebunch wheatgrass reaches higher densities and Cusick's bluegrass and Great Basin wildrye (*Leymus cinereus*) can be found.

3.7.2.2 Big Sagebrush/Sandberg's Bluegrass

It seems likely that in Washington this plant community type is confined to locations too dry for bluebunch wheatgrass to become established and on soil that is finer textured than is typical for needle-and-thread (*Stipa comata*) community types. It may also occur as a so-called *zootic* (literally, *from animals*) climax where grazing has eliminated larger, later-growing bunchgrasses. In general, on CNWR a high cover of big sagebrush and low forb diversity is characteristic of this type. Spiny hopsage may occur, especially at drier sites, with cover ranging from widely scattered individuals to a few locations at which it is co-dominant with big sagebrush. As with any sagebrush community, hot fires result in high sagebrush mortality and may stress native grasses if actively growing, leading to a short-term flush of Russian thistle (*Salsola kali*) and other exotic forbs and the long-term establishment of cheatgrass. Otherwise, forbs similar to as above also occur.

3.7.2.3 Big Sagebrush/Needle-and-Thread

This community is present in a range of soils in the Lower Crab Creek Basin, from those with a significant component of sand (sandy loam) to stabilized dunes. Big sagebrush is the dominant shrub, although bitterbrush commonly occurs at varying levels. Thickspike wheatgrass (*Elymus lanceolatus* sp. *lanceolatus*) may occur in the understory with the needle-and-thread. Where it is intermixed with bluebunch wheatgrass, needle-and-thread grass is thought to increase with disturbance, particularly livestock grazing. On CNWR, it is least abundant where loamy soils generally predominate. It often intergrades with other plant community types.

3.7.2.4 Big Sagebrush/Cheatgrass

This designation represents areas with extensive cheatgrass and other exotic species cover with or without big sagebrush in which the original/native potential plant community type could not be determined, or where it has likely been permanently replaced. This is the situation over much of the Refuge; this community type is especially prevalent where historical disturbances are the most intense (especially on historically farmed locations). Vegetation within this designation has highly variable shrub cover, a high cover of cheatgrass, frequently a significant cover of Sandberg's bluegrass, and usually a low cover of microbiotic crust. This designation represents vegetation in a degraded condition. However, there is considerable variability in the amount and rate of favorable successional changes of these areas on CNWR; some areas appear to be recovering toward native vegetation, whereas other areas appear to be permanently degraded. In the lower portions of this and similar types, particularly where water may temporarily accumulate, soils are heavier and salinities are higher; here black greasewood (*Sarcobatus vermiculatus*) and inland saltgrass (*Disticalis spicata*) may make an appearance.

3.7.2.5 Spiny Hopsage/Sandberg's Bluegrass

The spiny hopsage/Sandberg's bluegrass community occurs on dry sites with fine-textured soils and likely represents an unusual variant of the big sagebrush/Sandberg's bluegrass community. One

possible explanation for the absence of sagebrush is intermittent pooling of water (Downs et al. 1993). Sandberg's bluegrass is the dominant grass, although cheatgrass is a major or dominant component in most areas. Forb diversity and crust cover are generally low. This type can occur as pure stands of spiny hopsage, or mixed with big sagebrush in loamy soils throughout drier areas of the Refuge.

3.7.3 Greasewood

While limited on CNWR, greasewood is a valuable habitat type, especially as a winter food source. Growing to approximately the same size as nearby sagebrush (2 to 8 feet), it grows in dry, sunny areas in alkaline or saline soils, thereby supplanting other shrubs in these harsh conditions. Although it is frequently a monoculture in extreme alkalinity, on CNWR other alkaline-tolerant species, such as saltgrass, grey rabbitbrush, spiny hopsage, and Great Basin wildrye, are present. Greasewood is a valuable browse, particularly during the fall and winter, for wildlife including mule deer, Ord's kangaroo rats, and jackrabbits. Of additional value, greasewood is capable of vegetative regeneration, typically sprouting after fire, application of herbicides, and other types of disturbance, so it can re-colonize an area relatively quickly, unlike sagebrush. Unfortunately, it is also highly vulnerable to invasion and replacement by invasive weedy plants following those same disturbances, as well as changes in alkali soil types, which has occurred in response to hydrologic changes associated with the CBIP.

3.7.4 Scrub-Shrub

The scrub-shrub area represents the interface between the moist wetland and riparian areas and the much drier shrub-steppe areas that cover much of CNWR. As such, it is comprised of plant species from all of these habitats. Although this area is limited in size throughout the Columbia Basin, it provides important habitat for a variety of migratory birds. It provides the nesting habitat structure required by many species (e.g., Lazuli bunting) while allowing for easy access to water and the much more abundant food sources found in wetland areas.

3.7.5 Cliffs, Talus Slopes, and Rock Outcroppings

For the most part, these habitats provide structural benefits, i.e., providing roost sites, concealment, nesting sites, hunting perches, etc. They generally provide little in the way of vegetation, although they are often draped with a variety of colorful lichens and, on cooler north-facing slopes, mats of mosses. The micro-climates created by cliffs may result in the occurrence of Carey's balsamroot (*Balsamorhiza careyana*), Great Basin wildrye, and sedges.

3.7.6 Farm Fields – Small Grain and Green Forage Crops

During the establishment and expansion of CNWR, agricultural fields were sometimes purchased. Here, cooperative farming provides high-calorie foods for migrating and wintering waterfowl and other birds. Composition of the 753 acres currently farmed annually on CNWR varies according to farming agreements, but typical crops include alfalfa, timothy, winter wheat (forage), corn, wheat, barley, and buckwheat. At the margins of farm fields are usually exotic weeds, such as kochia (*Kochia scoparia*), lambsquarters (*Chenopodium album*), and bristlegrass (*Setaria leucopila*).

3.7.7 Seep Streams and Channels

This habitat arises as a result of the seepage of water from the Potholes Reservoir and Canal, from irrigation return flows, and from the more direct sub-surface flow from irrigated fields. These waters follow narrow channels from basin to basin (now lakes) and eventually to Crab Creek. These natural flow paths were mostly dry prior to the CBIP, but now function somewhat like small perennial creeks, except that their flow varies little. Vegetation is typical of wetlands in the area but mostly form only a narrow band. Bulrush, cattails, and occasionally phragmites give way to upland vegetation a short distance from surface water; saltgrass dominates where salinities are higher. Non-native plants, including tall wheatgrass (*Thinopyrum ponticum*), Canada thistle (*Cirsium arvense*), perennial pepperweed (*Lepidium latifolium*), purple loosestrife (*Lythrum salicaria*), and Russian thistle often dominate between the wetland plant zone and the drier upland. Golden currant (*Ribes aureum*) and Russian olive (*Elaeagnus angustifolia*) may border the moist areas. Beavers often block these channels, forming small, temporary ponds. These habitats augment the overall wetland component of the Refuge and provide important travel corridors for many of the smaller wildlife species with which they are associated.

3.7.8 Shallow Water Lakes

As noted earlier, CBIP water has created an extensive collection of small lakes on CNWR from Potholes Reservoir, associated canals, and irrigated cropland. Perhaps because of their young age, these lakes have not had time to accumulate deep soils high in organic matter and thus are typically unproductive. If shallow, they tend to be quite warm, although a few support an introduced trout fishery or other introduced fish. Shoreline vegetation is generally dense and with few trees present. Emergent vegetation consists mostly of bulrushes and cattails. Exotic phragmites occasionally occurs in shallow water or just above the water line. These small lakes with open surfaces allow the high number of waterfowl, for which the Refuge was created, to rest and feed and for some species to raise their young.

3.7.9 In-stream and Riparian

This habitat dominates Lower Crab Creek, from O'Sullivan Dam downstream to beyond the Refuge boundary. Water seeps through the dam and from Potholes Canal coalescing at various points downstream, creating rich riparian areas. Where the pre-CBIP Crab Creek was an ephemeral stream with limited ecological value, the present Crab Creek, flowing at several cubic-feet/second, is used by and supports a multitude of sensitive species, from neotropical migrant birds to anadromous fish; its ecological value far exceeds its limited acreage. Bottom substrates consist mostly of stone and sand, with aquatic plants anchored in some areas. The open channel is flanked by emergent species typical of wetland margins described elsewhere. Occasionally willows, or the exotic Russian olive, provide a tall woody structural component. Wood's rose (*Rosa woodsii*) and/or golden currant may reside along the floodplain adjacent to the stream. Off-Refuge, small dams capture and may divert its waters, some of which return at points downstream; through the Refuge, however, Crab Creek is generally a gaining system. A severe flood in the 1980s lowered and degraded portions of the channel. It does not function as a typical creek in that flows vary little through the year and between years; it does not follow a natural hydrograph.

3.7.10 Seasonal Alkali Wetlands

This severely limited habitat type on the Refuge results from the ponding and evaporation of water, concentrating salts and other solids, often resulting in relatively bare shorelines. Water levels fluctuate with precipitation and seepage from adjacent wetlands. Few aquatic plants can tolerate the seasonally high salinities, but saltgrass and salt-tolerant forbs may persist along the higher margins of the wetland. Although limited in productivity, brine shrimp and other invertebrates do provide an important food source for shorebirds and other wildlife. American avocets and black-necked stilts may nest along the shoreline in sparse vegetation.

3.7.11 Emergent Marsh

This is one of the most widespread wetland habitats on the Refuge as a result of water originating upstream from the CBIP and flowing down the Crab Creek "valley" to the Columbia River. Natural basins formed by Ice Age flooding capture and hold these waters and, if enough soft substrates exist around the resulting pond perimeter, emergent vegetation has become established. Cattail and bulrush dominate the vegetation of this habitat type. The productivity and structural complexity of these and other associated plants results in a high diversity of wildlife use. A large number of species nest, breed, and forage in this sometimes wide margin between open water and dry upland. This habitat continues to evolve and change. Vast amounts of organic matter are produced each year and, because water levels vary only slightly and fire infrequently reaches these wetland margins, much of this vegetation decays slowly beneath the water's surface or along the shorelines. The water and organic matter trap soil particles, slowly filling in the pond or lake; open water slowly gives way to more emergent vegetation, while upland vegetation becomes established on the higher margins.

This valuable habitat is in a relative unhealthy state, however. The more dynamic processes of fire, fluctuating water levels, and grazing/trampling will aid in recycling nutrients and creating structural diversity, supporting greater productivity and species diversity.

3.7.12 Moist Soil Management Areas

These community types are constructed and intensively managed temporary wetlands. Dikes and water control structures result in a controlled management situation. Target vegetation is usually early successional to produce the most seed for waterfowl and other wildlife. The areas are tilled periodically to set back succession, sometimes planted to millet, barnyardgrass (*Echinochloa crus-galli*), and smartweed (*Polygonum hydropiperoides*), and flooded after plant maturity in the fall to make food available to waterfowl. Even without planting, native and exotic seed-producing annuals and other plants will reproduce "naturally" and provide wildlife food for select species. Self-seeding plants include many species (some undesirable), the most common species being reed canarygrass (*Phalaris arundinacea*), bulrush, witchgrass (*Panicum capillare*), beggar's tick (*Bidens frondosa*), curly dock (*Rumex crispus*), knotweed (*Polygonum arenastrum*), barnyardgrass, and rushes.

3.7.13 Willow Woodland

This tree community consists of a multi-layer mix of age classes ranging from annual recruitments through relatively mature willows (many 30 or more years old) on a small portion of the Refuge (22 acres). This woodland, like many of the Refuge's other habitat types, is the result of water seepage from the CBIP, creating moist areas in shallow declines conducive to tree growth and retention. The

overstory is dominated by willows, primarily peachleaf willow (*Salix amygdaloides*), and occasionally cottonwoods (*Populus* sp.), while the understory consists of shrubs (e.g., Wood's rose and golden currant) or plants associated with emergent marsh, as described above. This type of habitat is rare in the Columbia Basin and important to a variety of species, primarily bat species, migrating neotropicals (e.g., red-eyed vireo, western tanager, MacGillivray's warbler, Bullock's oriole) and nesting and feeding raptors (e.g., red-tailed hawk, great horned owl, American kestrel).

3.8 Wildlife

While wildlife in the shrub-steppe areas of Washington is surprisingly abundant, water from the CBIP has greatly enhanced and concentrated almost all wildlife found on CNWR.

3.8.1 Mammals

Mammals known to occur, or suspected to occur, on CNWR are listed in Table 3.8-1. Most are those typically found in shrub-steppe areas of the West (e.g., mule deer, coyote, Great Basin pocket mouse), although the unusual amount of water has led to a high concentration of mammals not typical of the area (e.g., muskrat, porcupine). In general, mammal populations are healthy and stable. Several species have always been rare, such as the mountain lion, bobcat, and white-tailed deer, while the Washington ground squirrel has become rare due to a statewide decline in habitat. Other species have little, if any, historical data for the Refuge and the viability and trending of their populations is unknown (e.g., most bat species).

Table 3.8-1. Mammals found or possibly found on Columbia National Wildlife Refuge.

Group	Common Name	Scientific Name
Shrews	Vagrant shrew	*Sorex vagrans*
Shrews	Merriman's shrew	*Sorex merriami*
Shrews	Masked shrew	*Sorex cinereus*
Bats	Western pipistrelle	*Pipistrellus hesperus*
Bats	Western small-footed myotis	*Myotis ciliolabrum*
Bats	Townsend's big-eared bat	*Plecotus townsendii*
Bats	Big brown bat	*Eptesicus fuscus*
Bats	Pallid bat	*Antrozous pallidus*
Bats	Spotted bat	*Euderma maculatum*
Bats	Silver-haired bat	*Lasionycteris noctivagans*
Bats	California myotis	*Myotis californicus*
Bats	Long-eared myotis	*Myotis evotis*

Group	Common Name	Scientific Name
Bats	Small-footed myotis	*Myotis subulatus*
Bats	Little brown myotis	*Myotis lucifugus*
Bats	Long-legged myotis	*Myotis volans*
Bats	Yuma myotis	*Myotis yumanensis*
Bats	Fringed myotis	*Myotis thysanodes*
Rabbits	Black-tailed jackrabbit	*Lepus californicus*
Rabbits	Nuttall's cottontail	*Sylvilagus nuttallii*
Rodents	Yellow-bellied marmot	*Marmota flaviventris*
Rodents	Washington ground squirrel	*Urocitellus washingtoni*
Rodents	Northern pocket gopher	*Thomomys talpoides*
Rodents	Great Basin pocket mouse	*Perognathus parvus*
Rodents	Beaver	*Castor canadensis*
Rodents	Western harvest mouse	*Reithrodontomys megalotis*
Rodents	Deer mouse	*Peromyscus maniculatus*
Rodents	Northern grasshopper mouse	*Onychomys leucogaster*
Rodents	Bushy-tailed woodrat	*Neotoma cinerea*
Rodents	Montane vole	*Microtus montanus*
Rodents	Meadow vole	*Microtus pennsylvanicus*
Rodents	Sagebrush vole	*Lemmiscus curtatus*
Rodents	Muskrat	*Ondatra zibethica*
Rodents	Norway rat	*Rattus norvegicus*
Rodents	Ord's kangaroo rat	*Dipodomys ordii*
Rodents	House mouse	*Mus musculus*
Rodents	Least chipmunk	*Eutamias minimus*
Rodents	Porcupine	*Erethizon dorsatum*
Carnivores	Coyote	*Canis latrans*

Group	Common Name	Scientific Name
Carnivores	Raccoon	*Procyon lotor*
Carnivores	Long-tailed weasel	*Mustela frenata*
Carnivores	River otter	*Lontra canadensis*
Carnivores	Mink	*Mustela vison*
Carnivores	Badger	*Taxidea taxus*
Carnivores	Striped skunk	*Mephitis mephitis*
Carnivores	Bobcat	*Lynx rufus*
Carnivores	Mountain lion	*Felis concolor*
Ungulates	Mule deer	*Odocoileus hemionus*
Ungulates	White-tailed deer	*Odocoileus virginianus*
Ungulates	Rocky Mountain elk	*Cervus canadensis*

Sources: CNWR (1971, 1978, 1979), U.S. Fish and Wildlife Service (2000a), USGS (2006a). Additional source: U.S. Fish and Wildlife Service biologists.

Under certain circumstances, several mammal species are considered pests. Mink, raccoons, and coyotes may be predators at duck trapping locations during banding. Beaver prefer their own water management scheme to ours and frequently plug water control structures. Muskrats will burrow into dikes and under roads, causing leakage and weakness to levees that have led to dike failure. Skunks, mink, raccoons, and coyotes are nest predators that may take a large percentage of bird nests in some situations. Under existing policy, these species are managed on a need basis, in accordance with an IPM Plan, although active management is sporadic. Big game hunting for mule deer is allowed on CNWR. See Section 3.9, threatened and endangered species, for a discussion of the Washington ground squirrel.

3.8.2 Birds

Birds known to occur on CNWR are listed in Table 3.8-2. They include 209 species, not including accidentals (birds observed outside their native range, with only one or two observations at the Refuge). Most are native, with the exception of the upland game birds (quail, chukar, gray partridge, and ring-necked pheasant), European starling, Eurasian collared dove, rock dove, and house sparrow. Approximately 40 percent of the bird species known to use the Refuge have been observed to nest there, including about half of the known raptor species. Little data are available describing abundance of species other than waterfowl.

Waterfowl numbers on the Refuge vary depending on the conditions. When the area has cold weather and the ponds and wetlands are iced over, there is less available habitat for waterfowl and numbers can be low. However, when conditions allow for open water, numbers can climb dramatically. Monthly aerial survey data from the period 2001 through 2011 for CNWR indicate that during

November the average number of waterfowl that use the Refuge is 14,051, with a range from a low of 8,815 to a high count of 24,361. During the month of December, the average waterfowl number on the Refuge is 15,050 with a range from 11,885 to 18,215. During the standard mid-winter survey that takes place in January, data from the period 2005-2011 show that CNWR winters an average of 8,734 waterfowl, with a low count of 2,336 to a high count of 27,264. These data demonstrate that CNWR provides habitat for both migration (e.g., higher numbers in November) and for wintering (December and January).

Approximately 30 percent of CNWR is classified as waterfowl habitat, including areas of water, cropland, and grassland, much of which is aimed at providing habitat during migration, rather than waterfowl production. During migration, 19 species of ducks use the area; generally, the mallard is the most common followed by wigeon, green-wing teal, pintail, ring-necked duck, scaup, bufflehead, ruddy, common merganser, canvasback, redhead, shoveler, gadwall, hooded merganser, and wood duck. Estimated annual waterfowl production on CNWR between 1987 and 1991 (the last data available) ranged from 553-854, with an average of 712. Mallards accounted for most of the production, with gadwall, cinnamon teal, and redhead accounting for most of the remainder. Recent production may be less as habitat is less intensively managed for purpose.

Table 3.8-2. Birds found on Columbia National Wildlife Refuge.

Group	Common Name	Scientific Name
Geese	Greater white-fronted goose	*Anser albifrons*
Geese	Snow goose	*Chen caerulescens*
Geese	Great Basin Canada goose	*Branta canadensis moffitti*
Geese	Lesser Canada goose	*Branta canadensis parvipes* *Branta hutchinsii taverneri*
Ducks	Tundra swan	*Cygnus columbianus*
Ducks	Wood duck	*Aix sponsa*
Ducks	Gadwall	*Anas strepera*
Ducks	Eurasian wigeon	*Anas penelope*
Ducks	American wigeon	*Anas americana*
Ducks	Mallard	*Anas platyrhynchos*
Ducks	Blue-winged teal	*Anas discors*
Ducks	Cinnamon teal	*Anas cyanoptera*
Ducks	Northern shoveler	*Anas clypeata*
Ducks	Northern pintail	*Anas acuta*
Ducks	Green-winged teal	*Anas crecca*

Group	Common Name	Scientific Name
Ducks	Canvasback	*Aythya valisineria*
Ducks	Redhead	*Aythya americana*
Ducks	Ring-necked duck	*Aythya collaris*
Ducks	Greater scaup	*Aythya marila*
Ducks	Lesser scaup	*Aythya affinis*
Ducks	Surf scoter	*Melanitta perspicillata*
Ducks	White-winged scoter	*Melanitta fusca*
Ducks	Long-tailed duck	*Clangula hyemalis*
Ducks	Bufflehead	*Bucephala albeola*
Ducks	Common goldeneye	*Bucephala clangula*
Ducks	Barrow's goldeneye	*Bucephala islandica*
Ducks	Hooded merganser	*Lophodytes cucullatus*
Ducks	Common merganser	*Mergus merganser*
Ducks	Red-breasted merganser	*Mergus serrator*
Ducks	Ruddy duck	*Oxyura jamaicensis*
Fowls	California quail	*Callipepla californica*
Fowls	Chukar	*Alectoris chukar*
Fowls	Gray partridge	*Perdix perdix*
Fowls	Ring-necked pheasant	*Phasianus colchicus*
Loons	Common loon	*Gavia immer*
Grebes	Pied-billed grebe	*Podilymbus podiceps*
Grebes	Horned grebe	*Podiceps auritus*
Grebes	Red-necked grebe	*Podiceps grisegena*
Grebes	Eared grebe	*Podiceps nigricollis*
Grebes	Western grebe	*Aechmophorus occidentalis*
Grebes	Clark's grebe	*Aechmophorus clarkii*

Group	Common Name	Scientific Name
Cormorants	Double-crested cormorant	*Phalacrocorax auritus*
Pelicans	American white pelican	*Pelecanus erythrorhynchos*
Herons	American bittern	*Botaurus lentiginosus*
Herons	Great blue heron	*Ardea herodias*
Herons	Great egret	*Ardea alba*
Herons	Black-crowned night heron	*Nycticorax nycticorax*
Hawks	Turkey vulture	*Cathartes aura*
Hawks	Osprey	*Pandion haliaetus*
Hawks	Bald eagle	*Haliaeetus leucocephalus*
Hawks	Northern harrier	*Circus cyaneus*
Hawks	Sharp-shinned hawk	*Accipiter striatus*
Hawks	Cooper's hawk	*Accipiter cooperii*
Hawks	Swainson's hawk	*Buteo swainsoni*
Hawks	Red-tailed hawk	*Buteo jamaicensis*
Hawks	Ferruginous hawk	*Buteo regalis*
Hawks	Rough-legged hawk	*Buteo lagopus*
Hawks	Golden eagle	*Aquila chrysaetos*
Hawks	American kestrel	*Falco sparverius*
Hawks	Merlin	*Falco columbarius*
Hawks	Gyrfalcon	*Falco rusticolus*
Hawks	Peregrine falcon	*Falco peregrinus*
Hawks	Prairie falcon	*Falco mexicanus*
Rails	Virginia rail	*Rallus limicola*
Rails	Sora	*Porzana carolina*
Rails	American coot	*Fulica americana*
Cranes	Sandhill crane	*Grus canadensis*

Group	Common Name	Scientific Name
Shorebirds	Black-bellied plover	*Pluvialis squatarola*
Shorebirds	Pacific golden-plover	*Pluvialis fulva*
Shorebirds	Semipalmated plover	*Charadrius semipalmatus*
Shorebirds	Killdeer	*Charadrius vociferus*
Shorebirds	Black-necked stilt	*Himantopus himantopus*
Shorebirds	American avocet	*Recurvirostra americana*
Shorebirds	Spotted sandpiper	*Actitis macularius*
Shorebirds	Solitary sandpiper	*Tringa solitaria*
Shorebirds	Greater yellowlegs	*Tringa melanoleuca*
Shorebirds	Lesser yellowlegs	*Tringa flavipes*
Shorebirds	Long-billed curlew	*Numenius americanus*
Shorebirds	Marbled godwit	*Limosa fedoa*
Shorebirds	Semi-palmated sandpiper	*Calidris pusilla*
Shorebirds	Western sandpiper	*Calidris mauri*
Shorebirds	Least sandpiper	*Calidris minutilla*
Shorebirds	Baird's sandpiper	*Calidris bairdii*
Shorebirds	Pectoral sandpiper	*Calidris melanotos*
Shorebirds	Dunlin	*Calidris alpina*
Shorebirds	Stilt sandpiper	*Calidris himantopus*
Shorebirds	Short-billed dowitcher	*Limnodromus griseus*
Shorebirds	Long-billed dowitcher	*Limnodromus scolopaceus*
Shorebirds	Common snipe	*Gallinago gallinago*
Shorebirds	Wilson's phalarope	*Phalaropus tricolor*
Shorebirds	Red-necked phalarope	*Phalaropus lobatus*
Gulls	Bonaparte's gull	*Chroicocephalus philadelphia*
Gulls	Franklin's gull	*Leucophaeus pipixcan*

Group	Common Name	Scientific Name
Gulls	Ring-billed gull	*Larus delawarensis*
Gulls	California gull	*Larus californicus*
Gulls	Herring gull	*Larus argentatus*
Gulls	Thayer's gull	*Larus thayeri*
Gulls	Glaucous-winged gull	*Larus glaucescens*
Gulls	Caspian tern	*Hydroprogne caspia*
Gulls	Black tern	*Chlidonias niger*
Gulls	Forster's tern	*Sterna forsteri*
Doves	Rock pigeon	*Columba livia*
Doves	Mourning dove	*Zenaida macroura*
Doves	Eurasian collared dove	*Streptopelia decaocto*
Owls	Barn owl	*Tyto alba*
Owls	Great horned owl	*Bubo virginianus*
Owls	Snowy owl	*Bubo scandiacus*
Owls	Burrowing owl	*Athene cunicularia*
Owls	Long-eared owl	*Asio otus*
Owls	Short-eared owl	*Asio flammeus*
Nighthawks	Common nighthawk	*Chordeiles minor*
Nighthawks	Common poorwill	*Phalaenoptilus nuttallii*
Swifts	Vaux's swift	*Chaetura vauxi*
Swifts	White-throated swift	*Aeronautes saxatalis*
Hummingbirds	Rufous hummingbird	*Selasphorus rufus*
Kingfishers	Belted kingfisher	*Megaceryle alcyon*
Woodpeckers	Lewis' woodpecker	*Melanerpes lewis*
Woodpeckers	Red-naped sapsucker	*Sphyrapicus nuchalis*
Woodpeckers	Downy woodpecker	*Picoides pubescens*

Group	Common Name	Scientific Name
Woodpeckers	Hairy woodpecker	*Picoides villosus*
Woodpeckers	Northern flicker	*Colaptes auratus*
Songbirds	Olive-sided flycatcher	*Contopus cooperi*
Songbirds	Western wood-pewee	*Contopus sordidulus*
Songbirds	Willow flycatcher	*Empidonax traillii*
Songbirds	Hammond's flycatcher	*Empidonax hammondii*
Songbirds	Dusky flycatcher	*Empidonax oberholseri*
Songbirds	Say's phoebe	*Sayornis saya*
Songbirds	Ash-throated flycatcher	*Myiarchus cinerascens*
Songbirds	Western kingbird	*Tyrannus verticalis*
Songbirds	Eastern kingbird	*Tyrannus tyrannus*
Songbirds	Loggerhead shrike	*Lanius ludovicianus*
Songbirds	Northern shrike	*Lanius excubitor*
Songbirds	Warbling vireo	*Vireo gilvus*
Songbirds	Blue-headed vireo	*Vireo solitarius*
Songbirds	Red-eyed vireo	*Vireo olivaceus*
Songbirds	Black-billed magpie	*Pica hudsonia*
Songbirds	American crow	*Corvus brachyrhynchos*
Songbirds	Common raven	*Corvus corax*
Songbirds	Horned lark	*Eremophila alpestris*
Songbirds	Tree swallow	*Tachycineta bicolor*
Songbirds	Violet-green swallow	*Tachycineta thalassina*
Songbirds	Northern rough-winged swallow	*Stelgidopteryx serripennis*
Songbirds	Bank swallow	*Riparia riparia*
Songbirds	Cliff swallow	*Petrochelidon pyrrhonota*
Songbirds	Barn swallow	*Hirundo rustica*

Group	Common Name	Scientific Name
Songbirds	Black-capped chickadee	*Poecile atricapillus*
Songbirds	Red-breasted nuthatch	*Sitta canadensis*
Songbirds	Brown creeper	*Certhia americana*
Songbirds	Rock wren	*Salpinctes obsoletus*
Songbirds	Canyon wren	*Catherpes mexicanus*
Songbirds	Bewick's wren	*Thryomanes bewickii*
Songbirds	House wren	*Troglodytes aedon*
Songbirds	Winter wren	*Troglodytes hiemalis*
Songbirds	Marsh wren	*Cistothorus palustris*
Songbirds	Golden-crowned kinglet	*Regulus satrapa*
Songbirds	Ruby-crowned kinglet	*Regulus calendula*
Songbirds	Western bluebird	*Sialia mexicana*
Songbirds	Mountain bluebird	*Sialia currucoides*
Songbirds	Townsend's solitaire	*Myadestes townsendi*
Songbirds	Swainson's thrush	*Catharus ustulatus*
Songbirds	Hermit thrush	*Catharus guttatus*
Songbirds	American robin	*Turdus migratorius*
Songbirds	Varied thrush	*Ixoreus naevius*
Songbirds	Gray catbird	*Dumetella carolinensis*
Songbirds	Sage thrasher	*Oreoscoptes montanus*
Songbirds	European starling	*Sturnus vulgaris*
Songbirds	American pipit	*Anthus rubescens*
Songbirds	Bohemian waxwing	*Bombycilla garrulus*
Songbirds	Cedar waxwing	*Bombycilla cedrorum*
Songbirds	Orange-crowned warbler	*Oreothlypis celata*
Songbirds	Nashville warbler	*Oreothlypis ruficapilla*

Group	Common Name	Scientific Name
Songbirds	Yellow warbler	*Dendroica petechia*
Songbirds	Yellow-rumped warbler	*Dendroica coronata*
Songbirds	Townsend's warbler	*Dendroica townsendi*
Songbirds	MacGillivray's warbler	*Oporornis tolmiei*
Songbirds	Common yellowthroat	*Geothlypis trichas*
Songbirds	Wilson's warbler	*Wilsonia pusilla*
Songbirds	Yellow-breasted chat	*Icteria virens*
Songbirds	Spotted towhee	*Pipilo maculatus*
Songbirds	American tree sparrow	*Spizella arborea*
Songbirds	Chipping sparrow	*Spizella passerina*
Songbirds	Brewer's sparrow	*Spizella breweri*
Songbirds	Vesper sparrow	*Pooecetes gramineus*
Songbirds	Lark sparrow	*Chondestes grammacus*
Songbirds	Sage sparrow	*Amphispiza belli*
Songbirds	Savannah sparrow	*Passerculus sandwichensis*
Songbirds	Grasshopper sparrow	*Ammodramus savannarum*
Songbirds	Fox sparrow	*Passerella iliaca*
Songbirds	Song sparrow	*Melospiza melodia*
Songbirds	Lincoln's sparrow	*Melospiza lincolnii*
Songbirds	White-crowned sparrow	*Zonotrichia leucophrys*
Songbirds	Golden-crowned sparrow	*Zonotrichia atricapilla*
Songbirds	Dark-eyed junco	*Junco hyemalis*
Songbirds	Western tanager	*Piranga ludoviciana*
Songbirds	Black-headed grosbeak	*Pheucticus melanocephalus*
Songbirds	Lazuli bunting	*Passerina amoena*
Songbirds	Red-winged blackbird	*Agelaius phoeniceus*

Group	Common Name	Scientific Name
Songbirds	Western meadowlark	*Sturnella neglecta*
Songbirds	Yellow-headed blackbird	*Xanthocephalus xanthocephalus*
Songbirds	Brewer's blackbird	*Euphagus cyanocephalus*
Songbirds	Brown-headed cowbird	*Molothrus ater*
Songbirds	Bullock's oriole	*Icterus bullockii*
Songbirds	House finch	*Carpodacus mexicanus*
Songbirds	Red crossbill	*Loxia curvirostra*
Songbirds	Common redpoll	*Acanthis flammea*
Songbirds	Pine siskin	*Spinus pinus*
Songbirds	American goldfinch	*Spinus tristis*
Songbirds	Evening grosbeak	*Coccothraustes vespertinus*
Songbirds	House sparrow	*Passer domesticus*

Sources: CNWR (1971), USGS (2006b). Accidental species not included.

3.8.3 Reptiles and Amphibians

Species known to occur on CNWR, or potentially occurring, are listed in Table 3.8-3; several species likely occur on CNWR but have not been so documented. Reptile and amphibian species exist in all habitats on CNWR, though species diversity is higher in the more productive riparian and wetland habitats. Some species have a very local distribution; for example, tiger salamanders are largely restricted to small lakes, such as Scaup and Chukar lakes, that have no or very few fish (U.S. Fish and Wildlife Service 2000a). No inventory data exist to precisely document the numbers, extent, or type of habitat use by reptiles and amphibians on CNWR.

Table 3.8-3. Amphibians and reptiles found on Columbia National Wildlife Refuge.

Group	Common Name	Scientific Name	Known To Occur	Possibly Occurring
Amphibians	Long-toed salamander	*Ambystoma macrodactylum*		X
Amphibians	Tiger salamander	*Ambystoma tigrinum*	X	
Amphibians	Great Basin spadefoot	*Scaphiopus intermontanus*		X
Amphibians	Northern leopard frog	*Rana pipiens*	X[E]	
Amphibians	Columbia spotted frog	*Rana luteiventris*		X

Group	Common Name	Scientific Name	Known To Occur	Possibly Occurring
Amphibians	Bullfrog	*Rana catesbeiana*	X	
Reptiles	Painted turtle	*Chrysemys picta*	X	
Reptiles	Western rattlesnake	*Crotalus viridis*	X	
Reptiles	Rubber boa	*Charina bottae*		X
Reptiles	Western yellow-bellied racer	*Coluber constrictor*	X	
Reptiles	Western terrestrial garter snake	*Thamnophis elegans*	X	
Reptiles	Common garter snake	*Thamnophis sirtalis*	X	
Reptiles	Night snake	*Hypsiglena torquata*		X
Reptiles	Striped whipsnake	*Masticophis taeniatus*		X
Reptiles	Great Basin gopher snake	*Pituophis catenifer*	X	
Reptiles	Sagebrush lizard	*Sceloporus graciosus*	X	
Reptiles	Short-horned lizard	*Phrynosoma douglassii*		X
Reptiles	Side-blotched lizard	*Uta stansburiana*	X	
Reptiles	Western skink	*Eumeces skiltonianus*	X	

E = Likely extirpated; see Goal 5 in Chapter 2.
Sources: U.S Fish and Wildlife Service (2000a), CNWR (2011), Washington Nature Mapping Program (n.d.).

3.8.4 Fish

A wide variety of mostly non-native fish occur on CNWR, and many Refuge lakes are stocked by WDFW with gamefish. Native fish occur as well and are chiefly associated with Lower Crab Creek, which flows into the Columbia River downstream of CNWR. Fish using Refuge waters are summarized in Table 3.8-4. Sources used to compile this table do not always discriminate between waters of CNWR and waters on adjacent lands, or downstream of CNWR, so some species listed in the table may not occur on CNWR, rather in the vicinity.

Table 3.8-4. Fish use of waters on Columbia National Wildlife Refuge.

Common Name	Scientific Name	Occurrence
Minnows	[Unknown]	Waters not specified.
Panfish	[Unknown]	CNWR lakes and water systems.

Common Name	Scientific Name	Occurrence
Brown bullhead	*Ameiurus nebulosus*	Ubiquitous.
Suckers	*Catostomidae* sp.	Unspecified CNWR waters.
Largescale sucker	*Catostomus macroche*	Lower Crab Creek
Lake whitefish	*Coregonus clupeaformis*	Soda and Long Lakes.
Prickly sculpin	*Cottus asperrimus*	Ubiquitous.
Grass carp	*Ctenopharyngodon idella*	May be on CNWR, uncommon.
Shiners	*Cyprinidae* sp.	Waters not specified.
Common carp	*Cyprinus carpio*	Ubiquitous.
Three-spine stickleback	*Gasterosteus aculeatus*	Ubiquitous.
Tui chub	*Gila bicolor*	Lower Crab Creek.
Pumpkinseed	*Lepomis gibbosus*	Ubiquitous.
Bluegill	*Lepomis macrochirus*	Crab Creek below Brook Lake, Deadman Lake and ponds 1-5 on Coyote Creek and Bobcat Creek.
Smallmouth bass	*Micropterus dolomieu*	Crab Creek below Brook Lake; Deadman Lake and ponds 1-5 on Coyote Creek and Bobcat Creek.
Largemouth bass	*Micropterus salmoides*	Crab Creek below Brook Lake, Deadman Lake and ponds 1-5 on Coyote Creek and Bobcat Creek.
Black bass	*Micropterus* sp.	Crab Creek system, CNWR waters devoted to trout management.
Upper Columbia River steelhead	*Oncorhynchus mykiss*	Lower Crab Creek.
Rainbow trout	*Oncorhynchus mykiss*	Stocked in 49 seep lakes and 4 streams on CNWR.
Redband trout	*Oncorhynchus mykiss gairdneri*	Possibly occurring in Lower Crab Creek.
Summer/fall Chinook salmon	*Oncorhynchus tshawytscha*	Lower Crab Creek.
Yellow perch	*Perca flavescens*	Ubiquitous.
Black crappie	*Pomoxis nigromaculatus*	Crab Creek below Brook Lake.
Mountain whitefish	*Prosopium williamsoni*	Crab Creek below Highway 26.
Northern pikeminnow	*Ptychocheilus oregonensis*	Lower Crab Creek.

Common Name	Scientific Name	Occurrence
Redside shiner	*Richardsonius balteatus*	Lower Crab Creek.
Brown trout	*Salmo trutta*	Stocked in Crab Creek and many lakes.
Brook trout	*Salvelinus fontinalis*	Locally common, may be on CNWR.
Walleye	*Sander vitreus*	Crab Creek below Brook Lake.
Tench	*Tinca tinca*	Lower Crab Creek; uncommon.

Principal issues in fish management on CNWR include management of anadromous salmonids, control of undesirable introduced fishes and management of a mixed warmwater and trout fishery.

Crab Creek from below O'Sullivan Dam to the Columbia River is considered by NOAA-Fisheries as supporting anadromous fishes.[3] Fall Chinook salmon and steelhead have been found upstream as far as, and into, Red Rock Creek, a tributary that enters Crab Creek a short distance downstream of MU 5 (KWA Ecological Sciences 2004). There is evidence that steelhead may spawn in Red Rock Creek, and Chinook redds have been found in Red Rock Coulee.[4] Although these fish have not been observed in Crab Creek above Red Rock Creek, NOAA-Fisheries regards the upstream limit of use by these species as coinciding with O'Sullivan Dam and thus including all of Crab Creek within CNWR (KWA Ecological Sciences 2004).[5]

Most fish species found on CNWR were introduced unintentionally and are now regarded as undesirable or even harmful to Refuge ecosystems. Undesirable fish species in certain waterways include common carp, bluegill, pumpkinseed, bullhead, sculpin, and other prolific warmwater fishes. Absent management, these fish compete with desirable gamefishes, diminish and alter the aquatic invertebrate community, and eat or dig up desirable native aquatic plants. The CNWR Habitat Plan (U.S. Fish and Wildlife Service 2000a) determined that "warmwater species cannot effectively be kept out of refuge waters, even those managed intensively for trout. Without periodic chemical treatment (Rotenone), large populations of stunted fish (usually panfish) ultimately populate refuge lakes and water systems. Rotenone treatments also remove carp and fish competing with stocked trout from these waters; an action that greatly benefits macro-invertebrates and submerged aquatic plants." Accordingly, such treatment by WDFW is currently a significant element of fish management in Refuge lakes and streams. Fish management is also achieved, where feasible, by periodic draining of waters. For instance, carp are controlled in Marsh Units I to IV by drawing down water levels after freeze-up in November or December (U.S Fish and Wildlife Service 1997b).

The Service does not stock CNWR waters with fish, but WDFW stocks hatchery trout in selected lakes. To date, nearly all stocking consisted of rainbow trout fry, although brown trout, triploid

[3] It should be noted that although all of Crab Creek below O'Sullivan Dam is considered anadromous fish water, no anadromous species have been found on CNWR above Red Rock Creek below MU 5.
[4] Red Rock Creek flows through—and beyond—Red Rock Coulee. In addition to the Chinook redds found in Red Rock Coulee, which is on CNWR, steelhead have been observed in Red Rock Creek on CNWR, although spawning activity has not been observed.
[5] These waters were formerly stocked by the WDFW with rainbow and brown trout, but this practice ceased several years ago.

rainbow trout, tiger trout, and brook trout are also stocked in several lakes, although this will change with adoption of the CCP. No streams on CNWR are currently stocked, but some stocked lakes have inflow and/or outflow streams. Strategic objectives in management of fisheries were identified by the Service (2000a) to include:

- Maintenance of a fishery for 1+ year old trout from stocked fry.
- Maintenance of sustained warmwater gamefish populations in certain waterways.
- Management of high populations of warmwater non-gamefishes that cannot effectively or economically be removed.
- Maintenance of mixed warmwater and salmonid gamefishes in sufficient numbers to provide a "low-keyed" fishery.
- Management of flowing water and connected pond fisheries that contain abundant undesirable fishes and low gamefish populations.

Although the fish stocking program conflicts with Service policy of stocking only native fish, it is maintained because the stocked salmonid species are ecologically similar to native fishes, particularly in recognition of the fact that nearly all waters on CNWR were artificially created as a consequence of the CBIP and thus represent a habitat that was rare or absent in this area prior to the CBIP. Moreover, prior studies have shown that management of these gamefish populations and control of undesirable non-native fishes contributes to increased aquatic invertebrate diversity (particularly of dragonflies [*Odonata*]) (U.S. Fish and Wildlife Service 2000a).

3.9 Threatened, Endangered, and Rare Species

Protected species or species of concern known to occur, or potentially having suitable habitat, on CNWR include upper Columbia River steelhead, redband trout, greater sage-grouse, pygmy rabbit, Washington ground squirrel, and northern leopard frog.[6] No protected plant species are known to occur on CNWR.

3.9.1 Steelhead – Redband Trout

The inland redband trout (*Oncorhynchus mykiss gairdneri*) is the native, non-anadromous form of the upper Columbia River steelhead, which is listed as threatened under the ESA and is a candidate for state protection. As steelhead (i.e., anadromous), they are protected and recovery efforts are guided under the Upper Columbia River Salmon Recovery Plan.[7] However, non-anadromous forms of the species are not protected under this plan. It is, however, a species of concern at the Federal level. Redband trout occur within the Crab Creek watershed; however, it is not known if the species occurs on the Refuge. The redband trout is not specifically managed under this CCP, except as it is affected by CCP goals and objectives that affect Crab Creek flowing water fisheries in general.

3.9.2 Northern Leopard Frog

The northern leopard frog (*Rana pipiens*) is listed by the State of Washington as endangered and is treated by the Service as a species of concern. Its biology and distribution relative to CNWR, and

[6] These are species protected or of concern at the State or Federal level.
[7] The current recovery plan consists of multiple documents, available at www.ucsrb.com/theplan.asp (accessed January 24, 2011).

management measures to protect the species, are detailed in Chapter 2. Surveys performed in 2002-2005 identified northern leopard frogs at Potholes Reservoir north of CNWR, but did not examine habitat located on the Refuge (Germaine and Hays 2007). CNWR likely has habitat suitable for this species; however, it has not been determined if the species is present. Germaine and Hays (2007) also identify management recommendations for this species.

3.9.3 Washington Ground Squirrel

The Washington ground squirrel (*Spermophilus washingtoni*), a candidate for listing by both the State and Federal governments, is known to occur on CNWR within shrub-steppe habitat. Its biology and distribution relative to CNWR, and management measures to protect the species, are detailed in Chapter 2. There is as yet no State or Federal management plan for this species, but it is addressed specifically by Goal 4 in this document (see Chapter 2).

3.9.4 Greater Sage-Grouse

The greater sage-grouse (*Centrocercus urophasianus*) is listed as threatened by the State of Washington and is a candidate for protection under the ESA.[8] Its biology and distribution relative to CNWR, and management measures to protect the species, are detailed in Chapter 2. Although greater sage-grouse formerly lived on the Refuge, they have been extirpated, primarily due to reductions in the area and connectivity of their shrub-steppe habitat. Whether or not CNWR can play a role in the potential recovery of this species remains to be determined and would primarily be by contributing to connectivity of suitable and potential suitable habitat with contiguous lands in Grant County and other areas.

3.9.5 Pygmy Rabbit

The pygmy rabbit (*Brachylagus idahoensis*) is listed as endangered by both the State of Washington and Federal governments, and both authorities have adopted recovery plans to guide its management. Although CNWR is within the historical range of the pygmy rabbit, it has long been extirpated from the area, and the Refuge contains no designated critical habitat for the rabbit. Whether the Refuge can play any role in its recovery remains to be seen, although a provision to assist is outlined in Goal 4.

3.10 Invasive and Pest Species

A majority of the land within CNWR prior to the CBIP was originally dry and covered with sagebrush and perennial grasses, with extensive areas of cheatgrass that were first brought in with cattle grazing. As the water table rose due to irrigation and seepage through dams and unlined canals, over 200 wetlands were formed in depressions and drainages. Many wetland-associated species established naturally from other wetlands and water courses in the Columbia Basin.

Through time, a combination of intentional and accidental introductions of exotic species took place. Arid lands soils were gradually exposed to increased saturation, evapotranspiration, and salt buildup. Annual or constant grazing was removed during the 1970s and 1980s, exposing broken soil surfaces

[8] Sage-grouse in Washington have been found to be warranted for protection under the ESA, but are precluded at present due to higher priority species.

to invasion by aggressively establishing plant species. The resulting vegetative makeup of CNWR became a patchwork of some excellent native stands of perennial grasses and sagebrush, along with extensive cheatgrass-infested areas in much of the upland, and a combination of semipermanent and permanent wetlands that are a mixture of native cattail-bulrush marshes and sedge meadows, some of which have developed high weed abundance.

Several species of exotic plants have become permanently established in Refuge wetlands and uplands. In some cases they are merely a nuisance to management of the Refuge for migratory birds. In some instances, the exotic species form excellent stands of cover for waterfowl nesting. In other cases, as with purple loosestrife (*Lythrum salicaria*), Russian olive (*Elaeagnus angustifolia*), and salt cedar (*Tamarix* sp.), native species are losing ground against invaders, and wetland functions are imperiled.

A number of introduced animal species are regarded as pests on CNWR, and even some native species can become pests under certain circumstances, normally due to altered distribution or abundance. Any of these species have the potential to interfere with attainment of CNWR management goals. Invasive plant and animal species subject to management actions on CNWR are identified in Tables 3.10-1 and 3.10-2, and the actions to be implemented in their management are detailed in the IPM Plan (Appendix G).

Table 3.10-1. Invasive plant species managed on Columbia National Wildlife Refuge.

Common Name	Scientific Name	Class (1)
Russian knapweed	*Acroptilon repens*	B
Camelthorn	*Alhagi pseudalhagi*	B
Hoary cress/whitetop	*Cardaria* sp.	C
Longspine sandbur	*Cenchrus longispinus*	B
Diffuse knapweed	*Centaurea diffusa*	B
Canada thistle	*Cirsium arvense*	C
Bull thistle	*Cirsium vulgare*	C
Field bindweed	*Convolvulus arvensis*	C
Russian olive	*Elaeagnus angustifolia*	None
Kochia	*Kochia scoparia*	B
Perennial pepperweed	*Lepidium latifolium*	B/C
Purple loosestrife	*Lythrum salicaria*	B
Common reed	*Phragmites australis*	B
Reed canarygrass	*Phalaris arundinacea*	C

Common Name	Scientific Name	Class (1)
Russian thistle	*Salsola kali*	None
Bitter nightshade	*Solanum dulcamara*	C
Swainsonpea	*Sphaerophysa salsula*	B
Saltcedar	*Tamarix (parviflora)* sp.	C
Puncturevine	*Tribulus terrestris*	C

Noxious weed classification per Adams County and Grant County noxious weed boards.

Table 3.10-2. Animal species managed, or potentially managed, on CNWR as pests.

Common Name	Status	Scientific Name
American crow	Native	*Corvus brachyrhynchos*
Beaver	Native	*Castor canadensis*
Black-billed magpie	Native	*Pica pica*
Bullfrog	Exotic	*Rana catesbeiana*
Common carp	Exotic	*Carpus carpio*
Coyote	Native	*Canis latrans*
European starling	Exotic	*Sturnus vulgaris*
House sparrow	Exotic	*Passer domesticus*
Mink	Native	*Mustela vison*
Mosquitoes	Various	Various
Muskrat	Native	*Ondatra zibethica*
Northern flicker	Native	*Colaptes auratus*
Northern pocket gopher	Native	*Thomomys talpoides*
Northern raven	Native	*Corvus corax*
Raccoon	Native	*Procyon lotor*
Striped skunk	Native	*Mephitis mephitis*
Yellow-bellied marmot	Native	*Marmota flaviventris*

Source: CNWR (2004).

3.11 Cultural Resources and History

While CNWR does not have an extensive range of cultural resources, all prehistoric resources are considered extremely important, and the existing historical resources tell the story of settlement of the area.

3.11.1 Prehistoric and Historic Resources

The occupation and use of CNWR can be divided into two phases: the Pre-contact Period, representing Native American aboriginal occupation prior to Euro-American influence, and the Post-contact Period with Euro-American development and occupation of the area. Here, Pre-contact Period cultural resources will encompass those resources associated with Native American groups prior to 1800, and the Post-contact Period will include those resources associated with Euro-Americans, as well as those of Native American groups during this time.

Tremendous cultural activity centered around Crab Creek, which prehistoric and early European occupants used as a travel corridor through the channeled scablands. Two trails of historical importance, the White Bluffs and Cariboo Trails, pass through CNWR and were used by inhabitants and those passing through. Archeological deposits dating back more than 10,000 years have been detected on Refuge lands, and the area retains traditional cultural significance to members of the Yakama Nation, Nez Perce Tribe, CTUIR, CCT and the Wanapum people. Their ancestors resided on the land and/or used its resources; their past and present culture is tied closely with CNWR landscape.

Prior to the CBIP, CNWR and its scabland features were never a major center of habitation by man. Prehistoric humans inhabited the area seasonally, and it was not until the arrival of Euro-Americans that permanent habitations developed on what are now CNWR lands. Euro-Americans first visited the area as explorers, fur trappers, military units, miners, and settlers. By 1880, cattle ranches and farms were established on lands currently within CNWR, although populations were limited. In the late 1940s the Federal government began acquiring lands in and around CNWR as part of the CBIP, and population densities grew with the arrival of irrigated farmland.

Several archaeological sites have been recorded on CNWR, with documentation secured at the Washington State Historic Preservation Office, the Service's Pacific Regional Office, and at CNWR.

Chapter 4

Consultation, Coordination, Preparation

Chapter 4. Consultation, Coordination, Preparation

4.1 U.S. Fish and Wildlife Service Policy

As outlined by Service policy, NEPA, and the Council on Environmental Quality regulations for implementation (40 CFR 1500-1508), developing a CCP is a collaborative processes. This chapter summarizes the Service's efforts to involve the public; other agencies; and local, State, and Tribal governments in preparing the CCP. Consultation beyond the planning stage and for step-down plans will continue to address concerns, issues, and opportunities of mutual interest.

4.2 Agency Consultation and Coordination

In the course of developing the CCP and completing the NEPA analysis, the Service contacted a number of Federal, State, and local agencies to gather information and solicit input on the issues of concern. Rather than holding CCP-specific meetings, coordination and consultation was conducted by the Refuge Manager as she met with other agencies on all Refuge matters of interest to those agencies. This proved to be more efficient and saved considerable time over holding a series of CCP meetings. It allowed for other matters to be addressed and also established working relationships between the Refuge Manager and other agencies and staff. As a result of these consultations, the goals and objectives outlined in Chapter 2 were significantly enhanced to meet other agencies' goals, particularly those of the State of Washington.

4.3 Native American Government Consultation

In accordance with Service and NEPA policy, the Service invited the four federally recognized Native American Tribes in the area—the CTUIR, CCT, Nez Perce Tribe, and Yakama Nation—to participate in the CCP process at the scoping or development phase. None of the Tribes chose to do so. With release of the draft CCP, the Service again offered to meet with the Tribes to fully present the CCP and to arrange for appropriate input into the final CCP. Again, none of the Tribes chose to do so.

4.4 Formal Scoping

Prior to developing a CCP, the scope of the document must be determined. Scoping is open to the public and Tribal, State, and local governments, as well as to affected Federal agencies. This open process gives rise to important opportunities for better and more efficient analyses and simultaneously places responsibilities on public and agency participants alike to raise their concerns early.

The scoping period has specific objectives: 1) to identify the affected public and agency concerns; 2) to identify those concerns early in the NEPA process; 3) to define the issues and alternatives that will be examined in detail in the CCP, while simultaneously devoting less attention and time to issues that cause no concern; and 4) to save time in the overall process by helping to ensure that drafts adequately address relevant issues, reducing the possibility that new comments will cause the CCP to be rewritten or supplemented.

Scoping can lay a firm foundation for the rest of the decision-making process. If the EA can be relied upon to include all the necessary information for formulating policies and making rational choices, the agency will be better able to make a sound and prompt decision. In addition, if it is clear that all reasonable alternatives are being seriously considered, the public will usually be more accepting of the choice among them. Sometimes the scoping process enables early identification of a few serious problems with a proposal, which can then be resolved or the proposal modified as the proposal is still being developed.

As undertaken by the Service, scoping is a process, not an event or a meeting. It continued throughout the planning, development, and revision of this CCP; public comments have been welcomed at any time throughout CCP development.

4.4.1 Notice of Intent

The Service began the public scoping period by publishing a Notice of Intent to prepare the CCP in the *Federal Register* on May 28, 2009. In addition to basic information about the CCP/EA project, the notice provided information on the planning process; public involvement opportunities; Tribal government involvement; a history and description of CNWR; and a description of the initial issues, concerns and opportunities as developed by the Service. The 45-day comment period ended on July 13, 2009.

4.4.2 Other Public Notices

The planning team sent an initial news release to all local media contacts in television, newspaper, radio, and other mass media outlets (e.g., organization newsletters). A week prior to the public scoping meeting (see below), the planning team sent a public service announcement to the mass media contacts with specific information on the meeting location and meeting format.

The Service also mailed Planning Update #1, which announced the open house, to those in a mailing database in May 2009.

4.4.3 Public Scoping Open House

One public open house was held during the 45-day scoping/comment period on June 16, 2009, at the City of Othello Municipal Building. During that time, Service staff accepted official comments by oral comments captured on flipcharts at the scoping meeting; emails or letters sent to the Service; telephone calls; and/or completion of a comment sheet included in Planning Update #1. All comments gathered during the period were recorded and summarized in a Public Scoping Report, which is available on CNWR's web site.

4.5 Other Sources of Input – Resource Reviews

The Service also conducted internal resource reviews on visitor services and wildlife and habitat. The Service assembled teams of resource experts from local, State, and Federal agencies to assist with the resource reviews.

4.6 Planning Updates

As noted above, the Service distributed a planning update (summarized below) to individuals, agencies, and organizations on a mailing list to initiate the scoping process. A second update was released shortly before the draft CCP, and a third update was released to announce the availability of the draft CCP.

- Planning Update 1: May 2010, provided an overview of the CCP process, announced the start of the planning process, and presented draft issues that might be addressed in the CCP.
- Planning Update 2: February 2011, presented draft goals and alternatives that were being analyzed in the draft CCP.
- Planning Update 3: April 2011, announced the availability of the draft CCP and the public open house to discuss it.

CNWR's web site at www.fws.gov/columbia/ contains all planning-related documents.

4.7 Draft CCP Comments and Responses

The public comment period opened on the draft CCP through the publication of a Notice of Availability in the *Federal Register* on July 29, 2011. In addition to the basic information about the CNWR and CCP process, a summary outlined the differences between alternatives within the management plan. The draft CCP was available in hard copy, electronically on CD, and via the CNWR website. The Service mailed the draft CCP to a mailing list; those parties are included in Appendix J. The 31-day public comment period concluded on August 28, 2011.

During the public comment period on the draft CCP the Service received 39 comment letters. While the majority of the comments focused on hunting opportunities and provided few substantive comments, a few letters did provide specifics. Following are the comments received and the Service's response to those comments.

4.7.1 Management

Comment: Several letters recommended that the Service adopt Alternative 1 of the draft CCP, No Action, as the final management direction.

Response: The Service appreciates that many people like CNWR as it is and that current management actions are appropriate. However, the CCP process is the best opportunity to better conditions for wildlife and habitats and to provide the public new ways to enjoy that wildlife. The final management direction retains much of the existing management, while at the same time including measures to benefit wildlife and improve public use of the Refuge.

Comment: One writer suggested that the Three Party Agreement (i.e., the agreement that defines management of lands south of Potholes Reservoir—Upper Goose Lake, CNWR, and Seep Lakes Wildlife Management Area) be revisited and updated to turn management of Upper Goose Lake over to the Service.

Response: The Service is interested in management of Upper Goose Lake and has discussed this option with both the BOR and WDFW, with further talks to take place. All three parties must be in agreement prior to this action. No further action within the CCP is warranted.

Comment: One writer suggested that the Three Party Agreement between the BOR, Service, and WDFW should be included in the CCP.

Response: The Service has agreements with both the BOR and WDFW over management of lands in the area. Likewise, the BOR has an agreement with the WFDW. However, there are no agreements that include all three parties as signatories. That clarified, we agree that relevant agreements between the Service and other State and Federal agencies should be discussed and have been included in Appendix B.

4.7.2 Farming and Grazing

Comment: One letter noted that the Refuge farming program was originally intended to help deter waterfowl crop depredations on surrounding private lands, as well as provide food for Refuge wildlife. The writer noted that this was not discussed in the document. The writer also noted that Refuge crops historically focused on providing green browse during winter and spring when depredation was heaviest on nearby fields.

Response: The writer is correct. Objective 1.7 now includes depredation as a rationale for farming.

Comment: One letter noted that there appears to be no justification to use cattle on Refuge farm fields. During the first half of its history, almost all of CNWR was badly overgrazed, and a great deal of time, expense, and legal and political effort went into getting control of (eliminating) grazing. Around 1979-1981 a regional grazing and grassland assessment recommended elimination of grazing. Subsequently, over a period of years, Refuge personnel constructed many miles of boundary fence to stop on-off grazing, and many miles of internal fencing, gates, and cattle guards were removed. The letter recommended that as long as wetlands can be managed with water level management, mechanical equipment and/or fire, cattle and the associated fencing, temporary corrals, and loading ramps should not be reintroduced to the Refuge.

Response: The Service believes that targeted controlled grazing can be beneficial to certain species, e.g., long-billed curlew. On-off grazing is currently allowed on portions of the Refuge where the impacts of fencing outweigh the impacts of cattle use. These areas will continue to be monitored, and impacts assessed, to determine if changes in the grazing compatibility determination are warranted.

Comment: One writer suggested that, when possible, “the location of crops within Refuge farm units should take into account viewing by Refuge visitors” and that the location of Refuge corn plots and other crop shares should be chosen to optimize Refuge visitor observation opportunities.

Response: The Service agrees, and whenever possible and in accordance with other Refuge priorities, this will occur and has been noted in the CCP.

4.7.3 Refuge Species

Comment: One letter noted that the bird list had an omission and that Eurasian collared doves should be listed as occurring on the Refuge.

Response: The change has been made.

Comment: A reputable source noted that racers, garter snakes, and skinks should be listed as "known to occur" on the Refuge.

Response: The change has been made.

Comment: One letter noted that *Phragmites* should be discussed in Invasive and Pest Species section of Chapter 3 and listed in Table 3.10-1.

Response: The writer is correct, and the changes have been made.

Comment: One writer suggested that we contact Dr. Gordon Orians at the University of Washington about his knowledge of distribution of northern leopard frogs and bullfrogs on the Refuge, due to his past work there.

Response: In developing and implementing any recovery efforts for northern leopard frogs, the Service will contact any experts and past researchers on the Refuge it can identify for whatever assistance they can provide. The Service thanks the writer for the information and contact.

4.7.4 Hunting

Comment: The letters received on hunting did not provide any comments, per se. Instead they advocated adoption of Alternative 3 of the draft CCP, which allows for increasing hunting opportunities.

Response: Most of the hunting strategies from Alternative 3 have been incorporated in the management direction. The two exceptions are that the management direction discontinues the waterfowl hunting lottery and removes the permanent blinds in favor of hunters providing their own blinds on a first-come, first-served basis. The Service does not believe this will decrease the hunting quality or opportunities on CNWR.

Comment: One letter did not want to see an increase in hunting opportunities.

Response: Hunting has been identified by Congress as being a priority use on national wildlife refuges, when compatible with resource protection. The Service believes the slight increases in hunting opportunities in the management directions are appropriate. However, the Service will monitor impacts, and if undue impacts are found to result, hunting will be adjusted accordingly.

4.7.5 Recreational Access

Comment: Several letters supported adoption of Alternative 3 due to its heavier emphasis on providing recreational infrastructure.

Response: Most of the strategies that increase access and visitor facilities have been adopted in the final management direction.

Comment: One letter suggested that we should not allow boating unless appropriate launches and parking are provided.

Response: The Service believes this comment is aimed at State-managed areas. However, several of our facilities are in a state of disrepair and will be addressed as resources allow.

Comment: One letter asked that we renew access to Royal Lake for fishing.

Response: There are two reasons to maintain the closure of Royal Lake for public access: 1) CNWR was established as an inviolate sanctuary for waterfowl, and Royal Lake is one of the best Refuge areas on CNWR; 2) There are concerns over water quality in Royal Lake. Should conditions change in the future, the Service will look at modifying access.

4.7.6 Horseback and Bicycle Riding

Comment: Two letters support the continuation of allowing horseback riding and bicycling on CNWR.

Response: Both activities will continue as they have, i.e., on roads open to vehicular traffic.

4.7.7 Camping

Comment: One letter from the public suggested that camping be continued at Soda Lake and Bluebird Campgrounds to prevent damage done by illegal camping on nearby State lands.

Response: The Service appreciates the rationale behind the comment. However, camping has been found to be "Not Appropriate" under existing Service policy and not compatible with CNWR resources. Therefore, camping must be discontinued. However, the Service will discuss the issue with the WDFW.

4.7.8 Deep Water Lakes

Comment: One letter noted that the draft did not include objectives and strategies for lakes greater than 10 feet in depth (deep water lakes).

Response: The writer is correct. Deep water lakes were inadvertently left out of the CCP, despite there being early versions of such an objective. It should be noted that the acreage figures for the existing shallow water lakes includes **all** lakes on the Refuge. The oversight has been corrected by modifying the existing objective (Objective 2.2) and strategies to include deep water lakes. It should be further noted that the NEPA analysis covers an assessment of the impacts of deep water lake management due to these impacts being the same as that of shallow water lakes, apart from fish stocking. However, the impacts of fish stocking were covered under Chapter 4 of the draft CCP.

4.7.9 Maps

Comment: One letter noted "Map 3 (Acres Burned) – The inset omits [a] considerable acreage of wildfire areas … [E]xtensive fires occurred also at Lower Hampton Lake (2), Soda Lake, Halfmoon Lake, north of Hutchinson and Shiner Lakes, Owl Creek and east for miles, and I know there were other and lesser fires …. "

Response: The writer is correct. However, the map was intended to show burned areas that are being maintained as early successional shrub-steppe habitats (e.g., grasslands) to benefit species like long-billed curlew. No further corrections are needed.

Comment: One letter noted "Map 7 – Correct 'Close Morgan Lake Road' marker to show [the] closure starting at [the] entrance into [the] Refuge at [the] boundary north of McManamon Lake. To that point from the south it is a county road."

Response: The correction has been made.

4.7.10 Washington Department of Fish and Wildlife Comments

Comment: The WDFW supports adoption of Alternative 3, albeit with modifications. The WDFW specifically supports moist soil management, rehabilitation of riparian and in-stream habitats for fish passage, actions consistent with State species recovery plans, increasing coordination between the State and the Service on fish management, and other actions outlined in Alternative 3.

Response: See above.

Comment: "In several places the CCP mentions the need for a current and agreed to Fisheries Management Plan for CNWR. We agree with this assessment and are committed to participating in completion of this plan before or within one year of publication of the final CNWR CCP."

Response: The Service thanks the WDFW for its support of our policies and looks forward to working with the State in adopting and implementing a new Fisheries Management Plan.

Comment: The "loop trail [within the Drumheller Channel National Natural Landmark] may require seasonal closures during the year to protect wildlife from recreational disturbances during sensitive life history stages."

Response: The Service agrees, and this potential action has been noted as a stipulation in the compatibility determination.

Comment: "We support continued day use of the Soda Lake Campground, but would also like to see the continuation of overnight camping … Closing Soda Lake to overnight camping creates an inconvenience to our fishing constituents and pushes more overnight camping onto WDFW property, which increases competition for camping spots as well as our operations and maintenance costs."

Response: Although the Service understands the WDFW's concerns related to displaced campers and potential increases in maintenance costs for WDFW, camping was found to be not appropriate under Service policies and not compatible with CNWR's resource values.

Comment: Chapter 1-12; 1.6.5.3 – The CCP states, "The current Washington population [of pygmy rabbits] is estimated to be fewer than 250 rabbits. Of the five pygmy rabbit areas known to remain in Washington, the largest may be comprised of fewer than 150 rabbits." The WDFW asked about the source and whether or not the information needs updating.

Response: The information source was the WDFW's *Washington State Recovery Plan for the Pygmy Rabbit* (wdfw.wa.gov/publications/00275/wdfw00275.pdf), which was from 1995. We note that the

current population status is that there are no known pygmy rabbit populations in Washington State in the wild, and the correction has been made.

Comment: Chapter 2-15; Objective 1.3 – The CCP suggests as a target a ">10 percent cover of native grasses (e.g., bluebunch wheatgrass) and native forbs" and a ">15 percent cover of native shrubs (e.g., sagebrush, bitterbrush, rabbitbrush, hopsage, greasewood)." The WDFW notes that in 1970 Daubenmire (*Natural Vegetation of Oregon and Washington*) reports on average a 13 percent sage cover and about 45 percent native bunchgrass cover. The WDFW recommends coming more in line with these historical conditions and targeting, but not exceeding, a 15 percent shrub cover. Forb coverage specifications should be included as well.

Response: The figures Service chose for recovery and restoration of shrub-steppe were culled from a multi-agency management plan for greater sage-grouse. The conditions conducive to greater sage-grouse recovery are considered to represent high-quality shrub-steppe. The Service believes that our targets are more realistically achievable than those cited by Daubenmire. We also question how the Daubenmire information is represented and believe that under historical conditions, bare ground and biotic crust formed a significant portion of the shrub-steppe. That is, we believe that bunchgrass communities within the Columbia Basin would constitute less than 45 percent of ground coverage, although it may have represented 45 percent of the total area covered by vegetation. No change is warranted.

Comment: Chapter 2-21; Objective 1.7 – The CCP has as a target to "annually provide 203 to 550 acres of green forage (e.g., timothy hay, alfalfa, winter wheat) for migratory birds (especially geese and long-billed curlews) and other resident wildlife" and that the species benefitted would include "mule deer, lesser sandhill crane, western and lesser Canada goose, Taverner's cackling goose, mallard, redhead, long-billed curlew." The WDFW suggests that redhead would not benefit from green forage crops. They also note that, for "alfalfa in particular, cuttings prior to June 1 are likely to cause nest failures for mallard, pheasant, and curlew. Timothy hay and winter wheat may be better choices due to later harvest."

Response: The Service has removed redhead from the list of benefitting species. Alfalfa is planted as a crop to reduce depredation on adjacent private farm fields, and some of the land was specifically purchased to address depredation. The Service will review the farming agreements to determine if harvest times can be modified to better protect nesting species.

Comment: Chapter 2-21; Objective 1.8 – The CCP has a strategy to "Establish new and/or augment existing populations of Washington ground squirrels (*Spermophilus*) with sufficient genetic diversity to sustain the population without further augmentation." The WDFW suggests that "[g]iven the extent of habitat fragmentation throughout the CNWR, it is likely that augmentations may be needed periodically (e.g., every 10 years) to ensure genetic influx."

Response: The Service agrees with the comment, and the objective has been modified to reflect this reality.

Comment: Chapter 2-42; Objective 5.2 – The CCP proposes to "[d]iscontinue access through the Refuge via Morgan Lake Road from 1/2 hour after sunset to 1/2 hour before sunrise to ensure visitor safety." The WDFW recommends opening access earlier in the morning (1.5 hours before sunrise) to accommodate waterfowl hunters using Marsh Unit I.

Response: The WDFW comment is well-taken, and the strategy has been modified so that Morgan Lake Road access matches the hours that the Refuge is open. That is, if hunting hours differ from that of general access, Morgan Lake Road will be open to match that of hunting hours, or whichever is greater.

Comment: Chapter 2-49; Objective 7.2 – The CCP proposes to "[c]lose Marsh Unit I to deer hunting." The WDFW disagrees with this, suggesting that providing a "deer hunting opportunity in MU I would be desirable due to its size and number of deer it holds. An early muzzleloader season may be appropriate. If so, perhaps should be truncated to eliminate overlap with youth season."

Response: The Service disagrees with this comment for several reasons. 1) We are concerned with public safety in the area; modern firearms are a safety concern within Marsh Unit I due to its limited size and nearby private lands. 2) We are concerned about competition between waterfowl hunters and deer hunters. 3) There are only two quality spots on the Refuge to hunt waterfowl; Marsh Unit I is one of those spots. The Service is open to reexamining this closure in the future should conditions change.

Comment: Chapter 3-28; Table 3.8-5 – The CCP includes a table on 2010 fish stocking. The WDFW notes the following corrections:

- Quail Lake: Delete triploid rainbow trout and replace with tiger trout. No triploid rainbow trout have been planted into Quail Lake.
- West Falcon Lake needs to be added. Fish stocking in 2010 for this lake is exactly the same as East Falcon Lake. Of potential interest to the Refuge, brook trout stocking has ceased due to a USService DJ funding review of hatchery production and stocking of competitor, predatory, and inbreeding species (e.g., brook, brown, tiger trout, etc.) and their potential impacts to bull trout.
- Upper Heron Lake: Also stocked with rainbow trout fry (350 per year). Similar to West Falcon Lake, brook trout stocking has ceased in Upper and Lower Heron lakes.
- Lemna Lake: No catchable rainbow trout were stocked into this lake, just fry.
- Long Lake: A total of 4,000 fry were planted during the fall of 2010.
- Soda Lake: A total of 6,000 fry were planted during the fall of 2010.

Response: The Service notes the corrections, and the table has been eliminated in the CCP. Stocking will be addressed through the upcoming Fisheries Management Plan.

Comment: Chapter 4-20; 4.5.2.2 – "Due to their impacts on native species, we believe that the CNWR needs to be more aggressive with respect to bull frog control alternatives such as rotenone, as well as gaffing or other methods of take."[1]

Response: We agree that bullfrogs are a serious problem and will take appropriate management actions within budget and staff limitations to control the species, subject to Service policies and other Refuge priorities. This will take an even higher priority on lakes where northern leopard frog recovery may occur.

[1] Please note that this comment (and subsequent ones referring to Chapter 4) is in response to Chapter 4 of the draft CCP, Environmental Analysis, which has been removed from the final CCP as part of the NEPA decision-making process.

Comment: Chapter 4-21; 4.5.2.3 – "The proposal to use gabions and rock weirs below O'Sullivan Dam to dissipate energy in the event of a spill is not in line with bioengineering commitments elsewhere in the document."

Response: We agree, and the final management direction does not include rock gabions, etc.

Comment: Chapter 4-30; 4.5.3 – "The pygmy rabbit information is out-of-date/incorrect. Currently, there are no known, naturally occurring pygmy rabbit areas in Washington State. A pygmy rabbit reintroduction project is currently occurring on the Sagebrush Flats area in Grant County."

Response: Correction noted; see above.

4.8 List of Preparers

Many people assisted in the writing of this CCP. While the Service hopes that the following lists are complete, there were so many people providing assistance, it is possible that some people's names were inadvertently omitted. If so, please know that your contributions are valued and that the omission was in error.

4.8.1 U.S. Fish and Wildlife Service Planning Team

- Howard Browers, Supervisory Biologist, Burbank, Washington[2]
- Kelly Chase, Columbia National Wildlife Refuge Manager, Othello, Washington
- Lindsey Hayes, GIS Specialist, Burbank, Washington
- Randy Hill, Biologist, Othello, Washington[3]
- Sue McDonald, Visitor Services Manager, Burbank, Washington
- Heidi Newsome, FWS Supervisory Biologist, Burbank, Washington
- Rick Poetter, Columbia National Wildlife Refuge Manager (Retired), Othello, Washington
- Gordon Warrick, Columbia National Wildlife Refuge Biologist, Othello, Washington

4.8.2 Contractors

- Christopher Earle, ICF International, Olympia, Washington
- Erin VanDehay, ICF International, Portland, Oregon

4.8.3 Additional Assistance—Review, Consultation

- Joe Engler, Division of Refuges, Portland, Oregon
- Mike Green, Division of Migratory Birds, Portland, Oregon
- Ben Harrison, Chief, Division of Natural and Cultural Resources, Portland, Oregon
- Chuck Houghten, Chief, Division of Planning, Portland, Oregon
- Kevin Kilbride, Division of Refuges, Portland, Oregon
- Mike Marxen, Division of Visitor Services, Portland, Oregon

[2] Now at Bear River Migratory Bird Refuge, Brigham City, Utah.
[3] Now at the Ridgefield National Wildlife Refuge Complex, Ridgefield, Washington.

- Scott McCarthy, Division of Planning, Portland, Oregon
- Fred Paveglio, Division of Refuges, Portland, Oregon
- Anan Raymond, Division of Cultural Resources, Portland, Oregon

4.8.4 Columbia National Wildlife Refuge Management

- Greg Hughes, Former Project Leader[4]
- Jeff Howland, Deputy and Acting Project Leader
- Larry Klimek, Deputy Project Leader
- Kelly Chase, Refuge Manager

[4] Now at the Albuquerque Office, Albuquerque, New Mexico.

Appendices

Appendix A. Glossary and Abbreviations

AAQS: Ambient Air Quality Standards.

ACOE: (United States) Army Corps of Engineers.

ADA: Americans with Disabilities Act.

Adaptive Management: An approach to managing Columbia National Wildlife Refuge's resources that builds upon learning—based on best available science, common sense, experience, experimenting, new scientific discoveries and monitoring—by adjusting management practices based on what was learned. Where possible, Columbia National Wildlife Refuge management projects will be designed to produce knowledge along with meeting other resource objectives.

Administration Act: National Wildlife Refuge System Administration Act of 1966.

Aesthetic: Of or relating to the sense of beauty.

Affected Environment: In an environmental impact statement, a description of the existing environment, covering information that directly relates to the scope of the proposed action and alternatives that are analyzed.

Alternative: A set of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the National Wildlife Refuge System mission, and resolving issues.

Anadromous Fish: Fish that normally migrate to salt water as juveniles and return to fresh water as adults to spawn.

APHIS-PPQ: (United States Department of Agriculture) Animal Plant Health Inspection Service, Plant Protection and Quarantine.

Archeological Resource: Material remains of past human life or activities, including (but not limited to), pottery, basketry, bottles, weapons, tools, structures, and graves, or any portion of the foregoing items, as well as the physical site or context in which it is found.

ARPA: Archaeological Resources Protection Act of 1979. Protects cultural resources and outlines permitting procedures as well as violations and fines.

BAER: Burned Area Emergency Rehabilitation. Planned actions to stabilize and prevent unacceptable degradation to natural and cultural resources, to minimize threats to life or property resulting from the effects of a fire, or to repair/replace/construct physical improvements necessary to prevent degradation of land resources. Emergency stabilization actions must be taken within 1 year of containment of a wildland fire. Emergency rehabilitation actions are undertaken within 3 years of containment of a wildland fire to repair or improve fire-damaged lands unlikely to recover naturally to management-approved conditions.

BAF: Bioaccumulation Factors.

Basalt: A dark grey to black, fine grained igneous rock composed primarily of calcium feldspar and pyroxene, with or without olivine. This material underlies Columbia National Wildlife Refuge.

BCR: Bird Conservation Region.

BIDEH: Biological Diversity, Integrity and Environmental Health.

Biological Diversity (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. It also defines the interrelationships within and among various levels of ecological organization. Conservation, protection and restoration of biological species and genetic diversity are needed to sustain the health of existing biological systems. Federal resource management agencies must examine the implications of management actions and development decisions on regional and local biodiversity.

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.

BLM: (United States) Bureau of Land Management.

BMP: Best Management Practice(s). As a means of accomplishing an action, the practices that are based on the best available science and generally accepted standards for the field, as well as being the most effective and practicable (including technological, economic and institutional considerations).

BOR: (United States) Bureau of Reclamation.

BPA: Bonneville Power Administration.

Bti: *Bacillus thuringiensis israelensis*.

Bsp: *Bacillus sphaericus*.

Candidate Species (Federal): A species for which there is sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list it as endangered or threatened but issuance of the proposed rule is precluded (i.e., by other listing activity or lack of funding).

Candidate Species (State): Wildlife species that are under review by the Washington Department of Wildlife for possible listing as endangered, threatened, or sensitive.

CAP: Contaminants Assessment Process.

CAS: Chemical Abstract Service.

CBAS: Columbia Basin Audubon Society.

CBIP: Columbia Basin Irrigation Project.

CEAA: Canadian Entitlement Allocation Agreements.

CCP: Comprehensive Conservation Plan. The master land planning document used by the Service to administer the agency's lands (i.e., national bison ranges, national game preserves, national monuments, national wildlife refuges, waterfowl production areas, wetland management districts, and wildlife management areas).

CCT: Confederated Tribes of the Colville Reservation.

CD: Compatibility Determination.

Census Bureau: (United States) Census Bureau.

CEQ: (United States) Council on Environmental Quality.

CERCLA: Comprehensive Environmental Response, Compensation & Liability Act.

CFR: Code of Federal Regulations.

CNWR: Columbia National Wildlife Refuge.

Compatibility Determination: A written determination, usually signed 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.

Compatible Use: A proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purpose(s) of the national wildlife refuge.

Connectivity (Habitat Connectivity): The arrangement of habitats that allows organisms and ecological processes to move across the landscape.

Conservation and Management: To sustain and, where appropriate, restore and enhance healthy populations of fish, wildlife, and plants using methods and procedures associated with modern scientific resource programs.

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.

Council: Northwest Power and Conservation Council.

Criterion 1 (State-listed and Candidate Species): State-listed species are those native fish and wildlife species legally designated as endangered, threatened, or sensitive. State candidate species are those fish and wildlife species that will be reviewed by the department for possible listing as endangered, threatened, or sensitive. Federal candidate species are evaluated individually to determine their status in Washington and whether inclusion as a priority species is justified.

Criterion 2 (Vulnerable Aggregations): Vulnerable aggregations include those species or groups of animals susceptible to significant population declines, within a specific area or statewide, by virtue of

their inclination to aggregate. Examples include heron rookeries, seabird concentrations, marine mammal haul-outs, shellfish beds, and fish spawning and rearing areas.

Criterion 3 (Species Considered to be of Recreational, Commercial, and/or Tribal Importance by Washington State): Native and non-native fish and wildlife species of recreational or commercial importance and recognized species used for tribal ceremonial and subsistence purposes that are vulnerable to habitat loss or degradation.

CRITFC: Columbia River Intertribal Fish Commission.

CRP: Conservation Reserve Program.

Cryptobiotic Crust: See Microbiotic Crust.

Cryptogam: A plant that bears no flowers or seeds but propagates by means of spores. Cryptogamic organisms make up a cryptogamic crust or surface on certain soils.

CTUIR: Confederated Tribes of the Umatilla Indian Reservation.

Cultural Landscape: The distinctive setting or land use pattern associated with an historic site or areas such as a homestead, mining district, or townsite. There is evidence of human manipulation of the land through purposeful design, cultivation or extraction.

Cultural Resources: The physical remains, objects, historic records, and traditional lifeways that connect us to our nation's past.

CWA: Clean Water Act (Federal Water Pollution Control Act).

DAHP: (Washington) Department of Archaeology and Historic Preservation.

DCP: Disease Contingency Plan.

DOE: (United States) Department of Energy.

DOI: (United States) Department of the Interior.

EA: Environmental Assessment. A concise public document that analyzes the environmental impacts (consequences) of a proposed Federal action and provides sufficient evidence to determine the level of significance of the impacts.

ECC: Estimated Environmental Concentration.

Ecosystem: A biological community together with its associated non-living environment, functioning as a unit. A system made up of a community of animals, plants, and bacteria and its interrelated physical and chemical environment.

EE: Environmental Education. A teaching process that increases people's knowledge and awareness about the environment and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action.

EEC: Estimated Environmental Concentration.

EIS: 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, and any irreversible and irretrievable commitment of resources.

Endangered Species (Federal): A species that is likely to become extinct throughout all or a significant portion of its range. These species are listed by the United States Fish and Wildlife Service.

Endangered Species (State Plants): A species that is likely to become extinct throughout all or a significant portion of its range within the State of Washington.

Endangered Species (State Wildlife): Wildlife species native to the State of Washington that are seriously threatened with extinction throughout all or a significant portion of its range within the State.

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.

Environmental Justice: The fair treatment of people of all races, cultures, and income with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. Executive Order 12898 requires Federal agencies to identify and address and potentially disproportionate high and adverse human health and environmental effects of agency policies, programs and activities on minority and low-income populations.

Environmentally Preferable Alternative: The environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in the NEPA, Section 101. Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources. Section 1505.2(b) requires that, in cases where an EIS has been prepared, the Record of Decision must identify all alternatives that were considered, " … specifying the alternative or alternatives which were considered to be environmentally preferable."

EO: Executive Order.

EPA: (United States) Environmental Protection Agency.

Equestrian: Relating to horses or horseback riding.

ESA: Endangered Species Act.

Ethnography: The descriptive and analytic study of the culture of particular groups or communities. Such studies are often done through interviews with community members and often through living in and observing a community (a practice referred to as "participant observation").

Ethnohistory: The study of historical data, including but not necessarily limited to, documentary data pertaining to a group or community, using an ethnographic perspective.

Ethnocentrism: Viewing the world and the people in it only from the point of view of one's own culture and being unable to sympathize with the feelings, attitudes, and beliefs of someone who is a member of a different culture.

Fauna: The animals of a specified region or time.

FIFRA: Federal Insecticide, Fungicide, and Rodenticide Act.

Fishery: A place to catch fish. The Hanford Reach of the Columbia River is a popular sport fishing area for steelhead, chinook salmon, sturgeon, and smallmouth bass.

Floodplain: A plain along a river subject to periodic flooding. Floodplains are composed of sediment deposited by floods.

Flora: The plants of a specified region or time.

FONSI: Finding Of No Significant Impact.

Forage: Vegetation of all forms available and of a type used for animal consumption.

Foundation Plant Communities: Intact assemblages of native plant species that serve as sources for seed and propagation material for disturbed sites and plant community natural regeneration. Also referred to as "remnant" plant communities, these serve as a representation of plant communities that were historically widespread within the Columbia Basin.

FR: Federal Register.

FWS: (United States) Fish and Wildlife Service.

Geological Resources: Natural features related to the form of the earth or its solid surface. The Channeled Scablands is one of the key geological resources of Columbia National Wildlife Refuge.

GIS: Geographic Information System.

GMA: (Washington State) Growth Management Act.

GMU: (Washington State) Game Management Unit.

Goal: A descriptive, open-ended, often broad statement of desired future conditions that conveys a purpose but does not define measurable units.

GPS: Global Positioning System.

GUS: Groundwater Ubiquity Score.

GWMA: Groundwater Management Area.

Habitat: A specific set of physical conditions in a geographic area that surrounds an organism, a single species, a group of species, or a large community and are required by an organism for survival

and reproduction. The place where and organism typically lives. In wildlife management, the major components of habitat are food, water, cover, and living space.

Habitat Diversity: Refers to the number, interspersion, and relative abundance of indigenous plant and animal species and communities. It also refers to the horizontal and vertical structure of a plant community.

HACCP: Hazard Analysis and Critical Control Point.

Historic Conditions: Composition, structure and functioning of ecosystems resulting from natural processes that are believed, based on sound professional judgment, to be present prior to substantial human changes to the landscape.

Historic Preservation: Includes identification, evaluation, documentation, excavation, curation, acquisition, protection, rehabilitation, restoration, stabilization, maintenance and any combination of the foregoing activities relative to cultural resources.

Historic Records: Any historical, ethnographic, architectural documents, drawings and images that provide a record of the past.

Hydrology: The science dealing with the properties, distribution, and circulation of water.

IBA: Important Bird Area.

Ibid: Latin for "the same place." Here, it refers to a repetition of the preceding citation.

Impact: Synonymous with effects; includes ecological, aesthetic, historic, cultural, economic, social, or health effects, whether direct, indirect, or cumulative. Impacts may also include those resulting from actions that may have both beneficial and detrimental (adverse) effects. Impacts may be considered as direct, indirect, or cumulative.

Impact Severity Rating: Thresholds used in this CCP for analyzing the scope, scale, and intensity of effects on natural, cultural, and recreational resources. The four levels of impacts are:

Negligible: Resources would not be affected, or the effects would be at or near the lowest level of detection. Resource conditions would not change or changes would be so slight that they would not be of any measurable or perceptible consequence to a population, plant community, cultural resource, recreation opportunity, or visitor experience.

Minor: Effects would be detectable but localized, small, and of little consequence to a population, plant community, cultural resource, recreation opportunity or visitor experience. Mitigation, if needed to offset adverse effects, would be easily implemented and successful.

Moderate: Effects would be readily detectable and localized, with consequences to a cultural resource, population, plant community level, or specific recreation opportunity or visitor experience. Mitigation measures would be needed to offset adverse effects, would be extensive in nature and moderately complicated to implement, and probably would be successful.

Major: Effects would be obvious and would result in substantial consequences to cultural resources, populations, plant communities within the local area and region, or recreation opportunities and visitor experiences within the refuge. Extensive mitigating measures would be needed to offset adverse effects; would be large-scale in nature and very complicated to implement; and the probability of success would not be guaranteed. In some instances, major effects would include the irretrievable loss of the resource.

Time and duration of impacts have been defined as:

Short-term: An effect that generally would last less than a single year or season.

Long-term: A change in a resource or its condition that would last longer than a single year or season.

Improvement Act: National Wildlife Refuge System Improvement Act.

Indicator Species: A species of plant or animal that is assumed to be sensitive to habitat changes and represents the needs of a larger group of species.

Interpretation: A communication process that forges emotional and intellectual connections between the interests of the audience and the inherent meanings in the resource.

Invasive Species: Plant or animal species that tend to spread rapidly and harmfully. For example, cheatgrass invasion of native shrub-steppe displaces native species and alter natural fire regimes. Many invasive species are also noxious weeds.

IPM: Integrated Pest Management. Used to treat targeted invasive plant species on Columbia National Wildlife Refuge. Manual, mechanical, biological, cultural (e.g., prescribed fire, competitive plantings) and chemical treatment methods used to achieve prioritized weed control objectives. Invasive species managers draw upon the full range of appropriate control technologies to develop integrated treatment plans for target species at selected priority sites. Treatment methodologies are based upon the best information available from literature and professional experience, tailored to the characteristics of the particular species and site.

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.

JFSP: Joint Fire Science Program.

JH: Juvenile Hormone.

LC: Lethal Concentration.

LD: Lethal Dose.

LEIS: Legislative Environmental Impact Statement.

LOC: Level of Concern.

LOEC: Lowest Observed Effect Concentration.

LOEL: Lowest Observed Effect Level

Long-term Impact: A change in a resource or its condition that would last longer than a single year or season.

Major Impact: Effects would be obvious and would result in substantial consequences to cultural resources, populations, plant communities within the local area and region, or recreation opportunities and visitor experiences within Columbia National Wildlife Refuge. Extensive mitigating measures would be needed to offset adverse effects; would be large-scale in nature and very complicated to implement; and the probability of success would not be guaranteed. In some instances, major effects would include the irretrievable loss of the resource.

Management Unit: An administrative unit for refuge management purposes.

MCD: Mosquito Control District.

MCRNWRC: Mid-Columbia River National Wildlife Refuge Complex.

Microbiotic Crust: A diminutive collection of mosses, lichens, liverworts, algae, and bacteria that form a soil stabilizing crust. Microbiotic crusts are formed by living organisms and their by-products, creating a crust of soil particles bound together by organic materials on the surface of many soil types which fills the spaces between bunchgrass clumps within shrub-steppe habitats. Also known as cryptogamic, cryptobiotic, and microphytic, these organisms serve important functions in soil stability, moisture retention, nutrient transport, and plant community stability. The names are all meant to indicate common features of the organisms that compose soil crusts.

Migratory Birds: Those species of birds that migrate from place to place, either within the United States or between countries, to complete different stages of their life cycle. These species are listed under §10.13 of 50 CFR Chapter 1 – United States Fish and Wildlife Service, Department of Interior.

Minor Impact: Effects would be detectable but localized, small, and of little consequence to a population, plant community, cultural resource, recreation opportunity or visitor experience. Mitigation, if needed to offset adverse effects, would be easily implemented and successful.

MIST: Minimum Impact Suppression Technique(s). Used to describe methods of firefighting having the smallest environmental impacts on resources while still accomplishing fire suppression.

Mitigation: Avoiding, minimizing, rectifying, reducing, eliminating, or compensating for impacts.

MOA: Memorandum of Agreement.

Moderate Impact: Effects would be readily detectable and localized, with consequences to a cultural resource, population, plant community level or specific recreation opportunity or visitor experience. Mitigation measures would be needed to offset adverse effects, would be extensive in nature and moderately complicated to implement; and probably would be successful.

Monitoring: Tracking changes of selected parameters over time.

Monument: Hanford Reach National Monument.

MOU: Memorandum of Understanding.

MSDS: Material Safety Data Sheet.

NAGPRA: Native American Graves Protection and Repatriation Act of 1991. Specifies actions to be taken by Federal agencies with regard to Native American human remains, funerary objects, objects of cultural patrimony, and sacred objects.

National Register: National Register of Historic Places. Established through the National Historic Preservation Act of 1966, the Register is administered by the National Park Service. It is the nation's master inventory of known historic properties, including buildings, structures, sites, objects, and districts that possess historic, architectural, engineering, archaeological, or cultural significance at the national, state, and local levels.

Native: With respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem.

NCRS: (United States) Natural Resource Conservation Service.

Negligible Impact: Resources would not be affected, or the effects would be at or near the lowest level of detection. Resource conditions would not change or changes would be so slight that they would not be of any measurable or perceptible consequence to a population, plant community, cultural resource, recreation opportunity, or visitor experience.

NEPA: National Environmental Policy Act.

NHPA: National Historic Preservation Act. Outlines historic preservation responsibilities of Federal agencies.

NIOSH: National Institute for Occupational Safety and Health.

NOAA: (United States) National Oceanic and Atmospheric Administration.

NOAA-Fisheries: (United States) National Oceanic and Atmospheric Administration Fisheries. This agency was formerly known as the National Marine Fisheries Service.

NOAEC: No Observed Adverse Effect Concentration.

NOAEL: No Observed Adverse Effect Level.

NOEC: No Observed Effect Concentration.

Non-native Invasive Species: Invasive species are plants and animals that are introduced into new areas in which they are not among the native flora and fauna. Because they no longer face the natural enemies or competition from their place or origin, they spread or reproduce prolifically. Non-native invasive species can cause significant changes to ecosystems, upset the ecological balance, create economic disruptions, and harm plants and wildlife. Within this document the words non-native invasive species, invasives, noxious weeds, and weeds are used synonymously to represent those

non-native species that persist on the Monument and increase the risk of habitat fragmentation and degradation.

Noxious Weed: A plant species designated by Federal or state law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insect or disease; or non-native, new, or not common to the United States. (Federal Noxious Weed Act)

NPCC: Northwest Power and Conservation Council.

NPS: National Park Service.

NRHP: National Register of Historic Places.

NVCS: National Vegetation Classification System.

NWRS: National Wildlife Refuge System.

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.

ODFW: Oregon Department of Fish and Wildlife.

Ordinary High Water Mark: The line that water impresses on land by covering it for sufficient periods to cause physical characteristics that distinguish the area below the line from the area above it. Characteristics of the area below the line include, when appropriate, but are not limited to, deprivation of the soil and substantially all terrestrial vegetation.

OSHA: Occupational Safety and Health Administration.

Overlay Wildlife Refuge: A wildlife refuge on land which is owned by one or more Federal agencies but managed by the United States Fish and Wildlife Service.

Paleontological Resources: The preserved (fossilized) remains of plants and animals that existed in various geological periods, usually prior to human existence.

Permit: A short-term, revocable authorization to use public lands for specific purposes.

PIF: Partners in Flight.

Planning Area: The area upon which the planning effort will focus. A planning area may include lands outside existing planning unit boundaries currently studied for inclusion in the National Wildlife Refuge System and/or partnership planning efforts. It also may include watersheds or ecosystems outside of our jurisdiction that affect the planning unit. At a minimum, the planning area includes all lands within the authorized boundary of the refuge.

Post-contact: A time period referring to occupation of the area by Euro-Americans, usually assumed to be about 1800 in this region.

PPE: Personal Protective Equipment.

ppb: Parts Per Billion.

ppm: Parts Per Million.

Pre-contact: A time period referring to the occupation of the land solely by Native Americans and prior to the occupation by Euro-Americans. Generally equates to approximately pre-1800 in this region.

Preferred Alternative: The alternative which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors. The concept of the "agency's preferred alternative" is different from the "environmentally preferable alternative," although in some cases one alternative may be both.

Prescribed Fire: A fire ignited by management actions to meet specific objectives. An intentionally or naturally ignited fire that burns under specified conditions that allow the fire to be confined to a predetermined area and produce the fire behavior and fire characteristics required to attain planned fire treatment and resource management objectives.

Prey Species: An animal taken by a predator as food.

Priority 1 Species (State Plants): Those taxa that are in danger of becoming extinct throughout their ranges. Populations are at critically low levels or their habitats are degraded or depleted to a significant degree. These taxa are the highest priorities for preservation.

Priority 2 Species (State Plants): Those taxa that will become endangered in Washington if factors contributing to their population decline or habitat degradation or loss continue. These taxa are high priorities for preservation efforts.

Priority 3 Species (State Plants): Those taxa that are vulnerable or declining and could become endangered or threatened in Washington without active management or removal of threats. These taxa should be important in the analysis of potential preserve sites.

Proper Functioning Condition: Riparian-wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high waterflows, thereby reducing erosion and improving water quality; filtering sediment, capturing bedload; aiding floodplain development; improving flood-water retention and groundwater recharge; aiding development of root masses that stabilize streambanks against cutting action; aiding development of diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and supporting greater biodiversity. The functioning condition of riparian-wetland areas is a result of interaction among geology, soil, water, and vegetation.

Proposed Species For Listing (Federal): A species for which a proposed rule to list as endangered or threatened has been published in the *Federal Register*.

PUP: Pesticide Use Proposal.

Purposes (of the Columbia National Wildlife Refuge): 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 national wildlife refuge or refuge subunit.

Raptors: Birds of prey, such as the eagle, falcon, hawk, or owl.

RCW: Revised Code of Washington.

Review 1 Species: A plant species in need of additional fieldwork before a status can be assigned.

Review 2 Species: A plant species with unresolved taxonomic questions.

Riparian: Of or on the bank of a natural course of water. For example, riparian vegetation includes any and all plant life growing on the bank of a stream or the edge of, but not within, a pond or lake.

RM: Refuge Manual.

RONS: Refuge Operational Needs System

RQ: Risk Quotient.

RTK: Real-Time Kinematic.

Sacred Site: As defined by Executive Order 13007, a specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe as sacred by virtue of its established religious significance to, or ceremonial use by an Indian religion; provided that the Tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site.

SAMMS: Service Asset Maintenance and Management System

SARA: Superfund Amendments and Reauthorization Act

SCBID: South Columbia Basin Irrigation District.

Sensitive Species (State Plants): A species that is likely to become endangered or threatened in a significant portion of its range within the State of Washington.

Sensitive Species (State Wildlife): Wildlife species native to the State of Washington that are vulnerable or declining and are likely to become endangered or threatened throughout significant portions of their ranges within the State without cooperative management or the removal of threats.

SEPA: (Washington) State Environmental Policy Act.

Service: U.S. Fish and Wildlife Service

Short-term Impact: An effect that generally would last less than a single year or season.

SHPO: (Washington) State Historic Preservation Officer.

Shrub-steppe: Arid land dominated by shrubs and grasses where soil and moisture limit the growth of trees. Washington State Department of Fish and Wildlife considers shrub-steppe a priority habitat. Shrub-steppe habitats on CNWR support many rare plants.

Site: When referring to cultural resources; the location of an event, occupation or activity, building or structure or natural feature with cultural significance.

SLE: St. Louis Encephalitis.

Solitude: The state of being alone. Many people seek out natural areas, such as CNWR, in order to experience the feeling of solitude and to at least temporarily escape the crowds, noise, and technology of modern society.

Special Status Species: Wildlife and plant species either federally listed or proposed for listing as endangered or threatened; state-listed; or determined priority species.

Spot Treatment: The application of chemicals to control non-native invasive species directly onto a target plant, using a backpack spraying unit, hand-held wand, wick or other application device.

SPRC: (Washington) State Parks and Recreation Commission.

SSP: Science Support Program.

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 and is usually subsequent, subservient, and complementary to the CCP.

Strategy: A specific action, tool, technique, or combination of actions, tools, and techniques used to meet unit objectives.

SUP: Special Use Permit.

TE&S Species: Threatened, Endangered and Sensitive Species.

Threatened Species (Federal): A species that is likely to become endangered in the foreseeable future.

Threatened Species (State Plants): A species that is likely to become endangered in the foreseeable future.

Threatened Species (State Wildlife): Wildlife species native to the State of Washington that are likely to become endangered in the foreseeable future throughout significant portions of their ranges within Washington without cooperative management or the removal of threats.

Traditional/Religious Values: Places that possess values important to Native American tribal groups or other ethnic groups for traditional cultural or religious reasons. Traditional cultural values may not necessarily be associated with easily definable sites or objects, such as is the case with sacred peaks or viewsheds.

T-REX: Terrestrial Residue Exposure.

Trust Responsibility: The fiduciary obligations that attach to the United States as trustee of the assets and resources that the United States holds in trust for Native American governments and their members, the treaty and statutory obligations of the United States toward Native American governments and their members, and other legal obligations that attach to the United States by virtue of the special relationship between the Federal government and Native American governments. The identification and quantification of trust assets is recognized as an ongoing and evolving process.

TSCA: Toxic Substances Control Act.

TWA: Time Weighted Average.

ULV: Ultra Low Volume.

USC: United States Code.

USDA: United States Department of Agriculture.

USFS: United States Forest Service.

USGS: United States Geological Survey.

Vegetation Type: A classification of the plant community based on the dominant plant species in the community.

Visitor Day: Twelve visitor hours, which may be aggregated by one or more persons in single or multiple visits.

Visual Resources: The visible physical features on a landscape, such as land, water, vegetation, structures, and other features.

Vision Statement: A concise statement of what the planning unit should be, or what we hope to do, based primarily upon the National Wildlife Refuge System mission and specific refuge purposes, and other mandates.

Watch List Species: A species more abundant and/or less threatened in Washington than previously assumed.

Watershed: All land and water within the confines of a drainage divide.

Watershed Function: The ability of a watershed to effectively and safely capture, store and release precipitation.

WDFW: Washington Department of Fish and Wildlife.

WDNR: Washington Department of Natural Resources.

WDOE: Washington Department of Ecology.

WDPR: Washington Department of Parks and Recreation.

WNV: West Nile Virus.

WSA: Wilderness Study Area.

WWE: Western Equine Encephalitis.

Wetlands: Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water.

Wild and Scenic River: A portion of a river that has been designated by Congress as part of the National Wild and Scenic Rivers System—established by the Wild and Scenic Rivers Act of 1968—the purpose of which is to "protect rivers and their immediate environments that have outstanding scenic, recreation, geologic, fish and wildlife, historic, cultural, and other similar values and are preserved in free-flowing conditions."

Wilderness Units: Areas that have been designated by Congress as units of the National Wilderness Preservation System.

Wildfire: An unwanted wildland fire.

Wildlife-dependent Recreation: A use of a national wildlife refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation. The National Wildlife Refuge System Improvement Act of 1997 specifies that these are the six priority general public uses of the National Wildlife Refuge System.

WNHP: Washington Natural Heritage Program.

Yakama Nation: Confederated Tribes and Bands of the Yakama Nation.

YCC: Youth Conservation Corps.

YTC: Yakima Training Center.

Appendix B. Applicable Laws, Executive Orders, and Policies

B.1 Federal Laws and Treaties

Relevant laws of the United States that might apply to the implementation of the land-use alternatives on the Refuge are discussed in the sections that follow.

B.1.1 United States Treaties with American Indian Tribes

In May and June of 1855, at Wai-I-lat-pu (near present-day Walla Walla, Washington), leaders of various Columbia Plateau American Indian Tribes and bands negotiated treaties with representatives of the United States. The negotiations resulted in three treaties: one with the 14 Tribes and bands that would become the Yakama Nation, one with the three Tribes that would form the CTUIR, and one with the Nez Perce Tribe. The treaties were ratified by the United States Senate in 1859. The negotiated treaties are:

- Treaty with the Walla Walla, Cayuse, etc. (June 9, 1855; 12 Stat. 945)
- Treaty with the Yakama (June 9, 1855; 12 Stat. 951)
- Treaty with the Nez Perce (June 11, 1855; 12 Stat. 957)

The terms of all three treaties are essentially the same. Each of the three Tribal organizations agreed to cede large blocks of land to the United States. The Tribes retained certain lands for their exclusive use (the three reservations) and also retained the rights to continue traditional activities outside the reservations. These reserved rights include the right to fish (and erect fish-curing facilities) at usual and accustomed places. These rights also include rights to hunt, gather foods and medicines, and pasture livestock on open and unclaimed lands.

The act of treaty-making between the United States and an Indian Tribe has many legal consequences for both entities. The United States recognizes the existence of the Tribe as a sovereign entity and initiates a government-to-government relationship with the Tribe. At the same time, the Tribe loses some aspects of its sovereignty, such as the right to negotiate (independently of the United States) with other foreign powers. In return, the United States and the Tribe enter into a trust relationship, whereby the United States assumes the responsibility to preserve the rights and resources of the Tribe from incursions by private entities, states, or the Federal government itself. One aspect of this trust duty is the need to consult with the Tribes concerning decisions made by the Federal government that could affect Tribal rights or resources. In addition to these general legal consequences of treaty-making, the individual treaty itself defines particular new roles and responsibilities of the two governments, within the terms of the new legal relationship created by the treaty.

Every Federal agency that makes decisions potentially affecting the rights or resources of federally recognized American Indian Tribes shares in the trust responsibility duties of the Federal government. This trust responsibility includes the duty to consult with those Tribes concerning the potential impacts of agency decisions. As a result, the Service regularly consults with the CTUIR, the Yakama Nation, and the Nez Perce Tribe concerning decisions being made by the Service on the Refuge that might affect Tribal rights or resources.

B.1.2 International Treaties of the United States

B.1.2.1 Columbia River Treaty of 1961

In 1961, the United States and Canada signed the Columbia River Treaty; it was ratified in 1964. The treaty provided for building four storage dams—three in Canada (Mica, Keenleyside, and Duncan) and one in the United States (Libby). The reservoirs built and operated under the treaty represent almost half the water storage capacity on the Columbia River system. The treaty, however, addresses only hydropower generation and flood control; it contains no provisions related to environmental concerns, specifically the needs of salmon.

The three Canadian storage dams provide regulated flows that enable hydroelectric projects downstream in the United States to produce additional power benefits. The treaty requires the United States to deliver to Canada one-half of these downstream power benefits—the Canadian Entitlement. The United States' obligation to deliver the Canadian Entitlement extends to 2024, the first year the treaty can be terminated with 10 years' notice. The Canadian Entitlement Allocation Agreements (CEAA), also executed in 1964, established how the Canadian Entitlement was to be attributed to the six Federal and five non-Federal downstream hydroelectric projects. The CEAAs have been extended until 2024.

B.1.2.2 Migratory Bird Treaty Act of 1918

The Migratory Bird Treaty Act of 1918, as amended, is intended to protect birds that have common migration patterns between the United States and Canada, Mexico, Japan, and Russia. The law regulates the harvest of migratory birds by specifying factors such as the mode of harvest, hunting seasons, and bag limits. This Act stipulates that, except as permitted by regulations, it is unlawful at any time, by any means, or in any manner to "kill … any migratory bird." The Service is the lead agency in implementation and enforcement of this Act; other agencies consult with the Service regarding impacts to migratory birds and to evaluate ways to avoid or minimize impacts in accordance with the Service migration policy.

B.1.2.3 Pacific Salmon Treaty Act of 1985

The Pacific Salmon Treaty Act of 1985 ratified a treaty between the United States and Canada concerning Pacific salmon. The law is intended to protect and maintain Pacific salmon fisheries by regulating the fishing season. The law establishes panels with jurisdiction over certain areas. Associated regulations close the panel area to sockeye and pink salmon fishing unless opened by panel regulations or by in-season orders of the Secretary of Commerce that give effect to panel orders.

B.1.3 Federal Natural Resource Management, Cultural Resource Laws, Water Management, and Pollution Control

B.1.3.1 American Indian Religious Freedom Act of 1978

The American Indian Religious Freedom Act of 1978 reaffirms American Indians' religious freedom under the First Amendment and sets United States policy to protect and preserve the inherent and constitutional right of American Indian Tribes to believe, express, and exercise traditional religions.

This Act also requires that Federal agencies avoid interfering with access to sacred locations and traditional resources that are integral to the practice of religion.

B.1.3.2 Archeological and Historic Preservation Act of 1974

The Archaeological and Historic Preservation Act of 1974, as amended, protects sites that have historic and prehistoric importance.

B.1.3.3 Archaeological Resources Protection Act of 1979

The Archaeological Resources Protection Act of 1979, as amended, requires a permit for any excavation or removal of archaeological resources from Federal or Indian lands. Excavations must be undertaken for the purpose of furthering archaeological knowledge in the public interest, and resources removed are to remain the property of the United States. Consent must be obtained from the Indian Tribe or the Federal agency having authority over the land on which a resource is located before issuance of a permit; the permit must contain terms and conditions requested by the Tribe or Federal agency.

B.1.3.4 Bald and Golden Eagle Protection Act of 1972

The Bald and Golden Eagle Protection Act of 1972, as amended, makes it unlawful to take, pursue, molest, or disturb bald and golden eagles, their nests, or their eggs anywhere in the United States. A permit must be obtained from the Department of the Interior (DOI) to relocate a nest that interferes with resource development or recovery operations.

B.1.3.5 Clean Air Act of 1970

The Clean Air Act of 1970, as amended, is intended to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population." Section 118 of the Act requires each Federal agency with jurisdiction over properties or facilities engaged in any activity that might result in the discharge of air pollutants to comply with all Federal, state, interstate, and local requirements with regard to the control and abatement of air pollution.

B.1.3.6 Clean Water Act of 1977

The Clean Water Act (CWA) of 1977, as amended, was enacted to "restore and maintain the chemical, physical and biological integrity of the Nation's water." The CWA prohibits "discharge of toxic pollutants in toxic amounts" to navigable waters of the United States. Section 313 of the CWA requires all branches of the Federal government with jurisdiction over properties or facilities engaged in any activity that might result in a discharge or runoff of pollutants to surface waters, to comply with Federal, state, interstate, and local requirements. Section 404 of the CWA authorizes the Army Corps of Engineers (ACOE) to regulate, through permits, the discharge of dredged or fill material into waters of the United States, including wetlands. Section 10 of the Rivers and Harbors Act of 1899 authorizes the ACOE to regulate, through permits, structures and work in navigable waters of the United States.

B.1.3.7 Electric Consumers Protection Act of 1986

The Electric Consumers Protection Act amended the Federal Power Act (see Section C.1.3.13 below) to provide additional environmental protections in the licensing of hydroelectric projects (including the transmission lines and corridors). Each license is to include conditions to protect, mitigate, and enhance fish and wildlife affected by the project. These conditions are to be based on recommendations received from the Service, NOAA-Fisheries, Federal land managers on whose land the project sits, and state fish and wildlife agencies (16 U.S.C. § 803(j)(1)). The Federal Energy Regulatory Committee (FERC) is empowered to resolve any instances in which such recommendations are viewed as inconsistent while according "due weight to the recommendations, expertise and statutory responsibilities" of the resource agencies.

B.1.3.8 Endangered Species Act of 1973

The Endangered Species Act of 1973, as amended, is intended to prevent the further decline of endangered and threatened species and to restore those species and their habitats. This Act is jointly administered by the Departments of Commerce and Interior. Section 7 of this Act requires agencies to consult with the Service or the NOAA-Fisheries. This consultation determines whether endangered and threatened species or critical habitats are known to be in the vicinity of a proposed action and whether an action will adversely affect listed species or designated critical habitats.

B.1.3.9 Federal Insecticide, Fungicide, and Rodenticide Act of 1972

The Federal Insecticide, Fungicide, and Rodenticide Act of 1972, as amended, governs the storage, use, and disposal of pesticides through product labeling, registration, and user certification.

B.1.3.10 Federal Power Act of 1920

The original Federal Power Act provides for cooperation between FERC and other Federal agencies, including resource agencies, in the licensing of hydropower projects. FERC is authorized to issue licenses to construct, operate and maintain dams, water conduits, reservoirs and transmission lines to improve navigation and to develop power from any streams or other bodies of water over which it has jurisdiction. Following 1986 amendments (see Section B.1.3.7 above, Electric Consumer Protection Act), in deciding whether to issue a license, FERC is required to give "equal consideration" to the following purposes: power and development; energy conservation; protection, mitigation of damage to, and enhancement of, fish and wildlife (including spawning grounds and habitat); protection of recreational opportunities; and preservation of other aspects of environmental quality.

B.1.3.11 Federal Water Pollution Control Act Amendments of 1972

The Federal Water Pollution Control Act Amendments of 1972 is the predecessor Federal statute to the Clean Water Act of 1977.

B.1.3.12 Fish and Wildlife Conservation Act of 1980

The Fish and Wildlife Conservation Act of 1980, as amended, encourages all Federal entities (in cooperation with the public) to protect and conserve the nation's fish and wildlife.

B.1.3.13 Fish and Wildlife Coordination Act of 1934

The Fish and Wildlife Coordination Act of 1934, as amended, promotes more effectual planning and cooperation between Federal, state, public, and private agencies for the conservation and rehabilitation of the nation's fish and wildlife and authorizes the DOI to provide assistance.

B.1.3.14 Historic Sites, Buildings, and Antiquities Act of 1965

The Historic Sites, Buildings, and Antiquities Act of 1965 sets national policy to preserve historic sites, buildings, and antiquities for the inspiration and benefit of the United States' citizens.

B.1.3.15 National Environmental Policy Act of 1969

NEPA, as amended, establishes a national policy that encourages awareness of the environmental consequences of human activities and promotes consideration of those environmental consequences during the planning and implementing stages of a project. Under NEPA, Federal agencies are required to prepare detailed statements to address the environmental effects of proposed major Federal actions that might significantly affect the quality of the human environment.

B.1.3.16 National Historic Preservation Act of 1966

The National Historic Preservation Act of 1966, as amended, provides for nomination for placement of sites with significant national historic value on the National Register of Historic Places (NPS 1988). Permits and certifications are not required under this Act; however, consultation with the Advisory Council on Historic Preservation is required if a Federal undertaking might impact a historic property resource. This consultation generally results in an MOA that includes stipulations to minimize adverse impacts to the historic resource. Coordination with the State Historic Preservation Office is undertaken to ensure that potentially significant sites are properly identified and appropriate mitigation measures are implemented.

B.1.3.17 National Wildlife Refuge System Administration Act of 1966 (Amended by the National Wildlife Refuge System Improvement Act of 1997)

The National Wildlife Refuge System Administration Act of 1966, as amended, provides guidelines and directives for the administration and management of all lands within the system, including "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." The Secretary of the Interior is authorized to permit by regulations the use of any area within the system provided "such uses are compatible with the major purposes for which such areas were established."

B.1.3.18 Native American Graves Protection and Repatriation Act of 1990

The Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 directs the Secretary of the Interior to guide Federal agencies in the repatriation of Federal archaeological collections and collections affiliated culturally to American Indian Tribes, which are currently held by museums receiving Federal funding. This Act established statutory provisions for the treatment of inadvertent discoveries of American Indians' remains and cultural objects. Specifically, when discoveries are made during ground-disturbing activities, the following must take place: 1) activity in

the area of the discovery must cease immediately; 2) reasonable efforts must be made to protect the items discovered; 3) notice of discovery must be given to the Service Director and the appropriate Tribes; and 4) a period of 30 days must be set aside following notification for negotiations regarding the appropriate disposition of these items.

B.1.3.19 Occupational Safety and Health Act of 1970

The Occupational Safety and Health Act of 1970, as amended, establishes standards to enhance safe and healthy working conditions in places of employment throughout the United States. The Act is administered and enforced by the Occupational Safety and Health Administration (OSHA), an agency of the United States Department of Labor. Although the OSHA and the EPA both have a mandate to limit exposures to toxic substances, the jurisdiction of the OSHA is limited to safety and health conditions in the workplace. In general, each employer is required to furnish a place of employment free of recognized hazards likely to cause death or serious physical harm to all employees. The OSHA regulations establish specific standards telling employers what must be done to achieve a safe and healthy working environment. Employees have a duty to comply with these standards and with all rules, regulations, and orders issued by OSHA.

B.1.3.20 Pacific Northwest Electric Power Planning and Conservation Act of 1980

The Pacific Northwest Electric Power Planning and Conservation Act created the Northwest Power and Conservation Council (Council)—an interstate compact agency—and directed the Council to put fish and wildlife mitigation and enhancement on a par with hydroelectric power generation in the operation of the Federal Columbia River Power System. The goals of the Act include: 1) ensuring an adequate, efficient, economical and reliable power supply; and 2) protecting, mitigating and enhancing fish and wildlife harmed by hydroelectric projects. The Council is responsible for promulgating a Regional Power Plan and a Fish and Wildlife Program. When developing its Fish and Wildlife Program, the Council defers to the recommendations of fish and wildlife managers, i.e., agencies and the Tribes.

The Act includes a duty for Federal agencies that manage, operate, or regulate hydroelectric facilities in the Columbia Basin to provide “equitable treatment” for fish and wildlife with the other purposes for which the hydropower facilities are managed and operated. The Council describes equitable treatment as “meet[ing] the needs of salmon with a level of certainty comparable to that accorded the other operational purposes.”

B.1.3.21 Wild and Scenic Rivers Act of 1968

The Wild and Scenic Rivers Act of 1968, as amended, protects selected national rivers possessing outstanding scenic, recreational, geological, fish and wildlife, historical, cultural, or other similar values. These rivers are to be preserved in a free-flowing condition to protect water quality and for other vital national conservation purposes. This Act also instituted a National Wild and Scenic Rivers System, designated the initial rivers within the system, and developed standards for the addition of new rivers in the future. In accordance with this Act, the Secretary of the Interior has directed that all DOI agencies conduct assessments of their rivers for eligibility into the National Wild and Scenic Rivers System as part of land planning processes.

B.1.3.22 Wilderness Act of 1964

The Wilderness Act of 1964, as amended, was intended to " … assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition …." Per DOI and Service policy, DOI lands are to be assessed for their potential as additions to the National Wilderness Preservation System as part of normal land planning processes.

B.2 State Laws

State and local statutes also apply to activities on CNWR when Federal law delegates enforcement or implementation authority to state or local agencies. In general, state laws do not apply to the Federal government based on the National Supremacy Clause that reads, "This constitution, and the laws of the United States which shall be made in pursuance thereof; and all treaties made, or which shall be made, under the authority of the United States, shall be the supreme law of the land; and the judges in every state shall be bound thereby, any thing in the constitution or laws of any state to the contrary notwithstanding" (Article 4, U.S. Constitution).

B.2.1 Growth Management Act of 1989

Most planning by local governments falls under the State of Washington Growth Management Act (GMA), which established a statewide planning framework and created roles and responsibilities for planning at the local, regional, and state levels. The GMA required the largest and fastest growing counties (counties with more than 50,000 people or with a population growth of more than 20 percent in the past 10 years) and cities within those counties to develop new comprehensive plans. Counties not required to plan may elect to do so. Adams and Grant Counties have elected to plan under the GMA requirements. Jurisdictions under GMA must prepare comprehensive plans that project growth for a minimum of twenty years.

B.2.2 Shoreline Management Act of 1971

The Shoreline Management Act of 1971 uses authority passed to the state by the Federal Rivers and Harbors Act of 1899. Section 10 of the Rivers and Harbors Act prohibits the unauthorized obstruction or alteration of any navigable waters of the United States. Examples of activities requiring a United States Army Corps of Engineers permit include constructing a structure in or over any waters of the United States, excavation or deposit of material in such waters, and various types of work performed in such waters, including fill and stream channelization. The state is considered the owner of all navigable waterways within its boundaries.

The state has passed regulatory responsibility for the Shoreline Management Act to the affected county. Counties in Washington State regulate the shoreline (i.e., from the high-water mark to the low-water mark) through each county's Shoreline Management Master Plan and a shoreline permit system consistent with WDOE guidelines.

B.2.3 State Environmental Policy Act of 1971

The Washington State legislature enacted the State Environmental Policy Act of 1971 (SEPA). The statute was amended in 1983, and new implementing regulations (the SEPA rules) were adopted and codified by the WDOE in 1984 as Washington Administrative Code 197-11. The purpose and policy sections of the statute are extremely broad, including recognition by the legislature that "each person has a fundamental and inalienable right to a healthful environment …." SEPA contains a substantive mandate that "policies, regulations, and laws of the State of Washington shall be interpreted and administered in accordance with the policies set forth."

The SEPA applies to all branches of state government, including state agencies, municipal and public corporations, and counties. It requires each agency to develop procedures implementing and supplementing SEPA requirements and rules. Although the SEPA does not apply directly to Federal actions, the term "government action" with respect to state agencies is defined to include the issuance of licenses, permits, and approvals. Thus, as in the NEPA, proposals (Federal, state, or private) are evaluated, and may be conditioned or denied through the permit process, based on environmental considerations. The SEPA does not create an independent permit requirement, but overlays all existing agency permitting activities.

B.3 Executive Orders

This section identifies Presidential Executive Orders that clarify issues of national policy and provide guidelines relevant to CNWR land-use planning.

B.3.1 Executive Order 11593, Protection and Enhancement of the Cultural Environment

Executive Order 11593 requires Federal agencies to direct their policies, plans, and programs in a way that preserves, restores, and maintains federally owned sites, structures, and objects of historical or archaeological significance.

B.3.2 Executive Order 11988, Floodplain Management

Executive Order 11988 directs Federal agencies to establish procedures to ensure that the potential effects of flood hazards and floodplain management are considered for actions undertaken in a floodplain. This order further directs that floodplain impacts are to be avoided to the extent practicable.

B.3.3 Executive Order 11990, Protection of Wetlands

Governmental agencies are directed by Executive Order 11990 to avoid, to the extent practicable, any short- and long-term adverse impacts on wetlands wherever there is a practicable alternative.

B.3.4 Executive Order 12372, Intergovernmental Review of Federal Programs

Executive Order 12372 applies to state review of NEPA documents and to the coordination of state and Federal NEPA processes. The goal of this Executive Order is to foster an intergovernmental partnership and a strengthened coordination and consultation process.

B.3.5 Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 directs all Federal agencies, to the greatest extent practicable and permitted by law, to achieve environmental justice by identifying and addressing disproportionately high and adverse human health or environmental effects of agency programs, policies and activities on minority populations and low-income populations in the United States and its territories and possessions. This order directs each Federal agency, to the extent permitted by existing law, to develop strategies to identify and address environmental justice concerns. The order further directs each Federal agency, to the extent permitted by existing law, to collect, maintain, analyze, and make available information on the race, national origin, income level, and other readily accessible and appropriate information for areas surrounding facilities or sites expected to have a substantial environmental, human health, or economic effect on the surrounding populations. This action is required when these facilities or sites become the subject of a substantial Federal environmental administrative or judicial action.

B.3.6 Executive Order 13007, Indian Sacred Sites

Executive Order 13007 directs Federal agencies to take measures to protect and preserve American Indian Tribes' religious practices. Federal agencies shall, to the extent practicable and permitted by law, and when consistent with essential agency functions, accommodate access to and ceremonial uses of sacred sites by American Indian Tribes' religious practitioners. Further, the Executive Order states that Federal agencies will comply with presidential direction to maintain government-to-government relations with Tribal governments.

B.3.7 Executive Order 13112, Invasive Species

Issued on February 11, 1999, Executive Order 13112 is intended 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 Executive Order established an Invasive Species Council which created a National Invasive Species Management Plan detailing and recommending performance-oriented goals, objectives and specific measures of success for Federal agencies concerned about invasive species.

B.3.8 Executive Order 13175, Consultation and Coordination with Indian Tribal Governments

Executive Order 13175 further ensures that Federal government agencies recognize the unique legal relationship the United States has with Indian Tribal governments as set forth in the Constitution of the United States, treaties, statutes, other Executive Orders, and court decisions. It once again recognizes the right of Indian Tribes to self-government and to "exercise inherent sovereign powers over their members and territory." It directs Federal agencies to work with Indian Tribes on a government-to-government basis to address issues concerning Indian Tribal self-government, Tribal trust resources, and Indian Tribal treaty and other rights.

B.4 Presidential and Executive Branch Policies

President Clinton issued a memorandum to the heads of executive departments and agencies regarding government-to-government relations with Tribal governments on April 29, 1994. This memorandum directed executive departments and agencies to implement activities that affect Tribal rights in a "knowledgeable, sensitive manner respectful of tribal sovereignty." The memorandum outlined principles for executive departments and agencies to follow in their interactions with Tribal governments and clarified the responsibility of the Federal government to operate within a government-to-government relationship with federally recognized American Indian Tribes.

The United States Department of Justice reaffirmed a long-standing policy regarding the relationship between the Federal government and American Indian Tribes (61 FR 29424). The policy states that the United States recognizes the sovereign status of Indian Tribes as "domestic dependent nations" from its earliest days. The Constitution recognizes Indian sovereignty by classifying Indian treaties among the "supreme Law of the Land," and establishes Indian affairs as a unique area of Federal concern.

The Service American Indian policy commits the Service to working with Tribal governments on a government-to-government basis, recognizes the Federal trust relationship with Tribes and Tribal members' treaty rights, and commits the Service to consultation with Tribes regarding agency activities that could potentially affect the Tribes.

Appendix C. Appropriate Use Findings

The Appropriate Refuge Uses Policy (603 FW 1 [2006]) outlines the process that the Service uses to determine whether a public use on a refuge may be considered an appropriate. Priority public uses previously defined as wildlife-dependent uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation) under the National Wildlife Refuge System Improvement Act of 1997 are generally exempt from appropriate use review. Other exempt uses include situations where the Service does not have adequate jurisdiction to control the activity and refuge management activities. The appropriate use policy provides refuge managers with a consistent procedure to first screen and then document decisions concerning a public use. When a use is determined to be appropriate, a refuge manager must then decide if the use is compatible with a refuge's purpose(s) before allowing it on a refuge. The policy also requires review of existing public uses. During the CCP process, the Refuge Manager evaluates all existing and proposed Refuge uses at Columbia National Wildlife Refuge (CNWR) using the following guidelines and criteria as outlined in the appropriate use policy:

- Do we have jurisdiction over the use?
- Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)?
- Is the use consistent with applicable Executive Orders and Department and Service policies?
- Is the use consistent with public safety?
- Is the use consistent with goals and objectives in an approved management plan or other document?
- Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?
- Is the use manageable within available budget and staff?
- Will this be manageable in the future within existing resources?
- Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?
- Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality, compatible, wildlife-dependent recreation into the future?

Using this process and these criteria, and as documented on the following pages, the Refuge Manager determined the following uses are appropriate: biking, boating, farming, grazing, hiking, horseback riding, mosquito and other vector control, picnicking, and research. The uses found not appropriate are camping, rock climbing and bouldering, and swimming.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Columbia National Wildlife Refuge

Use: Biking

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

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

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

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

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

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

Not Appropriate____ **Appropriate** ✔

Refuge Manager: Mary M. Howland Date: 9/26/11

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

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

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

Refuge Supervisor: Date: 9/27/11

A compatibility determination is required before the use may be allowed.
The compatibility determination (CD) for this activity, and any corresponding stipulations, can be found in the CD for Interpretation, Environmental Education, Wildlife Observation, and Photography in Appendix D.

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Biking Rationale: CNWR has an extensive system of roads open to the public, and wildlife observation from these roads, either by automobile or bicycle, is consistent with protection of Refuge resources and augments the public uses of wildlife observation, photography, environmental education, and interpretation. In fact, under Goal 6, interpretive programs will likely be developed for motorized and non-motorized vehicle touring.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Columbia National Wildlife Refuge

Use: Boating

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

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

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

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

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

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

Not Appropriate_____ **Appropriate** ✔

Refuge Manager: Mary M. Howland Date: 9/26/11

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

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

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

Refuge Supervisor: _____ Date: 9/27/11

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

The compatibility determination (CD) for boating, and any stipulations, can be found in the CD for Fishing. The CD for canoeing, and any stipulations, can be found in the CD for Interpretation, Environmental Education, Wildlife Observation, and Photography in Appendix D.

FWS Form 3-2319
02/06

Boating Rationale: CNWR has an established a canoe trail to promote wildlife observation and photography, and such use is compatible with Refuge purposes with certain stipulations. Boating, both motorized and non-motorized, augments fishing on many lakes within CNWR and can be accomplished while still protecting Refuge resources. Without boating, many "Big 6" uses would be curtailed or degraded.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Columbia National Wildlife Refuge

Use: Camping

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

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

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

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

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

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

Not Appropriate ✔ Appropriate ___

Refuge Manager: Jeffrey M. Howland Date: 9/26/11

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

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

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

Refuge Supervisor: [signature] Date: 9/27/11

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

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Camping Rationale: While camping is consistent with Service policies when part of a wildlife-dependent activity, the general approach is not to allow the use if there are nearby opportunities for the use. In this case, camping is allowed at the nearby Mardon Resort. However, even if the opportunity were not found nearby, camping would not be appropriate on CNWR due to a shortage of staff and budgetary resources. Maintaining a campground is an expensive, time-consuming undertaking. Based on staff and budget projections, camping is too expensive to maintain. If camping at CNWR substantially contributed to the mission of the Service, or was crucial to the public's understanding and appreciation of the Refuge's resources, money and staff could be diverted from other programs. However, camping does neither.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Columbia National Wildlife Refuge

Use: Farming

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

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

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

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

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

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

Not Appropriate____ **Appropriate** ✔

Refuge Manager: Amy M. Howland Date: 9/26/11

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

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

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

Refuge Supervisor: Date: 9/27/11

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

FWS Form 3-2319
02/06

Farming Rationale: Farming provides food for the Refuge purpose species, waterfowl and other migratory birds, and for one of the Refuge's premier species, lesser sandhill cranes. Managing this use is time consuming and cannot be adequately managed with existing staff and budgets. Our current cooperative farmers are well-versed in farming practices and regulations on CNWR, and so the program has lessened the time commitment required of staff. This is likely to change in the future, however, as these farmers retire or quit farming the Refuge, which will increase the time required to manage the program as new farmers take their places. However, due to its value to migratory birds, this use is one that should be continued despite the trade-off whereby resources will need to be pulled from other management activities. The apparent return on investment warrants continuing this use at this time.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Columbia National Wildlife Refuge

Use: Grazing

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

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

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

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

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

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

Not Appropriate ___ Appropriate ✔

Refuge Manager: Jeffrey M. Haverland Date: 9/26/11

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

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

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

Refuge Supervisor: [signature] Date: 9/27/11

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

FWS Form 3-2319
02/06

Grazing Rationale: Grazing can be an effective tool to control certain invasive species and to set back succession to desired levels. It can also be used to create conditions favorable for target species like Washington ground squirrels and long-billed curlews.

Managing a grazing program, including the infrastructure, is expensive and time consuming. However, the Service does not have the resources (fencing), budget, or staff to prevent grazing; Washington is an open range state. It would be more expensive to fence the Refuge than to continue to allow grazing, and grazing does accomplish certain management objectives.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Columbia National Wildlife Refuge

Use: Hiking

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

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

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

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

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

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

Not Appropriate_____ **Appropriate** ✔

Refuge Manager: Mary M. Hovland Date: 9/26/11

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

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

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

Refuge Supervisor: [signature] Date: 9/27/11

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

The compatibility determination (CD) for this activity, and any corresponding stipulations, can be found in the CD for Interpretation, Environmental Education, Wildlife Observation, and Photography in Appendix D.

FWS Form 3-2319
02/06

Hiking Rationale: Hiking, with the appropriate stipulations and restrictions, allows "Big 6" uses like hunting, fishing, wildlife observation and photography. In addition, many of CNWR's existing and proposed interpretive and educational facilities and programs are centered around foot travel. Done correctly, hiking is fully compatible with protection of CNWR's natural and cultural resources.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Columbia National Wildlife Refuge

Use: Horseback Riding

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

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

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

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

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

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

Not Appropriate____ Appropriate ✔

Refuge Manager: Jeffrey M. Haverland Date: 9/26/11

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

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

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

Refuge Supervisor: [signature] Date: 9/27/11

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

FWS Form 3-2319
02/06

Horseback Riding Rationale: Horseback riding, with the appropriate stipulations and restrictions, allows "Big 6" uses like hunting, wildlife observation, and photography. However, except for special circumstances, the impacts of horse use in a desert environment restrict use to existing roads.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Columbia National Wildlife Refuge

Use: Mosquito and Other Vector Control

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

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

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

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

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

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

Not Appropriate ____ Appropriate ✔

Refuge Manager: [signature] Date: 9/26/11

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

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

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

Refuge Supervisor: [signature] Date: 9/27/11

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

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Mosquito Rationale: While not desirable, the need for public safety through protection against vector-borne diseases makes this use appropriate under stringent conditions and at appropriate times.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Columbia National Wildlife Refuge

Use: Picnicking

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

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

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

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

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

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

Not Appropriate____ **Appropriate** ✔

Refuge Manager: Mary M. Hourland Date: 9/26/11

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

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

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

Refuge Supervisor: Date: 9/27/11

A compatibility determination is required before the use may be allowed.
The compatibility determination (CD) for this activity, and any corresponding stipulations, can be found in the CD for Interpretation, Environmental Education, Wildlife Observation, and Photography in Appendix D.

FWS Form 3-2319
02/06

Picnicking Rationale: Picnicking is not normally an appropriate use. However, on CNWR the existing Soda Lake Campground has tables, sun shelters, restrooms, etc. Camping does not pass the appropriateness test, so the question becomes what to do with the facilities at Soda Lake? The obvious, most cost-effective, most efficient solution is to convert the campground to a day-use area. Picnicking would be only one of the uses permitted there, and would be secondary to using the site as a base for other appropriate uses, such as environmental education, wildlife observation, etc. The area is heavily used as a lunch stop by school groups on educational trips, anglers, hunters, bird watchers, etc.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Columbia National Wildlife Refuge

Use: Research

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

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

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

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

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

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

Not Appropriate_____ Appropriate ✔

Refuge Manager: Mary M. Hawland Date: 9/26/11

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

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

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

Refuge Supervisor: [signature] Date: 9/27/11

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

FWS Form 3-2319
02/06

Research Rationale: Research is critical to achieving many of the goals, objectives and strategies outlined in this CCP.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Columbia National Wildlife Refuge

Use: Rock Climbing and Bouldering

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

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

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

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

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

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

Not Appropriate ✔ **Appropriate** ___

Refuge Manager: Mary M. Hourland Date: 9/26/11

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

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

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

Refuge Supervisor: _____ Date: 9/27/11

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

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Rock Climbing Rationale: There is no reasonable connection with a wildlife-dependent use of the Refuge, and the actual and possible detrimental impacts to wildlife, habitats, cultural sites, and geology do not justify this use of CNWR.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Columbia National Wildlife Refuge

Use: Swimming

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

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

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

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

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

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

Not Appropriate ✔ Appropriate ___

Refuge Manager: Jeffrey M. Fowland Date: 9/26/11

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

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

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

Refuge Supervisor: [signature] Date: 9/27/11

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

FWS Form 3-2319
02/06

Swimming Rationale: The use does not significantly contribute to an appreciation of CNWR's resources and is not needed to accomplish any particular wildlife-dependent use of the Refuge. Due to public safety concerns and a lack of staff to oversee the activity, it is not an appropriate use of CNWR.

Appendix D. Compatibility Determinations

D.1 Introduction

The compatibility determinations (CDs) we developed during the CCP planning process evaluate uses projected to occur on the Columbia National Wildlife Refuge (CNWR). There is also an evaluation of funds needed for management and implementation of each use. Chapter 4 of the CCP also contains analysis of the impacts of public uses to wildlife and habitats. That portion of the document is incorporated through reference into this set of CDs.

D.1.1. Uses Evaluated At This Time

The following section includes full CDs for all refuge uses that are required to be evaluated at this time. According to Service policy, CDs will be completed for all uses proposed under a CCP that have been determined to be appropriate (see Appendix C). Existing wildlife-dependent recreational uses must also be reevaluated 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 reevaluated 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 D.1 Summary of Compatible Use Determinations

Page #	Refuge Use	Compatible	Next Year Due for Re-evaluation
D-4	Camping	No	N/A
N/A	Farming – CD prepared in 2006	Yes	2016
N/A	Grazing – CD prepared in 2006	Yes	2016
D-14	Fishing and Fish Stocking	Yes	2026
D-28	Horseback Riding	Yes	2021
D-35	Migratory Bird, Upland Game Bird, and Deer Hunting	Yes	2026
D-43	Interpretation, Environmental Education, Wildlife Observation, and Photography	Yes	2026
D-54	Mosquito/Vector Control	Yes	2021
D-73	Research	Yes	2021

D.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 refuges. Compatibility is not new to the NWRS 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, 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 compatibility policy, uses are defined as recreational, economic/commercial, or management use of a refuge by the public or a non-NWRS 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 Improvement Act of 1997 (Improvement Act), were adopted by the Service in October 2000 (http://refuges.fws.gov/policymakers/nwrpolicies.html). The regulations require that a use must be compatible with both the mission of the NWRS and the purposes of the individual refuge. This standard helps to ensure consistency in application across the NWRS. The Act also requires that CDs be in writing and that the public have an opportunity to comment on most use evaluations.

The NWRS 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 NWRS 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 1997). Evaluations of the existing uses on the CNWR are based on the professional judgment of Refuge and planning personnel including observations of Refuge uses and reviews of appropriate scientific literature.

D.2 Compatibility Determination – Camping

Use: Camping

Refuge Name: Columbia National Wildlife Refuge (CNWR)

Establishing and Acquisition Authorities

The CNWR was established June 13, 1944, when the first parcel of land was purchased under the authority granted the Migratory Bird Conservation Commission (Migratory Bird Conservation Act of 1929); the purchase was approved at the August 1943 meeting of the Commission. Subsequently, on September 6, 1944, Public Land Order 243 expanded the CNWR. Pursuant to land acquisition authorities granted the Secretary of the Interior through Executive Order 9337 (April 24, 1943), Public Land Order 243 dictated that " … the following-described public lands in Washington are hereby withdrawn … for the use of the Department of the Interior as a refuge … [Columbia National Wildlife Refuge]."

Refuge Purposes

National wildlife refuges are established " … for the development, advancement, management, conservation, and protection of fish and wildlife resources … " (16 U.S.C. §742f(a)(4)) and also " … 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. §42f(b)(1); Fish and Wildlife Act of 1956, 16 U.S.C. §742(a)-754, as amended).

CNWR was established " … as a refuge and breeding ground for migratory birds and other wildlife" and as " … an inviolate sanctuary, or for any other management purpose, for migratory birds."

National Wildlife Refuge System Mission

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

Description of Use

CNWR currently manages two campgrounds: Soda Lake and Bluebird.

Bluebird Campground is a secluded, primitive site off Morgan Lake Road with a portable toilet (seasonal), pavilion shelter, picnic tables, and dirt parking lot. The campground has no fee, but does require a special use permit (SUP). Boy scouts, school groups, and other youth organizations use the facilities.

Soda Lake Campground is a semi-primitive, first-come, first-served facility with 10 sites consisting of an area for tent camping, sun shelter, and picnic table. The campground is used primarily from spring through summer, but is open year-round. Portable toilets are provided year-round, with additional toilet facilities added in the spring and summer. A boat launch for fishing (managed by the

Bureau of Reclamation) is provided nearby on the west side of Soda Lake, with another one located further south off of the Soda Lake Dike. The campground is also the staging area for spring environmental education programs, run by the Central Basin Audubon Society in conjunction with the Service. Campers are charged a nightly fee of $5.00/site, and current regulations allow for a maximum stay of 14 days within 30 days.

The Service does not have use numbers for either campground, but approximately four SUPs are issued annually for the Bluebird Campground.

Availability of Resources

CNWR is open for many public uses, including hunting, environmental education and interpretation, wildlife photography and wildlife observation, which the campgrounds support. However, access trails, parking lots, signs, and other facilities are inadequate, as are staff resources, to enforce regulations and maintain these facilities. The costs outlined in Table D.2 would be required to administer and manage camping on CNWR.

Table D.2

Activity or Project	One-Time Expense	Recurring Expense
Law Enforcement		$15,000
Development/Maintenance of Parking and Trails		$1,500
Placement and Maintenance of Signs		$500
Outreach, Education, Monitoring		$15,000
Development/Maintenance of Accessible Sites		$300
Waste Management		$5,400
Totals		**$37,700**

Current staffing is not adequate to meet the needs of operating this campground in a compatible manner. Resources are not available to regularly clean facilities, pick up garbage, handle the disposal of garbage, control weeds and maintain grounds.

Anticipated Impacts of the Use

In general, camp sites tend to develop social trailing, which impact soils and vegetation around the site. This is certainly true at the Soda Lake Campground. This social trailing brings an increased potential for erosion, soil compaction (Liddle 1975), reduced seed emergence (Cole and Landres 1995), alteration of vegetative structure and composition, and sediment loading (Cole and Marion 1988).

Camping may result in increased runoff into streams due in part to exposed soils and reductions in vegetation (Green 1998). Even low levels of hiking or camping activity have been shown by research

to cause substantial degradation to vegetation and soils (Cole in Farrell and Marion 2002). Foot trails leading from the campground to shoreline fishing areas erode the streambank and impact shoreline vegetation, causing further erosion from seasonal high water levels.

Soil compaction occurs in areas used for camping, resulting in reduced vegetative reproduction and pioneering of invasive weed species (Liddle 1975). Use of a campsite as infrequently as one night per year is sufficient to cause measurable impacts in many vegetation types, but usually results in height reduction rather than cover loss (Cole 1995). The amount of impact generally increases with an increase of use, but not proportionally. Four times the amount of use did not result in four times the amount of cover and height reduction (Cole 1995).

Human waste disposal is a concern at the campgrounds, stemming from a failure to follow sanitation regulations. In one study, water quality in streams, measured by total coliform bacteria counts adjacent to camps, was negatively affected by weekend campsite use that revealed higher coliform counts (Christensen et al. 1978). In this western Washington study, bacteria were rapidly transmitted to the river water, even in dry periods. The presence of the toilets at the Soda Lake and Bluebird Campgrounds reduces, but does not eliminate, the risks of coliform entering the nearby water resources due mainly to a full compliance in using the toilets. Vandalism (i.e., tipping over the portable toilets) both spreads waste and creates the situation whereby campers and other users "use the bushes."

Likewise, litter, dispersion of pollutants and other illegal activities is also a concern at the campgrounds. Campers—especially anglers[1]—regularly discard baitcups, trash, and other litter items at the campsite or along the adjacent shorelines while fishing and recreating. Use of detergent, soap and toothpaste in streams and lakes harms fish and other aquatic life. Campers often leave other undesirable items (straw, couches, mattresses, chairs, etc.). Illegal removal of natural objects (plants, antlers, live animals, etc.) and cultural objects may result from camper visits. Creation of "improvements" (lean-tos, tables, chairs, game poles, etc.) and alteration of the site (trenching) are also byproducts of camping. Food from campsites may increase small mammal densities (Clevenger and Workman 1977; Foin et al. 1977) and increase mammalian predators.

Human activities can directly affect wildlife through purposeful or inadvertent harassment, a form of disturbance that can cause physiological effects, behavioral modifications, or death (Smith and Hunt 1995). Numerous studies have confirmed that the presence of people can cause a variety of disturbance reactions in wildlife, including flushing or displacement (Erwin 1989; Fraser et al. 1985; Freddy 1986), heart rate increases (MacArthur et al. 1982), altered foraging patterns (Burger and Gochfeld 1991), and even, in some cases, diminished reproductive success (Boyle and Samson 1985).[2] These studies and others have shown that the severity of the effects depends upon the distance to the disturbance and its duration, frequency, predictability, and visibility to wildlife (Knight and Cole 1991).

Birds are especially vulnerable to human activities when they are disturbed and flushed from feeding, resting, or nesting areas. Flushing, especially repetitive flushing, can strongly impact habitat use patterns of many bird species. Flushing from an area can cause birds to expend more energy, be deterred from using desirable habitat, affect resting or feeding patterns, increase exposure to

[1] This is an anecdotal observation based from FWS staff who have been on CNWR for years; no studies have been completed.
[2] Based on this information, it is likely that horseback riding and bicycling would have similar impacts.

predation, or cause abandonment of sites (Smith and Hunt 1995). Migratory birds are observed to be more sensitive than resident species to disturbance (Klein 1989). Herons and shorebirds were observed to be the most easily disturbed (when compared to gulls, terns and ducks) by human activity and flush to distant areas away from people (Burger 1981). A reduced number of shorebirds were found near people who were walking or jogging, and about 50 percent of flushed birds flew elsewhere (Burger 1981). In addition, the foraging time of sanderlings decreased, and avoidance (e.g., running, flushing) increased as the number of humans within 300 feet increased at a coastal bay refuge on the Atlantic (Burger and Gochfeld 1991).

Nest predation for songbirds (Miller et al. 1998), raptors (Glinski 1976), colonial nesting species (Buckley and Buckley 1976), and waterfowl (Boyle and Samson 1985) tends to increase in areas more frequently visited by people. In addition, for many passerine species, primary song occurrence and consistency can be impacted by a single visitor (Gutzwiller et al. 1994). This could potentially limit the number of breeding pairs of certain passerine species, thus limiting production within riparian habitats (Reijnen and Foppen 1994).

Wildlife disturbance results from the presence of campers and their pets[3] throughout the day and night, especially during the breeding season for nesting migratory birds. In their study comparing bird use of campground and non-campground riparian sites, Blakesley and Reese (1988) found that differences in avian community composition appeared related to nesting substrate, cover and foraging substrate. Bird species missing from campgrounds were ground or shrub nesting species and ground foraging species likely as a result of a sparsely vegetated understory. Some bird species sensitive to human disturbance may avoid campgrounds while more common and widespread species favor them (Garton et al. 1977). In a study of land use effects on breeding birds on the Snake River, Saab (1996) found that overall bird abundance was significantly reduced in recreation areas, while species richness and composition were similar among land use types. In Arizona, Aitchison (1977) found that breeding bird densities were similar between a campground when closed to campers and a relatively natural area; however, bird species composition differed between sites, the campground having relatively heavier bodied bird species. Once the campground was opened for human use, the breeding bird population decreased in density and diversity, while on the natural site, the bird population remained the same.

In Yosemite National Park, California, Garton et al. (1977) reported that the campground forest had less litter, grass and forb cover, log cover, and fewer trees under 25-feet than non-campground forest. The reduced vegetation was due primarily to campground visitors trampling vegetation, littering and cutting up logs and trees for firewood. The campground forest became more like a meadow-forest margin favoring Brewer's blackbirds, brownheaded cowbirds, and American robins—edge species that take advantage of human food sources. In the long term, the effects of continuous campground use will mean the area will support a much-reduced bird community in terms of species richness, diversity and density. Only the most strongly human-attracted species, such as European house sparrows, starlings, and brown-headed cowbirds, would likely benefit from the campsite (Garton et al. 1977). While it is uncertain that this situation would apply to the desert-like conditions on CNWR, it is certainly a cautionary tale and must be considered.

Dogs associated with campers also elicit a greater response from wildlife than pedestrians alone would (Hoopes 1993; MacArthur et al. 1982). In the case of birds, the presence of dogs may flush

[3] Although pets must be leashed at all times, this rule is frequently broken. Dogs and cats are also seen as predators by wildlife.

incubating birds from nests (Yalden and Yalden 1990), disrupt breeding displays (Baydack 1986), disrupt foraging activity in shorebirds (Hoopes 1993), and disturb roosting activity in ducks (Keller 1991). Many of these authors indicated that dogs with people, dogs on leash, or loose dogs provoked the most pronounced disturbance reactions from their study animals. Despite thousands of years of domestication, dogs still maintain instincts to hunt and chase. Given the appropriate stimulus, those instincts can be triggered. Dogs in the campground that become unleashed or not under the control of their owners may disturb or potentially threaten the lives of some wildlife. In effect, off-leash dogs increase the radius of human recreational influence or disturbance beyond what it would be in the absence of dogs. The role of dogs in wildlife diseases is poorly understood. However, dogs host endo- and ectoparasites and can contract diseases from, or transmit diseases to, wild animals. In addition, dog waste is known to transmit diseases that may threaten the health of some wildlife and other domesticated animals. Domestic dogs can potentially introduce various diseases and transport parasites into wildlife habitats (Sime 1999). Disturbance from dogs can be mitigated by enforcing current CNWR regulation 50 CFR 26.21 (b) " … no unconfined domestic animals, including but not limited to dogs … shall be permitted to roam at large …." However, camping increases the likelihood of unleashed dogs and their impacts.

Another concern regarding camping on CNWR is an increased potential for fire. Although fires are not allowed on CNWR, staff must regularly break up fire circles constructed by campers. Campers often, against regulations, cut or dig out vegetation to use as fuel. In addition, CNWR is heavily invaded by cheatgrass (*Bromus tectorum*), an extremely flammable exotic annual grass. Its presence in large quantities constitutes a fire hazard because it cures earlier in the season than native grasses, provides a fire link between low-growing plants and shrubs, creates a uniform blanket of fuel, and ignites readily due to its finely divided stems and pedicels. Wildfires in cheatgrass promote the growth of more cheatgrass, effectively eliminating what remains of native plant communities (Mutch 1967).

The majority of campers seek a peaceful outdoor experience. However, there are campers who use camping as an opportunity to party. Loud motors, music and uncontrolled dogs associated with some camping disturb wildlife and detract from a peaceful outdoor experience for other CNWR visitors. Nighttime activities, including barking dogs, loud sounds and lights, likely disturb wildlife in adjacent habitats.

The campgrounds, and allowing 24-hour access, are also an attractant for gangs. Adams and Grant Counties—in fact, the entire Columbia Basin—has experienced a dramatic upturn in gang membership and gang activities. This has resulted in graffiti (i.e., "tagging"), vandalism and even an attempted murder on CNWR. It cannot be stated conclusively that the campgrounds have any contributory effect to this problem, but there is little doubt that 24 hour access does contribute to the problem, access that would be necessary if the campgrounds were to remain open. Closing the campgrounds has the potential to benefit public safety.

Public Review and Comment

This CD was prepared concurrent with the CNWR's CCP. An open house was held and written comments were solicited from the public during the scoping period for the CCP. Public review and comment were solicited during the draft CCP comment period.

Determination

___X___ The use is not compatible.

_____ The use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility

Not Applicable

Justification

Camping is not listed as one of the wildlife-dependent recreational uses under the National Wildlife Refuge Improvement Act of 1997, as amended. Furthermore, it has been determined that campgrounds at CNWR are not necessary for the safe, practical, and effective conduct of existing wildlife-dependent recreational uses. While a certain portion of campers do participate in fishing activities, campgrounds are not needed to facilitate this single activity.

Currently, funding for the infrastructure and staff needed to maintain campgrounds are not available. The weekly, monthly, and annual maintenance of the campgrounds continues to pull CNWR resources and staff time away from projects designed to reach and achieve Refuge goals and objectives.

Camping is considered appropriate only when no reasonable (based on time, distance, and expense) lodging opportunities are available off-refuge and when staff resources needed to manage camping do not detract from the quality of another priority wildlife-dependent recreational use. There are other nearby private and public campgrounds that accommodate both RV and tent campers with a better level of service. During the CCP review, the Service focused on the presence of alternative, privately owned campgrounds directly adjacent to CNWR. These well-maintained fee campgrounds provide superior services to the government-operated campgrounds. The Service believes the public is better served by converting the Soda Lake and Bluebird Campgrounds to day-use only, reducing law enforcement issues associated with camping, and allowing the Refuge to promote uses such as wildlife viewing and photography. Existing boat launches will be maintained, which is in keeping with the conversion to day-use areas.

Based on the preceding analysis, camping has a negative impact on Refuge habitat; displaces and disturbs wildlife; is not necessary for the safe, practical, and effective conduct of existing wildlife-dependent recreational uses; detracts staff and operational resources away from programs that contribute to the conservation and management of wildlife; and may contribute to public safety concerns. It materially interferes with CNWR achieving its purposes, and therefore, is determined not a compatible use.

Mandatory 10- or 15-year Re-evaluation Date

Not Applicable

NEPA Compliance for Refuge Use Decision

_____ Categorical Exclusion without Environmental Action Statement.

_____ Categorical Exclusion and Environmental Action Statement.

___X___ Environmental Assessment and Finding of No Significant Impact.

_____ Environmental Impact Statement and Record of Decision.

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D.2 Compatibility Determination – Camping

Signatures

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

Refuge Manager/Project Leader Approval: _____ (Signature) 9/26/11 (Date)

Concurrence

Refuge Supervisor: _____ (Signature) 9/27/11 (Date)

Regional Chief, National Wildlife Refuge System: _____ (Signature) 9/28/11 (Date)

D.3 Compatibility Determination – Fishing and Fish Stocking

Use: Fishing and Fish Stocking

Refuge Name: Columbia National Wildlife Refuge (CNWR)

Establishing and Acquisition Authorities

The CNWR was established June 13, 1944, when the first parcel of land was purchased under the authority granted the Migratory Bird Conservation Commission (Migratory Bird Conservation Act of 1929); the purchase was approved at the August 1943 meeting of the Commission. Subsequently, on September 6, 1944, Public Land Order 243 expanded the CNWR. Pursuant to land acquisition authorities granted the Secretary of the Interior through Executive Order 9337 (April 24, 1943), Public Land Order 243 dictated that " … the following-described public lands in Washington are hereby withdrawn … for the use of the Department of the Interior as a refuge … [Columbia National Wildlife Refuge]."

Refuge Purposes

National wildlife refuges are established " … for the development, advancement, management, conservation, and protection of fish and wildlife resources … " (16 U.S.C. §742f(a)(4)) and also " … 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. § 42f(b)(1); Fish and Wildlife Act of 1956, 16 U.S.C. §742(a)-754, as amended).

CNWR was established " … as a refuge and breeding ground for migratory birds and other wildlife" and as " … an inviolate sanctuary, or for any other management purpose, for migratory birds."

National Wildlife Refuge System Mission

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

Description of Use

In the National Wildlife Refuge System Improvement Act, the United States Congress declared fishing one of six wildlife-dependent public uses of the NWRS. If determined compatible, fishing would become a priority public use for CNWR.

Approximately 39 named lakes/ponds and management units, varying in size from one to over 100 acres on the Refuge, were created by the Columbia Basin Irrigation Project (CBIP). Currently on Service-administered lands, recreational bank fishing and fishing from small craft occurs on these lakes and a section of Crab Creek.

Fish caught by CNWR visitors include rainbow trout, walleye, largemouth bass, crappie, and other panfish. The Service does not closely monitor fishing use on the Refuge and does not have estimates

for angler days or fish taken. CNWR, through the Fisheries Management Plan yet to be written, will allow fish stocking of Refuge waters by WDFW to maintain ecosystem functions within specified Refuge waters when it is not in opposition to other Refuge priorities (e.g., northern leopard frog management).

While most of the lakes are realistically only fishable from the bank or via float tubes, boats are used on the larger lakes in select areas. No boats or flotation devices are allowed in Marsh Units I and II. Gasoline motors are prohibited on Upper Hampton, Lower Hampton, Hutchinson, Royal, and Shiner lakes, although the use of electric motors is allowed. All other waters open to fishing allow both motorized and non-motorized boats. Personal watercraft are not allowed on any waters within the CNWR boundary.

General Fishing Seasons

Currently the Service follows fishing seasons, equipment, creel limits, etc., established by the State of Washington according to regulations published annually in the *Washington Department of Fish and Wildlife Sport Fishing Rules Pamphlet*, except that several areas of the Refuge are only open during specific time periods to protect other wildlife.

WDFW has been involved in the fishing program on CNWR since 1955. During 1981, a cooperative management letter was established to formalize the management relationship between CNWR and WDFW. The agreement states, "WDFW will have responsibility for fishery management subject to established refuge policies and management objectives." The agreement requires long-term and annual fisheries management plans, as well as several other planning/communication requirements to be completed by WDFW. As a result of a proposed modification to fishing regulations that standardize all fishing seasons within the State during 1996, options to reduce disturbance to migration/wintering, and breeding migratory birds on CNWR were limited. As a result, the Refuge manager determined the fishing program was not compatible with the purposes of the Refuge.[4]

An environmental assessment (EA) completed in 1996 recommended modifying the fishing program on the Refuge that could not occur under the current standardized fishing seasons set by WDFW. The standardized fishing seasons would not allow for seasonal closures of Refuge units, as described below, that were needed to reduce disturbance of migratory birds during the breeding and migration/wintering periods.

1) Marsh Unit III upstream to Morgan Lake Road in Section 36 and areas south of McManamon Road would be open to fishing from March 1 until September 30.

2) The Pillar/Widgeon chain of lakes would be open to fishing during March and September only.

3) All of the waters in Crab Creek and Marsh Units I and II from O'Sullivan Dam to Morgan Lake Road in Section 36 would be closed to fishing to prevent disturbance to nesting waterfowl.

[4] The purposes of the refuge are: 1) For withdrawn lands *" ... as a refuge and breeding ground for migratory birds and other wildlife ... "* (Public Land Order 243, dated Sep. 6, 1944); and 2) " *… for use as an inviolate sanctuary, or for any other management purpose, for migratory birds."* (16 U.S.C. § 715d (Migratory Bird Treaty Act)).

The alternative seasons and unit closures identified as the preferred alternative in the 1996 EA were implemented during 1996. Refuge monitoring and observations after the implementation of these new fishing regulations indicated that there was no change in nesting activity even with decreased disturbance in the Pillar-Widgeon chain, as well as other primary nesting areas. Migratory bird monitoring determined that these units were most important for migrating/wintering birds. The two month fishing seasons (March and September) resulted in impacts during one of the most important time periods (March) for migrating/wintering migratory birds for this chain of lakes, as well as other Refuge units. Because of these impacts, a review team agreed that a fishing season from April 1 through September 30 for the entire Refuge would provide adequate opportunities for quality fishing, while reducing the disturbance to migratory birds during the migration/winter period. This single season simplified Refuge regulations, facilitating public understanding as well as Federal and State law enforcement. Other specific modifications to the fishing program by Refuge management unit are discussed below.

Stocking Program

Currently, stocking on CNWR is being undertaken according to the 1996 plan, although this plan has not been updated within the required 10-year time frame; the plan is currently being updated. Refuge lakes and waterways have been stocked by WDFW with hatchery rainbow trout fry in order to be in compliance with current NWR policy, which prohibits the stocking of catchable size fish. Warmwater game species (e.g., black bass and panfish [crappie, bluegill]) have been introduced to Refuge waters devoted to trout management and are present in the entire Potholes Reservoir and Crab Creek system. Warmwater species cannot effectively be kept out of Refuge waters, even those managed intensively for trout. Without periodic chemical treatment (Rotenone), large populations of stunted fish (usually panfish) ultimately populate Refuge lakes and water systems. Rotenone treatments also remove carp from these waters, an action that greatly benefits macro-invertebrates and submerged aquatic plants. In addition, the following categories of fisheries management are identified in the Fisheries Management Plan:

1) Trout/Selective Waters (catch targeted at 2+-year-old trout).

2) Warmwater Species/Intensive Management (sustained population of warmwater species using introductions to maintain balanced populations).

3) Warmwater Minimal (high populations of non-game species that cannot or effectively or economically be removed).

4) Mixed Species (mixed warmwater and salmonid game fishes) in sufficient numbers to provide a low-keyed fishery.

5) Stream Fisheries (flowing waters as well as unnamed ponds dependent on the flowing water with populations of undesirable fishes and low numbers game fish).

How this fish stocking program will be implemented in the future will be revisited as the new Fisheries Management Plan is written; however, the new plan will be required to be in conformance with Service policy.

Availability of Resources

CNWR is open for many public uses other than fishing, including hunting, environmental education and interpretation, wildlife photography and wildlife observation. The same facilities used for these activities are also useful for fishing. However, access trails, parking lots, signs, and other facilities are inadequate, as are staff resources, to enforce regulations and maintain these facilities. The costs outlined in Table D.3 would be required to administer and manage fishing on CNWR. The Service does not have the resources to administer a fishing program, if this were a stand-alone program. However, since many of the costs and benefits associated with the fishing program are also borne/realized through other programs (e.g., maintenance of parking lots also benefits hiking, wildlife observation, and other uses), the Service can effectively manage the program.

Table D.3

Activity or Project	One-Time Expense	Recurring Expense
Law Enforcement		$15,000
Development/Maintenance of Parking and Trails	$10,000	$10,000
Placement and Maintenance of Signs	$15,000	$2,000
Outreach, Education, Monitoring	$3,000	$2,000
Development/Maintenance of Accessible Sites	$75,000	$500
Develop WDFW Fisheries Management Plan	$10,000	$1,000
Totals	**$113,000**	**$30,500**

Anticipated Impacts of the Use

Bank fishing as a solitary and stationary activity tends to be less disturbing to wildlife than hunting or motorized boating (Tuite et al. 1983). However, there would be disturbance of birds and other wildlife using the open waters where fishing would occur, and when boats are used, the disturbance would be substantially greater. Fishing activities may influence the composition of bird communities, as well as distribution, abundance and productivity of waterbirds (Bell and Austin 1985; Bordignon 1985; Bouffard 1982; Cooke 1987; Edwards and Bell 1985; Tydeman 1977). Anglers often fish in shallow, sheltered bays and creeks that birds prefer, negatively impacting distribution and abundance of waterfowl, grebes, and coots (Cooke 1987). Increases in anglers and associated shoreline activity can discourage waterfowl from using otherwise suitable habitat (Jahn and Hunt 1964). In Britain, anglers displaced waterfowl from their preferred feeding and roosting areas and caused wigeon, green-winged teal, pochard, and mallard to depart from a reservoir prematurely (Jahn and Hunt 1964). Anglers influenced the numbers, behavior, and diurnal distribution of avian scavengers present at sites in Washington, when compared to non-fishing days (Knight et al. 1991). Shoreline activities, such as human noise, would cause some birds to flush and go elsewhere.

Bank fishing allows the anglers direct access to the potholes and lakes. Waterbird and waterfowl use of these areas varies seasonally, as does angler presence. Waterfowl are prevalent on the lakes in the

winter, especially when surrounding wetlands freeze, but angler presence is little or none, as is disturbance to waterfowl (see the Hunting CD for impacts to waterfowl).

In addition, trampling of vegetation and deposition of sewage or other chemicals are expected to commonly occur (Liddle and Scorgie 1980). Disturbance and destruction of riparian vegetation, bank stability, water quality, and littering may result from high levels of bank fishing activities. It is not known what the threshold would be on CNWR that meet the definition of "high levels." However, that level has clearly not been reached as impacts at this time are minor, at worst.

By its nature, fishing results in the intentional take of individual fish. Catch-and-release fishing can also harm individual fish, killing them or reducing their likelihood of long-term survival. Although creel and fishing activity censuses have not been made in this particular area, it is estimated that use will increase. The number of people fishing and any potential impacts will be monitored and access points, areas open/closed to fishing, and seasonal/temporary closures will be considered in coordination with WDFW.

Although fishing is a priority public use, historically, fish would not have been found in lentic systems within CNWR; they didn't exist. The establishment of the CBIP, which altered water patterns throughout the Columbia Basin, created numerous water bodies within the Refuge.[5] To maintain ecological functions, stocking of fish has been allowed and thus created fishing opportunities for the general public. To prevent wildlife and habitat impacts, all stocking will be completed under a Fisheries Management Plan in conjunction with WDFW. This will outline strategies to alter or eliminate stocking as necessary for protection, enhancement and/or reintroduction of species such as the northern leopard frog.[6] Additional impact analysis may be required as the Fisheries Management Plan is developed, depending on the actions proposed at that time. In the meantime, continuing current management actions will have negligible impacts on CNWR.[7] This is primarily due to the current low to moderate use levels seen on the Refuge. Should use substantially increase, the potential impacts of fishing as described above could be realized and corrective actions may be necessary. Periodic monitoring will be needed.

CNWR provides resting, and in some cases nesting, habitat for wintering and migratory birds, including waterfowl, shorebirds and other waterbirds. Recreational boating can affect their use in Refuge waters. Boating is not allowed in all Refuge waters; CNWR has areas that are closed to all public use, and these areas provide important undisturbed habitat for fish and wildlife. In other areas of the Refuge only non-motorized boats are allowed. Many smaller water bodies are unsuitable and not practicable for boating. Some areas receive high use; therefore, the wildlife is disturbed or displaced during high visitor usage.

Boating activity, both motorized and non-motorized, can alter distribution, reduce use of particular habitats or entire areas by waterfowl and other birds, alter feeding behavior and nutritional status, and cause premature departure from areas (Knight and Cole 1995). More sensitive species may find it difficult to secure adequate food or loafing sites as their preferred habitat becomes fragmented and

[5] The lakes themselves are artificial. However, they function the same as "natural" lakes within the Columbia Basin.
[6] Research has shown that fishless water bodies were more likely to contain frog larvae than were fish-containing water bodies (Knapp et al. 2003). As additional information on potential reintroduction sites for northern leopard frogs is gathered, adaptive management will be incorporated.
[7] This is particularly true as the principal species of interest, northern leopard frog, is likely extirpated from refuge waters.

recreation-related disturbances increase (Pfister et al. 1992; Skagen et al. 1991). Motorized boats generally have more impact on wildlife than non-motorized boats because motorboats produce a combination of movement and noise (Knight and Cole 1995; Tuite et al. 1983). Motorized boats can also cover a larger area in a relatively short time, in comparison to non-motorized boats.

Canoes and kayaks can cause significant disturbance effects based on their ability to penetrate into shallower marsh areas (Knight and Cole 1995; Speight 1973). In the Ozark National Scenic Riverway, green-backed heron activity declined on survey routes when canoe and boat use increased on the main river channel (Kaiser and Fritzell 1984). Canoes or slow-moving boats have also been observed to disturb nesting great blue herons (Vos et al. 1985). Huffman (1999) found that non-motorized boats within 100 feet of the shoreline in south San Diego Bay caused all wintering waterfowl to flush between the craft and shore. However, compared to motorboats, canoes and kayaks appear to have less disturbance effects on most wildlife species (DeLong 2002; Huffman 1999; Jahn and Hunt 1964).

In Denmark, fast-moving boats were observed to have the greatest impact on red-breasted merganser broods (Kahlert 1994). The presence of fast-moving boats also caused the most significant modifications to the amount of time animals spent feeding and resting. In England, an increased rate of disturbance from boats partly caused a decline in roosting numbers of shorebird species (Burton et al. 1996). In addition, boaters have been observed to cause massive flights of diving ducks on the Mississippi River (Thornburg 1973). Motorized boats within 1,000 feet of shore caused all wintering waterfowl and shorebirds to flush between the craft and shore in south San Diego Bay, regardless of speed (Huffman 1999). However, disturbance to birds in general was reduced when boats traveled at or below the five mph speed limit. Impacts of boating can occur even at low densities, given their noise, speed, and ability to cover extensive areas in a short amount of time. The total number of boats and people can be an inappropriate measure of recreational intensity because the presence of a single boat might be just as disturbing as that of many (Knight and Knight 1984; Tuite et al. 1983). Even a low level of boating activity affects the duration and pattern of use by wildlife (Bratton 1990).

Motorized boats introduce noise and pollution, in the form of gas and oil in water, and particulates in the air, in aquatic habitats at CNWR. An EPA report indicates that two-stroke engines, found on many motorized boats, discharge as much as 25 percent of unspent oil and gas directly into the water. Increased speeds of two-stroke engines can result in greater discharge of unspent oil and gas. Hydrocarbons in gas and oil released from two-stroke engines float on the surface and settle within shallow aquatic habitats. Hydrocarbon pollution has been found to bioaccumulate within the complex food web, posing a serious threat to the marine environment (Tjarnlund et al. 1993). Hydrocarbons can also be transferred to eggs from the plumage of incubating birds. Extremely small amounts of petroleum hydrocarbons can be toxic to eggs and birds that may ingest these contaminants (Hoffman 1989).

While the impacts of boating can be major, due to the seasons of use and general low levels of use on CNWR, the impacts from boating associated with fishing are generally minor, although during peak use periods or on certain lakes (e.g., Soda Lake) the impacts would be expected to be moderate. If use increases overall or in particular areas, this use may need to be reexamined and additional controls implemented. As noted under Goal 4, monitoring of recreational use is needed, which will provide the basis for changing boating associated with fishing.

As noted below in the Justification Section, fish stocking and the pre-stocking treatment of lakes with Rotenone has positive impacts for the Refuge. None of the lakes on CNWR are natural, so stocking

in and of itself does not negatively impact native fish in a native habitat, although native fish (e.g., sculpins) in these artificial lakes could be negatively impacted. The extent of the impacts, both negative and positive, cannot be quantified at this time, and this is research that should be conducted during the duration of this CCP, with changes to be implemented with the next CCP or as needed under adaptive management standards.

Public Review and Comment

This CD was prepared concurrent with the CNWR's CCP. An open house was held and written comments were solicited from the public during the scoping period for the CCP. Public review and comment were solicited during the draft CCP comment period.

Determination

_____The use is not compatible.

___X___The use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility

- Fish stocking operations will be conducted in accordance with an approved Fisheries Management Plan, developed in conjunction with WDFW. If a new plan is not developed within one year of the CCP being adopted, the stocking program will likely be discontinued until a plan is written. The new plan will be required to be in conformance with Service policy to the extent possible (see the Justification Section below).
- Stocking will be of rainbow trout only. While these are not truly native, they are close to the native species found in the area. Stocking of other species and of genetically modified trout will not be allowed.
- The State of Washington will apply Rotenone and other chemicals only in consultation with the Service. The Service may require that Rotenone, etc., be applied prior to stocking to meet Refuge purposes and to meet justification needs as described below.
- Monitoring will be conducted to ensure that high-quality habitat for feeding, resting, breeding, and thermal protection for waterfowl, waterbirds, and other wildlife species is maintained. Changes to regulations, additional closures, etc., may be implemented if undue impacts are being seen, as determined by Refuge biologists and the Refuge Manager.
- CNWR will monitor and evaluate anglers and the fish stocking program to determine if objectives are being met.
- Inventory and monitoring will be conducted to identify and evaluate potential northern leopard frog habitat and associated management needs. Selected lakes may be removed from the stocking program, and possibly fishing access closed, to facilitate frog recovery.
- CNWR will provide information on bank fishing and access at appropriate sites and through printed brochures. Information will also include current migratory bird and Refuge regulations, as well as maps of closed areas.
- Closed areas and use restrictions will be aggressively enforced.
- All fishing on CNWR will require the appropriate State licenses and tags, and all fishing will be consistent with applicable State regulations, although there may be future instances where more stringent regulations are required to meet resource or management needs.
- Continue to maintain areas closed year-round to boating, areas seasonally closed, and waters open year-round.

- Continue the prohibition of gasoline motors on Upper Hampton, Lower Hampton, Hutchinson, Royal, and Shiner Lakes.
- Permit no boating that is not associated with fishing or wildlife observation and photography.
- Continue the prohibition of air-thrust and inboard water-thrust watercraft.
- Continue periodic law enforcement to help ensure compliance with regulations and area closures.
- Regulations will be described in brochures and posted at Refuge boat ramps. Outreach and education to fishing and boating groups will occur periodically.
- Monitor boating activities by periodically assessing and estimating the level of boating activity in various locations. Maintain survey efforts to assess population numbers for the Refuge populations of waterfowl and waterbirds. Monitoring data will be used by the Refuge Manager in the periodic re-evaluation of this CD.

Justification

Fishing

Fishing is one of the six priority public uses of the NWRS. It is well recognized that fishing can give many people a deeper appreciation of fish and wildlife and a better understanding of the importance of conserving habitat, which ultimately contributes to the NWRS mission. Providing a quality fishing program contributes to achieving CNWR's goals. This program, as described, was determined to be compatible with Refuge purposes, though jurisdiction where most of the bank fishing would occur (below the mean high water level) lies with the State of Washington. If through monitoring it is determined that undue impacts are being felt, sufficient restrictions to address the particular root problem will be placed on fishing to ensure that an adequate amount of high-quality feeding, breeding and resting habitat would be available for migratory birds in relatively undisturbed areas (sanctuaries). Based on monitoring, bank fishing activity may need to be confined to designated areas.

In addition, the majority of waterfowl use near bank fishing areas occurs in the winter and spring months, although a few birds arrive as early as September and October. Since the majority of fishing activity occurs in the spring, summer and fall, disturbance to waterfowl species is expected to be minimal. Monitoring will be needed to ensure that impacts are indeed minimal and that they remain that way.

It is anticipated that wildlife, primarily waterbirds, will find sufficient food resources and resting places such that their abundance and use of CNWR will not be measurably lessened, fishing pressure will not cause fish stocks (i.e., forage) to decline, the physiological condition and production of waterfowl and other waterbirds will not be impaired, their behavior and normal activity patterns will not be altered dramatically and their overall welfare will not be negatively impacted.

Fish Stocking

The current WDFW fishery management program for the Refuge was developed to be in compliance with Refuge Manual (RM) Chapter 7, Population Management, Section 10 Fishery Resource Management. This section states:

> *"Stocking of fish in refuge waters will be limited to measures aimed at maintaining balanced fish populations or replacing populations decimated by unusually severe or atypical losses*

> *due to climatic or environmental factors. There are circumstances where the spawning grounds of fish occurring in refuge waters have been destroyed. Provided spawning grounds cannot be rehabilitated, it may be considered a mitigation of this loss to implement a program of continual restocking fingerlings fish into these waters. Such a practice would have its primary objective the maintenance of a balanced community of naturally occurring fish species. The harvesting of catchable-size members of the restocked fish populations by sport fisherman may be considered a legitimate, wildlife-oriented recreational activity on the refuge. Stocking refuges with catchable-size sport fish specifically to support recreational fishing is prohibited."* (7 RM 10.6)

This policy then refers to the Propagation and Stocking policy cited below.

The Propagation and Stocking Policy in the Service Refuge Manual (RM) (7 RM 12.1(1)) states that " … species introduced or stocked will be indigenous to the area." It goes on to add, "The objectives of propagation and stocking on land an waters within the NWRS are " … to re-establish native species within their original breeding range … " (7 RM 12.2(A)) and " … [e]xotics of any fish or animal species will not be stocked or released on any unit of the National Wildlife Refuge System without a thorough review of the consistency of such actions with the objectives of which the refuge is managed and a specific authorization by the Director and the director of the State wildlife agency concerned." (7 RM 12.1C).

Stocking, as currently described in the Fisheries Management Plan, appears to conflict with Service policy. However, the following factors must be considered before compliance with policy can be determined:

- Approximately 39 named lakes/ponds and management units, varying in size from one to over 100 acres on CNWR, were created by the development of the Potholes Reservoir. Groundwater seepage from the Potholes Reservoir located on the north boundary of the Refuge, as well as drainage water from the surrounding Columbia Basin Irrigation Project (CBIP), created wetlands in the canyons and lower elevations of the Refuge. In addition, the Refuge has installed water control structures and developed a water delivery system to maximize the use of drainage water for the development of wetlands on the Refuge during the past 45 years. Except for Crab, Bobcat, and Coyote creeks, these wetlands are not natural and did not exist before development of the reservoir and were not present in the frame of reference for biological integrity (present prior to substantial human changes to the landscape).
- Warmwater fish have been legally and illegally introduced to the Crab, Bobcat and Coyote Creek systems. Except for small wetlands/ponds that are not attached to these wetland systems, or are connected during floods, it is likely impossible to remove warmwater exotic fish species from Refuge wetlands. Management for warmwater exotics is through use of Rotenone to remove warmwater species or stocking to try and balance large warmwater predators with panfish. This management is costly (approximately $50-$70/acre-foot of water) and requires considerable human resources to implement. Ultimately, without management, warmwater fish populations in most Refuge lakes/ponds result in overstocked and stunted populations of panfish.
- Although not native, the stocking of rainbow trout in Refuge wetlands approximates the native fish species (redband, bull trout, and steelhead) that occupied these creek systems before the CBIP.

- Unpublished research at the University of Washington has indicated that the species richness, diversity and densities of dragonflies (*Odonates* spp.) are greater in Refuge lakes/ponds managed for rainbow trout. In addition, the diversity and density of all invertebrates appear to be higher in ponds managed for trout. It is believed that overstocked and stunted populations of warmwater species in ponds/lakes greatly reduce the total invertebrate fauna.
- There is anecdotal evidence from CNWR biologists that after carp and other undesirable fish are removed from Refuge lakes through the use of Rotenone prior to stocking efforts, vegetation responds dramatically (due to reduced depredation by carp, etc.) and waterfowl use is increased significantly for several years until undesirable species find their way back to the lakes.

In light of the above, a 2002 Biological Review Team believed that if the fisheries program was managed to minimize disturbance to migrating and wintering birds, it would be beneficial to maintain management for trout on CNWR. This management would support the purpose of the Refuge by providing greater diversity and numbers of invertebrates, which are important forage for migrating aquatic birds. It would also support the National Wildlife Refuge Improvement Act by providing for a priority public use. By implementing specific recommendations the CNWR fisheries program was able to minimize disturbance to wildlife, as well as provide improved habitat for migratory birds.

Continuing fish stocking, although technically against Service policy, is in the best interest of meeting CNWR purposes. Without the application of Rotenone by the State of Washington, it is unlikely the Service could afford to treat the lakes, and waterfowl use would suffer. The dual benefits of meeting Refuge purposes and providing for fishing opportunities, coupled with the fact that none of the lakes are natural, warrants continuation of fish stocking by the State of Washington—when a revised Fisheries Plan is completed meeting Service needs and standards.

The species of interest most likely to be impacted by fish stocking, northern leopard frog, has likely been extirpated from the Refuge; there are no known northern leopard frogs currently on CNWR. As further research, inventory and monitoring efforts provide additional information on northern leopard frogs, modifications to the fishing and fish stocking programs may be needed to accommodate the amphibian's needs.

Mandatory 10- or 15-year Re-evaluation Date

Provide month and year for "allowed" uses only.

___X___Mandatory 15-year re-evaluation date (for wildlife-dependent public uses).

_____Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses).

NEPA Compliance for Refuge Use Decision

_____Categorical Exclusion without Environmental Action Statement.

_____Categorical Exclusion and Environmental Action Statement.

___X___Environmental Assessment and Finding of No Significant Impact.

_____Environmental Impact Statement and Record of Decision.

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D.3 Compatibility Determination – Fishing and Fish Stocking

Signatures

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

Refuge Manager/Project Leader Approval: _____ (Signature) 9/26/11 (Date)

Concurrence

Refuge Supervisor: _____ (Signature) 9/27/11 (Date)

Regional Chief, National Wildlife Refuge System: _____ (Signature) 9/28/11 (Date)

D.4 Compatibility Determination – Horseback Riding

Use: Horseback Riding

Refuge Name: Columbia National Wildlife Refuge (CNWR)

Establishing and Acquisition Authorities

The CNWR was established June 13, 1944, when the first parcel of land was purchased under the authority granted the Migratory Bird Conservation Commission (Migratory Bird Conservation Act of 1929); the purchase was approved at the August 1943 meeting of the Commission. Subsequently, on September 6, 1944, Public Land Order 243 expanded the CNWR. Pursuant to land acquisition authorities granted the Secretary of the Interior through Executive Order 9337 (April 24, 1943), Public Land Order 243 dictated that " … the following-described public lands in Washington are hereby withdrawn … for the use of the Department of the Interior as a refuge … [Columbia National Wildlife Refuge]."

Refuge Purposes

National wildlife refuges are established " … for the development, advancement, management, conservation, and protection of fish and wildlife resources … " (16 U.S.C. §742f(a)(4)) and also " … 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. §42f(b)(1); Fish and Wildlife Act of 1956, 16 U.S.C. §742(a)-754, as amended).

CNWR was established " … as a refuge and breeding ground for migratory birds and other wildlife" and as " … an inviolate sanctuary, or for any other management purpose, for migratory birds."

National Wildlife Refuge System Mission

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

Description of Use

While not one of the six wildlife-dependent public uses listed or identified in the National Wildlife Refuge System Administration Act, as amended (1997), horseback riding is an existing use on the CNWR that can facilitate wildlife observation, but is not necessary to achieve it. Historically, horseback riding has only occurred on roads open to public vehicular traffic (approximately 10-15 miles of roadways, depending on the season).

As proposed, horseback riding would continue to only be allowed on roads open to public vehicular travel. Presently, most use occurs in the spring and fall months, and it is anticipated that use patterns would be similar if horseback riding is designated as a compatible activity. Currently CNWR has no hard numbers on how many user days can be attributed to this activity; however, use appears to occur only seasonally and infrequently.

Availability of Resources

Costs to continue to provide for horseback riding, including signing, required maintenance and rehabilitation of roads, monitoring, and parking lot maintenance, would be moderate. The direct costs for road maintenance would be minimal, with road maintenance and monitoring for other public use activities covering all costs. Base funding is available to cover staff costs; that is, sufficient funds and staff are available to manage the activity as it is an alternate means of wildlife observation and road maintenance is necessary in any event.

Activity or Project	Recurring Expense
Development and Accessibility Improvements	$2,000
Maintenance	$5,000
Program Operations/Monitoring	$2,000
Totals	**$9,000**

Anticipated Impacts of the Use

Impacts related to horseback riding range from exotic plant seed dispersal (Beck 1993; Hammitt and Cole 1987) in horse coats and manures, soil compaction and erosion (Bainbridge 1974; Hammitt and Cole 1987; Hendee et al. 1990), stream sedimentation (Wilson and Seney 1994), trail widening (Whittaker 1978),[8] vegetation trampling (Nagy and Scotter 1974; Weaver and Dale 1978; Whittaker 1978), aesthetic concerns relative to horse manure (Lee 1975), and direct wildlife disturbance (Owen 1973), to direct and indirect conflicts with other recreationists.

Possible biological impacts of horseback riding are disturbance to wildlife and habitat. Wildlife can be affected through the sight and sound of recreationists (Boyle and Samson 1985). Some of the effects of disturbance to wildlife from recreational activities include changes in foraging behavior; reduction of productivity; abandonment or alteration of breeding territories; alteration of animal distribution; alteration of flight behavior; energy depletion; and disruption of nest and brood rearing attentiveness (Klein 1989; Knight and Skagen 1988).

Wildlife disturbance relative to horseback riding has been poorly studied, with most references using other activities such as hiking and cross-country skiing to infer horseback riding impacts. Only one study identified disturbance tolerance of waterfowl to horseback riders and found that horseback riders could approach geese up to a distance of 150 feet. This is compared to suggested hiking trail distances of 250 feet (Miller et al. 1998) and boat buffers ranging from 250 to 900 feet (depending on type of boat, whether motorized, and species impacted; Burger et al. 1999). The 150-foot approach distance offered by Owen (1973) is consistent with observations suggesting that horseback wildlife observers can approach wildlife at closer distances than through other forms of travel. Many wildlife species appear to be habituated to livestock and thus are less likely to flee when approached through this method. However, any form of approach is expected to cause some disturbance, which will vary

[8] For the purposes of this analysis, 'trails' is synonymous with the roads open to horseback riding. In this instance, riding along the shoulder of roads can result in widening and additional disturbance.

according to the species affected and the type, level, frequency, and duration of disturbance, as well as the time of day or year that it occurs.

In addition to direct impacts to wildlife, habitat can be affected through vegetation trampling, soil compaction and erosion (Cole 1983, 1990). Public use activities can also have adverse impacts on vegetation and soil conditions. Impacts from vegetation trampling can lower species richness, decrease ground cover and density of plant species, increase species diversity through an increase in weedy annuals, and induce changes in species composition (Bonanno 1992; Bright 1986; Grabherr 1983).

Exotic plants can also be spread to new sites through forage (e.g., hay brought in to feed horses, which contains seeds of exotic plants) and manure (Beck 1993). Exotic plant establishment is further facilitated by increased trail disturbance, as many exotic plants gain a competitive advantage in highly disturbed sites; hoof action tends to dig up and puncture the soil surface (McQuaid-Cook 1978).[9] This can also increase the spread of previously established exotics by providing loose, disturbed soil for germination and spreading reproductive plant structures.

The extent of impacts from horseback riding varies. Horseback riding in the spring may contribute to short-term, albeit moderate to severe, disturbances of ground nesting birds. At other times of the year, wildlife would likely not experience significant impacts from disturbance. Impacts to native vegetation would occur from horses as they moved over the landscape and could be extensive depending on the amount of use and the time of year. Noxious weeds could be spread further into shrub-steppe habitat from either on-site weed sources or from horse droppings; vegetation maintenance (noxious weeds and native plants) along roads and trails would be less problematic than treating new or managing existing weed sources out on the landscape. Overall, disturbances along roads and out on the landscape will result in minor impacts to resident wildlife, due to the low volume and seasons of use. However, there may be isolated long-term impacts from localized noxious weed spread and infestation.

Public Review and Comment

This CD was prepared concurrent with the CNWR's CCP. An open house was held and written comments were solicited from the public during the scoping period for the CCP. Public review and comment were solicited during the draft CCP comment period.

Determination

_____The use is not compatible.

___X___The use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility

At present, horseback riding on CNWR is unmonitored, and the impacts to wildlife and associated habitat are unknown. However, use is relatively low, and most occurs during cooler months when wildlife is not as active or when disturbance is not as likely to be detrimental (i.e., during breeding or nesting seasons). However, as stated by the anticipated impacts described in the previous section, any

[9] Horse hooves can produce as much as 1,500 pounds per square inch of pressure exerted on the soil surface with each step (Hendee et al.1990).

increased or unrestricted horseback riding could lead to impacts on wildlife resources through exotic seed encroachment, vegetation trampling, erosion, and wildlife disturbance. These impacts would be cumulative with associated impacts from other public use opportunities. Therefore, in order to ensure the compatibility of this use, the following stipulations would be necessary.

- Horseback riding must be restricted to roads open to vehicular travel. In these areas, anticipated impacts are not believed to exceed those already induced by vehicles and foot travel associated with other public use activities.
- Any horseback riding area would be subject to seasonal closures based on the presence of sensitive wildlife populations.
- Horse trailers would be restricted to designated parking areas.
- Horseback riding would be a day-use only.
- A system to monitor the level of use and vegetation damage and impact along roadsides and designated parking areas would need to be established.
- The activity could be reduced or closed with the finding of significant negative impacts to CNWR facilities or natural and cultural resources.

Justification

Horseback riding is believed to be a compatible public use under the stipulations outlined in this CD. The primary reasons for this determination include:

1) Impacts associated with horseback riding are not believed to exceed impacts already caused by other public use activities in select areas.

2) Horseback riding does not substantially interfere with Refuge purposes.

3) Roadways already are highly disturbed areas, and allowing horseback riding will not substantially add to this disturbance.

It is understood from the summary of anticipated impacts that some elements of the horseback riding program have the potential to detract from the Service's ability to achieve CNWR purposes. These impacts will be monitored and if they, or any as yet not considered impacts are discovered, this CD would be reevaluated.

Mandatory 10- or 15-year Re-evaluation Date

Provide month and year for "allowed" uses only.

_____Mandatory 15-year re-evaluation date (for wildlife-dependent public uses).

___X___Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses).

NEPA Compliance for Refuge Use Decision

_____Categorical Exclusion without Environmental Action Statement.

_____Categorical Exclusion and Environmental Action Statement.

___X___Environmental Assessment and Finding of No Significant Impact.

_____Environmental Impact Statement and Record of Decision.

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D. 4 Compatibility Determination – Horseback Riding

Signatures

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

Refuge Manager/Project Leader Approval: _____ (Signature) 9/26/11 (Date)

Concurrence

Refuge Supervisor: _____ (Signature) 9/27/11 (Date)

Regional Chief, National Wildlife Refuge System: _____ (Signature) 9/28/11 (Date)

D.5 Compatibility Determination – Migratory Bird, Upland Game Bird, and Deer Hunting

Use: Migratory Bird, Upland Game Bird, and Deer Hunting

Refuge Name: Columbia National Wildlife Refuge (CNWR)

Establishing and Acquisition Authorities

The CNWR was established June 13, 1944, when the first parcel of land was purchased under the authority granted the Migratory Bird Conservation Commission (Migratory Bird Conservation Act of 1929); the purchase was approved at the August 1943 meeting of the Commission. Subsequently, on September 6, 1944, Public Land Order 243 expanded the CNWR. Pursuant to land acquisition authorities granted the Secretary of the Interior through Executive Order 9337 (April 24, 1943), Public Land Order 243 dictated that " … the following-described public lands in Washington are hereby withdrawn … for the use of the Department of the Interior as a refuge … [Columbia National Wildlife Refuge]."

Refuge Purposes

National wildlife refuges are established " … for the development, advancement, management, conservation, and protection of fish and wildlife resources … " (16 U.S.C. §742f(a)(4)) and also " … 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. §42f(b)(1); Fish and Wildlife Act of 1956, 16 U.S.C. §742(a)-754, as amended).

CNWR was established " … as a refuge and breeding ground for migratory birds and other wildlife" and as " … an inviolate sanctuary, or for any other management purpose, for migratory birds."

National Wildlife Refuge System Mission

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

Description of Use

Hunting is allowed on portions of Management Units 1, 2, 3 (sub-headquarters only), 4 and 6, as specified on the hunting tear sheets published annually. This amounts to 13,596 acres open to some form of hunting (46 percent of the Refuge), leaving 16,060 as sanctuary areas. The CNWR has not monitored levels of use or take; however, based on anecdotal field observations by long-time Service staff, use is currently low and well within the carrying capacity for a quality hunt and the Refuge's resources.

Service allows hunting of resident game and migratory birds within established WDFW bag limits and seasons that coincide with the State waterfowl hunting season.[10] Hunting will be permitted by muzzleloader (new use), shotgun, and archery, as appropriate to the species being hunted. All hunting on CNWR will be in State-specified seasons that coincide with the waterfowl hunting season, regardless of the species being pursued, with one exception. If an early season muzzleloader deer hunt is opened, this would generally occur outside the State waterfowl hunting season. Otherwise, hunting generally begins mid-October and ends on the fourth week in January. The longest continuous species-specific hunting seasons during this time are waterfowl (second weekend in October to the third weekend in January) and upland birds (October-January); the shortest season is deer (selected days in November/December, depending on the area and weapon used).

Species That Can Be Hunted on the Refuge

- California Quail
- Chukar
- Gray (Hungarian) Partridge
- Ring-necked Pheasant
- Snipe
- Coot
- Ducks
- Geese
- Deer (Mule)

Youth Hunt Area

While youth have always been encouraged to participate in hunting on CNWR, the only youth-specific hunting has been during the State-specified Youth Hunt weekend— usually falling during the last weekend in September—on Marsh Unit I. The Service will now specifically set aside Farm Units 35-36 for Washington State–defined youth hunters who are accompanied by a non-hunting adult 18 years of age and older. Youth will be permitted to hunt on Wednesdays, Saturdays, Sundays and Federal holidays (Veteran's Day, Thanksgiving, Christmas, New Year's Day and Martin Luther King, Jr.'s, Birthday) concurrent with the State waterfowl season. Youth hunters interested in using this area must register with CNWR between September 1 and October 1 and follow all State and Federal regulations. This area will be open to youth waterfowl hunting only. The number of participants in this program will be limited to the number of hunters that can safely hunt. This number will vary annually depending on cropping, but will also include considerations for safe spacing.

General Waterfowl

Waterfowl hunting will be permitted in Marsh Unit I and Farm Units 226-227 on Wednesdays, Saturdays, Sundays and Federal holidays (Veteran's Day, Thanksgiving, Christmas, New Year's Day and Martin Luther King, Jr.'s, Birthday) concurrent with the State waterfowl season. Marsh Unit I will be on a free-roam system and Farm Units 226-227 will be on a first-come, first-served system for the three pit blinds. All other areas open to hunting will be open to migratory bird, upland game bird and deer hunting.

[10] All hunting on CNWR occurs within the span of the waterfowl hunting season. If a state-regulated hunt falls outside of that window—for example, an early archery deer season—that hunt is not allowed on the Refuge.

Upland Game Birds

The hunting of upland game birds will be permitted on CNWR areas open to hunting during normal hunting hours, except for the following locations: Marsh Unit I (open at noon) and Farm Units 226-227 (no upland game bird hunting allowed).

Deer

The hunting of deer will be permitted on CNWR areas open to hunting, except Marsh Unit I and Farm Units 226-227. Historically, hunting has been by shotgun and archery only; the Service will allow the use of muzzleloaders in select areas where appropriate based on management needs and public safety.

Availability of Resources

Table D.4 shows the estimated funds needed to administer the program. Because hunting is considered a priority public use on a national wildlife refuge, the Service will find funding to administer the program to a safe level, at a minimum.

Table D.4

Activity or Project	One-Time Expense	Recurring Expense
Law Enforcement		$15,000
Preparation of Hunt Areas, Parking Lots	$2,000	$1,000
News Releases, Fact Sheets, Annual Hunting Brochures	$5,000	$2,000
Outreach, Education, Monitoring		$2,000
Development/Maintenance of Accessible Site	$75,000	$2,000
Develop Fisheries Management Plan in Conjunction with WDFW	$10,000	$1,000
Totals	**$92,000**	**$23,000**

Anticipated Impacts

Hunting, by its nature, results in the intentional take of individual animals, as well as wounding and disturbance (DeLong 2002). It can also alter behavior (e.g., foraging time), population structure and distribution patterns of wildlife (Bartelt 1987; Cole and Knight 1990; Madsen 1985; Owens 1977; Raveling 1979; Thomas 1983; White-Robinson 1982).

Harvest data are reported by hunters to WDFW and season and bag limits are adjusted accordingly to ensure that overall populations of game species remain healthy into the future. While hunter use of CNWR has not been closely monitored, the Service expects hunter numbers to increase over the next 15 years as habitat improvements are implemented under this CCP, resulting in increased species

populations. Impacts to species numbers and composition will be monitored, and, if necessary, additional measures will be developed in coordination with WDFW to protect Refuge resources.

There is an adequate amount of quality, non-hunted and closed habitat available to both hunted and non-hunted wildlife because: 1) some high wildlife use areas will remain closed; and 2) some high wildlife use areas open to hunting will be hunted infrequently, or not at all due to the walking distance required. As noted above, 13,596 acres are open to some form of hunting (46 percent of the Refuge), leaving 16,060 as sanctuary areas. In addition, no one species hunted, or hunting season, applies to all the acres available (e.g., waterfowl hunting only occurs on a small portion of the Refuge due to suitable habitat types and species availability). A program will be implemented to monitor wildlife population numbers and habitats in both open and closed areas.

It is anticipated that wildlife populations will find sufficient food resources and resting places such that their abundance and use of the Refuge will not be measurably lessened from hunting activities due to the location of sanctuary areas nearby to all hunting areas. It is well-known that these areas are used by wildlife through observation; the highest concentrations of waterfowl on the Refuge are in Marsh Unit IV, an area closed to hunting.

At present, the State of Washington has determined that the game management units covering CNWR have harvestable populations of deer and upland game birds. The Pacific Flyway Council, of which the Service is the convening agency, sets annual waterfowl hunting parameters, determining if there is a harvestable population in any given year. In light of harvestable populations and due to low hunting pressure, the limited number of individuals expected to be removed from wildlife populations due to hunting will not cause populations to materially decline; the physiological condition and production of hunted species will not be impaired; their behavior and normal activity patterns will not be altered dramatically; and their overall welfare will not be negatively impacted. If monitoring determines differently as hunting pressure increases or wildlife populations decrease, hunting seasons, areas open, etc. will be re-examined.

Although conflicts between user groups can arise, this is currently not a significant issue at the present levels of use. Should significant conflicts become evident in the future, changes to the program will be made to minimize conflicts and insure public safety. Conflicts can include conflicting needs of various user groups, hunters pursuing the same game and competition among hunters for choice sites. Unethical hunting behavior may also become more evident as it becomes increasingly difficult for hunters to locate sufficient hunting areas and as more hunters use the Refuge.

Public Review and Comment

This CD was prepared concurrent with CNWR's CCP. An open house was held and written comments were solicited from the public during the scoping period for the CCP. Public review and comment were solicited during the draft CCP comment period.

Determination

_____The use is not compatible.

___X___The use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility

CNWR hunting programs will be designed to provide high-quality experiences. A quality hunt experience means that: 1) hunters are safe; 2) hunters exhibit high standards of ethical behavior; 3) hunters are provided with uncrowded conditions; 4) hunters have reasonable harvest opportunities; 5) hunters are clear on which areas are open and closed to hunting; and 6) minimal conflicts occur between hunters and other visitors, especially those engaging in other wildlife-dependent priority public uses. The seven-day-per-week recreational hunting program proposed on portions of Management Unit 1 (excluding Marsh Unit I), Management Unit 2 (east of Morgan Lake Rd.), Management Unit 3 (sub-headquarters), Management Unit 5 (south of Highway 26) and Management Unit 6 (portions of CNWR within the Lower Crab Creek Unit of the Columbia Basin Wildlife Management Area managed by WDFW) would include the following management actions and/or restrictions to reduce impacts.

- Sufficient escape, feeding and resting habitat for wildlife in both open and closed areas will be provided.
- Periodic biological and social monitoring—and evaluation of hunting programs, including feedback from users—will be conducted to determine if visitor and natural resource objectives are being met.
- All hunting on CNWR will require the appropriate State license and tag and will be consistent with applicable State regulations.
- Hunting will be limited to select areas and will not be allowed where is will conflict with threatened, endangered, or sensitive species.
- Hunting will be limited to muzzleloader, shotgun and archery, as appropriate for the species being hunted.
- Only non-toxic shot is allowed for upland birds and migratory waterfowl.
- All hunting will be in State-specified seasons that coincide with the waterfowl hunting season, regardless of the species being pursued, unless an early season muzzleloader deer hunt is established.
- Hunters will use existing open roads and parking areas to access hunting sites, and all hunting will be conducted on foot.
- Hunter compliance with current migratory bird, upland, and big game hunting and Refuge regulations would be achieved through a combination of printed information (WDFW and CNWR), signs, outreach efforts and enforcement of regulations by Service, WDFW, or other law enforcement officers.
- Camping, overnight use and fires are prohibited.
- Construction of pit blinds is not permitted.

Justification

When determined compatible, hunting is one of the six priority public uses of the NWRS. National wildlife refuge hunting programs are designed to provide high-quality experiences. In general, hunting on national wildlife refuges should be superior to that available on other private or public lands, which may require special restrictions (Refuge Manual 8). Measures are often used to ensure quality, including limiting hunt days, limiting shells and using buffers for public use trails, thereby eliminating the need for seasonal trail closures.

Hunting has given many people a deeper appreciation of wildlife and a better understanding of the importance of wildlife and habitat conservation, which ultimately contributes to the NWRS mission. Furthermore, a goal of CNWR is to provide opportunities for quality wildlife-dependent recreation. By law, hunting is one of the six priority public uses of the NWRS.

Hunting, as controlled by the stipulations outlined above, will not materially detract or interfere with achieving CNWR purposes or the NWRS mission, and in some instances may benefit Refuge purposes. For example, deer hunting is a well-established tool to manage for desired vegetation. On CNWR, managing for vegetation/habitats that benefit migratory birds is an important Refuge objective.

Mandatory 10- or 15-year Re-evaluation Date

Provide month and year for "allowed" uses only.

___X___Mandatory 15-year re-evaluation date (for wildlife-dependent public uses).

_____Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses).

NEPA Compliance for Refuge Use Decision

_____Categorical Exclusion without Environmental Action Statement.

_____Categorical Exclusion and Environmental Action Statement.

___X___Environmental Assessment and Finding of No Significant Impact.

_____Environmental Impact Statement and Record of Decision.

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D.5 Compatibility Determination – Migratory Bird, Upland Game Bird, and Deer Hunting

Signatures

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

Refuge Manager/Project Leader Approval: _____ (Signature) 9/26/11 (Date)

Concurrence

Refuge Supervisor: _____ (Signature) 9/27/11 (Date)

Regional Chief, National Wildlife Refuge System: _____ (Signature) 9/28/11 (Date)

D.6 Compatibility Determination – Interpretation, Environmental Education, Wildlife Observation, and Photography

Includes Secondary Activities – Hiking, Biking, Canoeing, Picnicking, and Auto Touring

Use: Interpretation, Environmental Education, Wildlife Observation and Photography

Refuge Name: Columbia National Wildlife Refuge (CNWR)

Establishing and Acquisition Authorities

The CNWR was established June 13, 1944, when the first parcel of land was purchased under the authority granted the Migratory Bird Conservation Commission (Migratory Bird Conservation Act of 1929); the purchase was approved at the August 1943 meeting of the Commission. Subsequently, on September 6, 1944, Public Land Order 243 expanded the CNWR. Pursuant to land acquisition authorities granted the Secretary of the Interior through Executive Order 9337 (April 24, 1943), Public Land Order 243 dictated that " … the following-described public lands in Washington are hereby withdrawn … for the use of the Department of the Interior as a refuge … [Columbia National Wildlife Refuge]."

Refuge Purposes

National wildlife refuges are established " … for the development, advancement, management, conservation, and protection of fish and wildlife resources … " (16 U.S.C. §742f(a)(4)) and also " … 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. §42f(b)(1); Fish and Wildlife Act of 1956, 16 U.S.C. §742(a)-754, as amended).

CNWR was established " … as a refuge and breeding ground for migratory birds and other wildlife" and as " … an inviolate sanctuary, or for any other management purpose, for migratory birds."

National Wildlife Refuge System Mission

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

Description of Use

In the National Wildlife Refuge Improvement Act, the United States Congress declared wildlife observation, photography, environmental education and interpretation as four of six wildlife-dependent public uses of the NWRS. If determined compatible, these four uses would become priority public uses for CNWR. Currently, none of these programs are officially established, but thousands (estimated) of people per year participate in these activities on CNWR.

Interpretive sites, interpretive trails (including a canoe trail on Hutchinson and Shiner Lakes), wildlife observation sites, day-use areas and/or an auto tour route will continue or are proposed. Some sites and trails may only be open seasonally to both protect sensitive resources and to take advantage of specific interpretive, viewing, and photographic opportunities (e.g., sandhill cranes on their spring migration). Other sites and trails will be open year-round but monitored to address any negative impacts. Interpretive points, trails, observation sites, signs, kiosks, etc., will focus on CNWR wildlife and habitats, historic features, cultural resources and traditions, restoration, management, geologic resources and the other special values of the Refuge. Since there are currently very limited facilities to support these uses on CNWR, the Service expects wildlife observation and photography and interpretation to increase over the next 15 years as facilities are developed.

In support of these four priority use activities, cross-country hiking will be allowed in some areas (to be determined in step-down planning according to resource values identified through assessments). Parking areas will be available that will also serve a trail to be created on the Drumheller Channels National Natural Landmark and existing or new trails developed.[11] Interpretive panels/informational signs will be installed where needed and appropriate. Interpretive and educational opportunities could be self-guided or lead by Service staff or docents.

The Refuge currently has a 22-mile auto tour route identified using existing refuge, county, and state roads. The tour runs the entire length of Morgan Lake Road (refuge road) north to State Route 262, west along State Route 262 (state road) to Road H (county road) where it runs back south to McManamon Road (county road) and east to Morgan Lake Road, passing the Drumheller Channel National Natural Landmark overlook along the way. No special provisions are made for this tour; it is a designation only. The only restriction on Morgan Lake Road, other than a 25-mile/hour speed limit, is no commercial vehicles are allowed, including farm equipment. This is a restriction common to all Refuge roads on CNWR. Likewise, no special maintenance or facilities are required or exist for the tour route.

Bicycles are also occasionally used in support of the four priority use activities. The level of use is low and is considered to be incidental. The impacts from bicycle use are also very minimal because their use is limited to Refuge roads open to vehicular traffic. Increases in bicycle use are not expected due to the difficulty of riding on gravel roads and the relatively harsh riding environment. Bicycle use will be allowed on Refuge roads but not promoted through designated trails or visitor information. A separate CD has not been written for bicycling based on the above information.

Canoe-based wildlife viewing will be promoted on the Hutchinson-Shiner Canoe Trail and Lower Hampton Lake. This use is considered a low impact way to see aquatic wildlife and habitats in designated areas. Use levels are low and not expected to increase substantially during the life of the CCP, thus a separate CD has not been prepared. Informal monitoring of this use will occur over the life of the CCP.

Picnicking is an incidental use associated with existing tables and shade structures located at the Soda Lake fishing launch site. This is a secondary use that supports day-use fishing and wildlife observation activities originating at this site. This use will be allowed but not promoted as a picnicking site. Replacement of existing tables and maintenance of toilet facilities will be determined in step-down planning based on site-specific future use levels.

[11] Trails could be created fresh, or they could be established on existing administrative roads.

Currently, there is a minimal environmental education program at CNWR. However, existing staff, summer student hires, and volunteers, such as the Central Basin Audubon Society, have been able to serve some area students annually through classroom talks and tours or field days on the Refuge. With a larger environmental education staff throughout the Mid-Columbia River National Wildlife Refuge Complex (MCRNWRC), many more (an estimated 400) students a year could participate in an environmental education program. The proposed environmental education program is designed to provide effective resources, tools and training for teaching multi-disciplinary topics related to CNWR, such as science, natural and cultural heritage, conservation, writing, and others. Educators would attend a teacher orientation and then design, schedule and run their own field trips on the Refuge.[12] Service staff would provide teacher training, site-specific curricula, materials and activities and field trip assistance where possible to enhance learning in an outdoor setting. Students and teachers could participate in restoration and monitoring activities through one-time activities or more long-term monitoring studies. Staff would work with students and educators to foster an understanding of, and appreciation for, resource management and the human impacts on wildlife and habitats. Active participation in resource protection would be encouraged.

Activity	Primary Usage Areas	Primary Season of Use
Auto Tour Route	Morgan Lake Road	Spring, Summer, Fall
Biking (Incidental Use)	Areas open to vehicular traffic: Morgan Lake Road, access road to Hutchinson-Shiner lakes	Spring
Canoeing	Hutchinson-Shiner Canoe Trail, Lower Hampton Lake	Spring, Summer
Environmental Education	Marsh Unit I, Soda Lake Day Use Area, Bluebird Day Use Area (by permit only)	Spring
Hiking	Three interpretive trails within Management Unit 2, areas open to other public use (i.e., hunting) within Management Units 1, 2, 4, 5, 6	Spring, Fall
Interpretation	Three interpretive trails in Management Unit 2, interpretive panels at select sites within CNWR	Spring, Summer, Fall
Picnicking (incidental use supporting fishing and wildlife observation)	Soda Lake Day Use Area	Spring, Summer, Fall

[12] This would be a program run in conjunction with one proposed for the larger Hanford Reach National Monument (Monument) through the MCRNWRC. The reader is directed to the Monument's Comprehensive Conservation Plan for full details.

Activity	Primary Usage Areas	Primary Season of Use
Wildlife Observation/Photography	Throughout Refuge areas open to public use; concentrated use in spring crane migration areas within Corfu and Marsh Unit I, Royal Lake Overlook, Drumheller Channels National Natural Landmark Overlook, interpretive trails	Spring, Summer, Fall

The Service does not have accurate visitor use numbers for any of the activities listed above. This is an information need that will need to be determined in the future.

Availability of Resources

The following funding/annual costs would be required to administer and manage wildlife observation, photography, interpretation and environmental education activities as described above. Because interpretation, environmental education, wildlife observation and photography are considered priority public uses on a national wildlife refuge, the Service will find funding to administer the program to a safe level, at a minimum.

Activity or Project	One-Time Expense	Recurring Expense
Develop Trails	$30-60,000	
Signs/Interpretive Panels	$20,000	
Maintenance of Trails, Roads, Parking Areas, Other	$15,000 for interpretive materials	$20,000
Law Enforcement		$20,000
Monitoring and Administration		$10,000
Totals	**$50-100,000**	**$50,000**

Anticipated Impacts of the Use

While there is an auto tour route delineated, almost every visitor looking for access to the interior of the Refuge uses Morgan Lake Road, and it is unlikely that the auto tour route adds any substantial numbers to visitor use days. As such, there is negligible additional impact from designation of the tour route to that from the mere existence of the road (e.g., dust, wildlife collisions, pollution). As noted in the CCP, the Service is considering closing Morgan Lake Road to overnight use, which will have no impact to or from the auto tour route. As the tour route adds few additional vehicles to roads being maintained for other purposes, there are no additional costs to the Service associated with the activity.

The maintenance of trails and parking areas will impact soils, vegetation and, in some instances, hydrology around the site. This could include an increased potential for erosion, soil compaction (Liddle 1975), reduced seed emergence (Cole and Landres 1995), alteration of vegetative structure and composition, and sediment loading (Cole and Marion 1988). However, where possible, existing administrative roads (many maintained seasonally as firebreaks) and facilities will be used. In addition, most parking lots and access trails will be relatively small in size (less than 0.25 acre each, widely scattered throughout the Refuge). These factors are coupled with best management practices (BMPs), to minimize impacts to natural and cultural resources.[13] In areas where new trails or access points are established, BMPs (e.g., seasonal closures during sensitive life cycles, routing of trails away from sensitive areas) would negate or minimize impacts.

Human activities on trails and at other access points, as well as cross-country hiking, can result in direct effects on wildlife through harassment, a form of disturbance that can cause physiological effects, behavioral modifications, or death (Smith and Hunt 1995). Numerous studies have confirmed that people on foot can cause a variety of disturbance reactions in wildlife, including flushing or displacement (Erwin 1989; Fraser et al. 1985; Freddy 1986), heart rate increases (MacArthur et al. 1982), altered foraging patterns (Burger and Gochfeld 1991), and even, in some cases, diminished reproductive success (Boyle and Samson 1985).[14] These studies and others have shown that the severity of the effects depends upon the distance to the disturbance and its duration, frequency, predictability and visibility to wildlife (Knight and Cole 1991).

On CNWR, birds are especially vulnerable and can be impacted from human activities when they are disturbed and flushed from feeding, resting, or nesting areas. Flushing, especially repetitive flushing, can strongly impact habitat use patterns of many bird species. Flushing from an area can cause birds to expend more energy, be deterred from using desirable habitat, affect resting or feeding patterns, increase exposure to predation, or cause abandonment of sites (Smith and Hunt 1995). Migratory birds are observed to be more sensitive than resident species to disturbance (Klein 1989). Herons and shorebirds were observed to be the most easily disturbed (when compared to gulls, terns and ducks) by human activity and flush to distant areas away from people (Burger 1981). A reduced number of shorebirds were found near people who were walking or jogging, and about 50 percent of flushed birds flew elsewhere (Burger 1981). In addition, the foraging time of sanderlings decreased, and avoidance (e.g., running, flushing) increased as the number of humans within 300 feet increased at a coastal bay refuge on the Atlantic (Burger and Gochfeld 1991).

Nest predation for songbirds (Miller et al. 1998), raptors (Glinski 1976), colonial nesting species (Buckley and Buckley 1976), and waterfowl (Boyle and Samson 1985) tends to increase in areas more frequently visited by people. In addition, for many passerine species, primary song occurrence and consistency can be impacted by a single visitor (Gutzwiller et al. 1994). This could potentially limit the number of breeding pairs of certain passerine species, thus limiting production within riparian habitats (Reijnen and Foppen 1994).

Of the wildlife observation techniques proposed, wildlife photographers tend to have the largest disturbance impacts (Dobb 1998; Klein 1993; Morton 1995). While wildlife observers frequently stop to view species, wildlife photographers are more likely to approach wildlife (Klein 1993). Even

[13] Best management practices are described in detail in Chapters 2 and 3 of the *Columbia National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment*.
[14] Based on this information, it is likely that horseback riding, bicycling and canoeing would have similar impacts.

slow approach by wildlife photographers tends to have behavioral consequences to wildlife species (Klein 1993). Other compounding factors include the potential for photographers to remain close to wildlife for extended periods of time in an attempt to habituate the wildlife subject to their presence (Dobb 1998) and the tendency of casual photographers, with low-power lenses, to get much closer to their subjects than other activities would require (Morton 1995), including wandering off trails. This usually results in increased disturbance to wildlife and habitat, including trampling of plants. Visitor education programs, monitoring, and law enforcement, coupled with best management practices for facility design would minimize impacts.

The environmental education program would use many existing public facilities, or ones created for other purposes (e.g., parking areas for anglers), including parking areas, trails, interpretive sites, and wildlife observation accommodations. This would help to minimize impacts. Additionally, this activity is considered to be of minor impact due to the stipulations imposed below and through best management practices.

While visitors to national wildlife refuges can seriously impact natural and cultural resources, the level of use on CNWR at this time is compatible with protection of resources. If use increases or changes in the future, many of these activities may need "caps" or other established mitigation techniques employed. An active monitoring program, even if it is just field observations, will be needed and employed to evaluate impacts to resources. Both the monitoring program and the mitigation measures will be outlined in the Visitor Services Plan.

Many members of the public are not familiar with national wildlife refuges and confuse them with other Federal land management systems, such as national parks, or with state parks. Providing information through educational programs, written materials, and interpretive panels helps to build an understanding and appreciation of the Refuge's unique purposes and activities. Providing information regarding the mission of the Service and the purposes of the Refuge, along with specific resource information, may alleviate potential negative impacts on wildlife by educating our visitors.

Although all of these activities can result in disturbance to wildlife, disturbance will be intermittent and short-term. There are more than adequate amounts of undisturbed habitat available to wildlife for escape and cover. It is anticipated that wildlife populations will find sufficient food resources and resting places such that their abundance and use of the Refuge will not be measurably lessened from allowing the above activities to occur. The relatively limited number of individuals expected to be adversely affected will not cause wildlife populations to materially decline, the physiological condition and production of local wildlife species will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be negatively impacted. Thus, allowing these uses to occur, with stipulations, will not materially detract or interfere with the purposes for which CNWR was established or the mission of the NWRS.

Public Review and Comment

This CD was prepared concurrent with CNWR's CCP. An open house was held and written comments were solicited from the public during the scoping period for the CCP. Public review and comment were solicited during the draft CCP comment period.

Determination

_____ The use is not compatible.

___X___ The use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility

- Monitoring will be conducted to insure that high-quality habitat for wildlife feeding, resting, breeding is maintained.
- A system to monitor the level of use and vegetation damage and impact along roadsides, designated parking areas, and trails would need to be established.
- The Refuge will provide signs, brochures, and digital information to promote the appropriate use of trails, roads, and waters to minimize wildlife and habitat disturbance.
- Collection of plants and animals is prohibited unless a Special Use Permit is obtained from the Refuge (except associated to legal hunting and fishing activities)
- Any of these activities could be reduced or closed with the finding of significant negative impacts to CNWR facilities or natural and cultural resources.
- Limits will be established for the total number of environmental education groups permitted per day.
- Participants will be restricted to designated hiking trails, sites or facilities as determined by Service staff. Seasonal closures may be necessary to protect Refuge resources.
- No overnight use of the Refuge is allowed except travel on roads open to public use.
- Bicycle use is restricted to roads open to vehicular traffic
- Picnicking and support facilities will be limited to the Soda Lake Day use boat launch site
- Education groups must provide a sufficient number of adults to supervise the group, as determined by Service staff.
- Students involved in restoration and monitoring projects must receive some form of training (activity and project-specific) prior to commencement of the activity. This is to ensure their safety while out in the field and to minimize wildlife and habitat disturbance.
- Collection of samples for study (i.e., plants, soils) will be restricted to study areas, and samples must be used on-site. Collection will be of materials needed to enhance hands-on learning and investigation and will be designed as part of structured activities and lessons, guided by teachers, and monitored by Service staff. These activities are an integral part of the education program design and philosophy and their impacts are considered minimal.

Justification

Wildlife observation, photography, and environmental education and interpretation are priority public uses of the NWRS. Providing opportunities for these activities would contribute toward fulfilling provisions of the National Wildlife Refuge System Administration Act, as amended in 1997, and one of the goals of CNWR. Wildlife observation, photography, and interpretation would provide an excellent forum for allowing public access and increasing understanding of Refuge resources. The educational possibilities provided by these opportunities would outweigh any anticipated negative impacts associated with implementation of the program. The stipulations outlined above, as well as the best management practices identified, would minimize potential impacts relative to wildlife/human interactions.

To assist in interpretation and environmental education, CNWR's environmental education program (often coupled with that of other refuges within the MCRNWRC) would provide a diversity of environmental education opportunities to students and teachers. These include: 1) facilities, materials and training; 2) access to a variety of CNWR habitats; and 3) the ability to observe wildlife and

conduct hands-on exploration. The program is intended to foster a better understanding of CNWR's ecosystems and wildlife resources, and in turn build a public that is more knowledgeable about, and involved in, resource stewardship.

Interpretation, environmental education, wildlife observation and photography, as controlled by the stipulations outlined above, will not materially detract or interfere with achieving CNWR purposes or the NWRS mission, and in some instances may benefit Refuge purposes. For example, an educated public is one less likely to damage natural and cultural resources and is more likely to be supportive of funding for national wildlife refuges and other public lands.

Mandatory 10- or 15-year Re-evaluation Date

Provide month and year for "allowed" uses only.

___X___Mandatory 15-year re-evaluation date (for wildlife-dependent public uses).

_____Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses).

NEPA Compliance for Refuge Use Decision

_____Categorical Exclusion without Environmental Action Statement.

_____Categorical Exclusion and Environmental Action Statement.

___X___Environmental Assessment and Finding of No Significant Impact.

_____Environmental Impact Statement and Record of Decision.

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D.6 Compatibility Determination – Interpretation, Environmental Education, Wildlife Observation, and Photograph

Includes Secondary Activities – Hiking, Biking, Canoeing, Picnicking, and Auto Touring

Signatures

Prepared by: Larry Klinck (Signature) 9/26/11 (Date)

Refuge Manager/Project Leader Approval: Mary M. Howland (Signature) 9/26/11 (Date)

Concurrence

Refuge Supervisor: (Signature) 9/27/11 (Date)

Regional Chief, National Wildlife Refuge System: Ed S. West (Signature) 9/28/11 (Date)

D.7 Compatibility Determination – Mosquito/Vector Control

Use: Mosquito/Vector Control

Refuge Name: Columbia National Wildlife Refuge (CNWR)

Establishing and Acquisition Authorities

The CNWR was established June 13, 1944, when the first parcel of land was purchased under the authority granted the Migratory Bird Conservation Commission (Migratory Bird Conservation Act of 1929); the purchase was approved at the August 1943 meeting of the Commission. Subsequently, on September 6, 1944, Public Land Order 243 expanded the CNWR. Pursuant to land acquisition authorities granted the Secretary of the Interior through Executive Order 9337 (April 24, 1943), Public Land Order 243 dictated that " the following-described public lands in Washington are hereby withdrawn … for the use of the Department of the Interior as a refuge … [Columbia National Wildlife Refuge]."

Refuge Purposes

National wildlife refuges are established " … for the development, advancement, management, conservation, and protection of fish and wildlife resources … " (16 U.S.C. §742f(a)(4)) and also " … 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. §42f(b)(1); Fish and Wildlife Act of 1956, 16 U.S.C. §742(a)-754, as amended).

CNWR was established " … as a refuge and breeding ground for migratory birds and other wildlife" and as " … an inviolate sanctuary, or for any other management purpose, for migratory birds."

National Wildlife Refuge System Mission

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

Description of Use

This use is not a priority public use as defined by the National Wildlife Refuge System Improvement Act. Mosquito monitoring and treatment on CNWR will be conducted by the Grant and Adams Counties Mosquito Control Districts (MCDs). The mosquito species documented to be breeding on, or residing on CNWR, and targeted for monitoring and treatment, are *Culex inornata*, *Culex pipiens*, *Culex tarsalis*, *Ochlerotatus dorsalis*, *Aedes vexans*, *Aedes cinereus*, *Coquillettidia perturbans,* and *Anopheles punctipennis*. *Culex tarsalis* is the primary vector of western equine encephalitis (WEE) and St. Louis encephalitis (SLE) in Washington and is also considered to be a significant vector of West Nile virus (NWV) (Washington Department of Public Health 2004).

CNWR will allow the MCDs to continue access to the Refuge for monitoring and controlling mosquitoes to address human health concerns in neighboring communities wherever it does not

directly conflict with resource protection needs. CNWR is located in central Washington south of Potholes Reservoir west to the Columbia River within Grant and Adams Counties; nearby communities of concern are Othello (8 miles south), Warden (11 miles east), Royal City (17 miles west) and Moses Lake (23 miles north). While these communities are well outside the flight range of mosquitoes on CNWR, the Refuge can act as a reservoir for vector-borne diseases, such as WNV. Of immediate concern are the many farms and residences in close proximity to CNWR.

The MCDs have identified two specific areas on the Refuge containing wetland and riparian areas that historically have produced mosquito larvae, of which most are in Marsh Units III and V; in general, the larger permanent wetlands found elsewhere on the Refuge are not major mosquito breeding sites. Within a portion of the seasonal and permanent water wetland edges there are abundant wildlife (birds, mammals, amphibians, reptiles, etc.), invertebrate and plant resources. Waterfowl species, such as mallards, northern shovelers, and ruddy ducks, use these edges. Other mosquito larvae breeding sites that are more ephemeral, too small, or densely vegetated receive little waterfowl and other wildlife use. These more stagnant and ephemeral areas are usually more conducive to mosquito breeding and are the areas targeted.

Treatment of larval mosquito populations through application of larvicides may occur on as much as 700 acres of wetland habitats, or proportionally 2.5 percent of the total Refuge area. Only those areas where monitoring has shown that larval mosquito populations have reached or exceeded predetermined species-specific thresholds would be targeted for treatment. Specific areas treated, and the aerial extent of treatment, would vary from year to year, depending on mosquito populations and environmental conditions. While most disturbance would be confined to the targeted wetland, some disturbance related to accessing the monitoring and treatment sites is expected to occur in upland and riparian areas.

During an average mosquito monitoring period, MCDs have field technicians assess larval mosquito populations between the months of April through September. Monitoring activities may occur at any time during the day. Mosquito monitoring crews may require one-half to one full day to conduct monitoring activities, and the frequency would depend on mosquito activity, which is in turn is dependent on environmental conditions such as temperature. The more active the mosquitoes become (typically temperature-dependent), the greater the monitoring frequency. Monitoring frequency may range from once per week to once every three days. MDCs monitor larval stage mosquito populations and identify species using the dipper method. Dipping occurs about every 1-2 weeks where there are pools of standing water.

Treatment of larval mosquito populations is initiated when a predetermined species-specific threshold is reached or exceeded (see Table D.5 and D.6). Larval thresholds calling for treatment may be reached or exceeded at any point during the monitoring season from April through October. Larval treatments may occur anytime during the daylight hours. The frequency of larval treatments depends on the larvicide's persistence, the rate of post-treatment mosquito recovery and the species-specific seasonal development. Larval treatment frequency may range from once every seven days to once per month. Actual treatment of breeding sites depends on larval populations, but the majority of larvicide treatments occur May through July.

Annual precipitation amounts have a direct effect on mosquito populations. During drought years (seasons having low precipitation) mosquito populations tend to be low, and during wet years (seasons with high precipitation) mosquito populations tend to be high. Mosquito control applications generally occur anytime between April and September of each year, depending on environmental

conditions. In the last three years, mosquito control treatments have occurred as early as March 4 in 2002 and as late as October 15 that same year.

Table D.5 Threshold Levels of Vector Mosquitoes per Dip Indicating Chemical Treatment as Defined by the MCDs

Number of Larvae Per Dip	Disease Vector Species Absent	Disease Vector Species[1] Present and	
		No Residences Within 1 Mile	Multiple Residences Within 1 Mile
0-2	No Treatment	No Treatment	No Treatment
3-5	No Treatment	No Treatment	Treat
6-	No Treatment	Treat	Treat

[1] *Culex pipiens*, *Culex tarsalis*, *Culiseta inornata*, *Aedes vexans*, *Aedes cinereus*, *Anopheles punctipennis*, *Ochlerotatus dorsalis,* and *Coquillettidia perturbans* are the eight disease vector mosquito species currently listed by the Centers for Disease Control as WNV carriers. Other species may be added to this list as WNV spreads to western states.

Mosquito Monitoring

MCDs monitor larval stage mosquito populations and identify species using the dipper method. This entails using a long-handled ladle called a dipper to collect water samples from pools potentially serving as mosquito sources. Dipping occurs about every 1-2 weeks wherever there are pools of standing water. Dip counts are used to estimate the numbers of immature mosquitoes and to determine the need for mosquito control.

The monitoring activities described above are conducted under an annual special use permit (SUP) granted by the Service to the MCDs. CNWR proposes to allow the MCDs to continue these activities under special conditions set forth in the annual SUP. Post treatment monitoring to determine efficacy of control is conducted in the same way, using dip method for larval counts and mosquito light traps for adults, but more frequently and at and around the specific treatment sites.

Table D.6 CNWR Mosquito-Borne Disease Health Threat and Phase Response Matrix[1]

Current Conditions		Threat Level	Refuge Response
Health Threat Category[2]	Refuge Mosquito Populations[3]		
No documented existing or historical health threat/emergency.	No Action Threshold	1	Reduce and eliminate artificial mosquito breeding sites such as tires, tanks, or similar debris/containers.

Current Conditions		Threat Level	Refuge Response
Health Threat Category[2]	**Refuge Mosquito Populations[3]**		
Documented historical health threat/emergency.	Below Action Threshold	2	Response as in threat level 1; plus allow compatible monitoring and disease surveillance; water-level manipulation that disrupts mosquito life cycles, including timing and rate of flood-up and drawdown of managed wetlands, and/or vegetation management to discourage egg laying by mosquitoes but do not conflict with wildlife management objectives.
	Above Action Threshold	3	Response as in threat level 2; plus allow compatible site-specific larviciding of infested areas as determined by monitoring. Larvicides may include Bti, Bs, and methoprene. Bti and Bts would be the first options considered.
Documented existing health threat (specify multiple levels, if necessary; e.g., disease found in wildlife, disease found in mosquitoes).	Below Action Threshold	4	Response as in threat level 2; plus increase monitoring and disease surveillance.
	Above Action Threshold	5	Response as in threat levels 3 and 4; plus allow compatible site-specific pupaciding and/or adulticiding of infested areas as determined by monitoring. Pupaciding may include monomolecular films and adulticiding may include pyrethrins (anvil) and sumithrin products.
Officially determined existing health emergency.	Below Action Threshold	6	Maximize monitoring and disease surveillance.
	Above Action Threshold	7	Response as in threat level 6; plus allow site-specific larviciding, pupaciding, and adulticiding of infested areas as determined by monitoring. Emergency conditions will exempt control measures from CD. Larvicides, pupacides and adulticides may include those listed in threat levels 3 and 5 and pre-approved organophosphates (malathion).

[1] Taken from National Wildlife Refuge System Mosquito Management Guidelines for 2005 (U.S. Fish and Wildlife Service 2005), the Service Director's guidance.
[2] Health threat/emergency as determined by Federal and/or State/local public health authorities with jurisdiction inclusive of refuge boundaries and/or neighboring public health authorities.
[3] Action thresholds represent mosquito population levels that may require intervention measures.

Mosquito Treatment (Larvicides/Pupacides)

There are currently five general categories of larvicides/pupacides used for mosquito control in the United States—biological, organophosphate, insect growth regulator, oil and monomolecular film.

The biological larvicides are *Bacillus thuringiensis israelensis* (Bti) and *Bacillus sphaericus* (Bsp). Temephos is an organophosphate insecticide with broad-spectrum activity and high toxicity toward birds and fish and will therefore not be considered further. Methoprene and diflubenzuron are insect growth regulators. Methoprene poses reduced ecological risk and equivalent efficacy compared to diflubenzuron. Therefore, diflubenzuron will not be considered further. GB 1111 is a petroleum distillate categorized as an oil. Monomolecular films are an isostearyl alcohol compound.

Larvicides (Bti): Bti is a microbial insect pathogen used to control larval stages of mosquitoes and black flies. It is a naturally occurring anaerobic spore forming bacteria that is mass produced using modern fermentation technology. Formulated Bti products contain bacterial spores and protein endotoxins that are activated in the alkaline mid-gut of insect species and subsequently bind to protein-specific receptors of susceptible insect species, resulting in the lethal response (Lacey and Mulla 1990). Therefore, Bti must be ingested by the target insect to be effective; mosquito pupa and adults are not affected. Bti is available in granular and liquid formulations. The granular formulations are applied at rates of 5-20 pounds of formulated product per acre. The liquid formulations are applied at rates of 0.25-2 pints of formulated product per acre.

Larvicides (Bsp): Like Bti, Bsp is a microbial insect pathogen with a similar mode of action (Walton et al. 1998). Formulated Bsp products used as mosquito larvicides consist of bacterial spores and protein endotoxins. Bsp is available in two granular formulations, Vectolex CG and Vectolex WDG. Vectolex CG is applied at rates of 5-20 pounds of formulated product per acre. Vectolex WDG is applied at rates of 0.5-1.5 pounds of formulated product per acre. Both Bti and Bsp may be applied as a spot treatment to small areas or broadcast over larger areas by ground (e.g., backpack, truck-mounted broadcasters) and/or aerial (fixed-wing or helicopter) equipment.

Larvicides (Methoprene): Methoprene is a synthetic insect growth regulator that mimics juvenile hormones (Tomlin 1994). It interferes with the insect's maturation stages, preventing the insect from transforming into the adult stage and thereby precluding reproduction. Methoprene is a contact insecticide that does not need to be ingested. It is most effective on early larval instars, but does not affect pupae or adult mosquitoes (Extension Toxicology Network [EXTOXNET] 1996). Treated larvae will pupate, but will not emerge as adults. The insect eventually dies in the pupal stage. In mosquito control applications, methoprene is applied directly to the larval breeding habitat. It is available in several formulations—liquid, granular, pellet and briquette. Methoprene is applied at rates of 0.75-1 ounces of formulated product per acre using ground and/or aerial equipment.

Pupacides (GB 1111 and Monomolecular Film): GB 1111 forms a barrier at the air water interface causing suffocation of air breathing insects (Lawler 1998). Therefore, GB 1111 has broad spectrum insecticidal activity and controls both mosquito larva and pupa. GB 1111 is applied at rates of 2-5 gallons of formulated product per acre using ground equipment. Monomolecular films (CMCD uses Agnique NMF) reduce the water surface tension. This interferes with larval orientation at the air-water interface and/or increases wetting tracheal structures, thus suffocating the organism. As the film spreads over the water surface, it tends to concentrate mosquito pupae, which may increase mortality from crowding stress (Dale and Hulsman 1990). Monomolecular films are applied at rates of 0.2-0.3 gallons of formulated product per acre using ground and/or aerial equipment.

Mosquito Treatment (Adulticides)

There are currently three general categories of adulticides used for mosquito control in the United States—natural pyrethrins, synthetic pyrethroids and organophosphates. Natural pyrethrins are

extracted from a certain species of chrysanthemum plant and consist of a mixture of pyrethrin-I, pyrethrin-II, cinerin I and II and jasmolin I and II (EXTOXNET 1994). Resmethrin, sumithrin, and permethrin are synthetic pyrethroids. Sumithrin poses reduced ecological risk and equivalent efficacy compared to resmethrin and permethrin. Therefore, resmethrin and permethrin will not be considered further. Malathion and naled are organophosphates.

Most adulticides used currently are applied as ultra-low volume (ULV) sprays, meaning relatively small amounts are used (compared to some agricultural pesticides), and they are sprayed as very fine droplets (0.00039-0.00118 inches in diameter). This small droplet size allows the spray to drift for a relatively longer period of time compared to larger droplets, and the small size delivers an appropriate dose of the pesticide to kill an adult mosquito. Drift is a necessary component of adulticiding because these sprays are most effective on flying insects. For this reason, adulticide applications generally occur in the evening or early morning hours when the majority of mosquito species are most active. Adulticides may be applied by truck-mounted sprayers or applied aerially by helicopter or fixed-wing aircraft.

Adulticides (Pyrethrins): The natural pyrethrins are non-systemic contact poisons which quickly penetrate the insect nervous system causing paralysis and subsequent death (EXTOXNET 1994; Tomlin 1994). A few minutes after application the insect cannot move or fly away. However, the pyrethrins are swiftly detoxified by enzymes in the insect and thus exposed insects can recover. To delay the enzyme action so a lethal dose is ensured, commercial products are formulated with piperonyl butoxide to inhibit detoxification (Tomlin 1994). Pyrethrin products are applied at a rate of 0.0025 pounds of active ingredient per acre.

Adulticides (Synthetic Pyrethroids-Sumithrin): Like the natural pyrethrins, sumithrin is a non-systemic contact insecticide with a similar mode of action. Sumithrin products are also formulated with piperonyl butoxide as a synergist. Sumithrin products are applied at a rate of 0.0012 to 0.0036 pounds of active ingredient per acre.

Adulticides (Organophosphates—Malathion and Naled): Malathion is a non-systemic, broad-spectrum, organophosphate insecticide and acaricide with contact, stomach, and respiratory action and is a cholinesterase inhibitor (Tomlin 1994). It is used to control a variety of insect pests of agriculture, including mosquitoes, flies, household insects, animal parasites, and head and body lice. Malathion is available in many formulations, including emulsifiable concentrates and ultra low volume (ULV) liquid concentrates. The ULV concentrate is applied as a nonthermal aerosol using a maximum rate of 0.007 pounds of active ingredient per acre.

Availability of Resources

Other than writing the SUPs, coordinating the activity with the MCDs and reviewing activities, costs to the Service will be low. The MCDs provide the materials and apply the appropriate control measures, as well as conduct the monitoring to determine when vector control is needed. The following funding would be required to administer and manage research activities as described above. No special equipment, facilities, or improvements are anticipated. Current budget allocations are sufficient to administer and manage this use.

Activity or Project	One-Time Expense	Recurring Expense
Administration (Evaluation of Applications, Management of Permits, Oversight)		$1,000
Coordination with MCDs		$2,000
Formulation of Mosquito Management Plan		$25,000
Totals		**$28,000**

Anticipated Impacts of the Use

Monitoring

The impacts of monitoring will be confined to pathways along shorelines where dip net samples will be taken. Small areas of vegetation may be crushed in transit to pools of water, but as the frequency of occurrence is low the vegetation will likely spring back after it has been bent under foot. The potential exists for the spreading of noxious weed seed, or disturbing vegetation and thus allowing colonization of exposed dirt to weed seeds. This is minimized by requiring MCDs to clean equipment used in monitoring and treatment as outlined in the annual SUP. Placing and checking of CO_2 (carbon dioxide) traps might also create a transient impact from footsteps on the vegetation going to and from the traps. Again, this is done at most once a week. There will be no disturbance of habitat associated with the single light trap, as it is in the maintenance yard at headquarters.

Toxicity and Effects to Non-target Organisms

The dominant impact of mosquito control will relate to the toxicity and effects of the treatments on non-target organisms. The possible effects of the larvicides Bti, methoprene, GB-1111, monomolecular film and the pyrethroid, sumithrin, and malathion adulticides will be discussed separately.

Treatment/Larvicide (Bti): Bti has practically no acute or chronic toxicity to mammals, birds, fish, or vascular plants (U.S. Environmental Protection Agency [USEPA] 1998). Extensive acute toxicity studies indicated that Bti is virtually innocuous to mammals (Siegel and Shadduck 1992). These studies exposed a variety of mammalian species to Bti at moderate to high doses, and no pathological symptoms, disease, or mortality were observed. Laboratory acute toxicity studies indicated that the active ingredient of Bti formulated products is not acutely toxic to fish, amphibians, or crustaceans (Brown et al. 2002; Brown et al. 2000; Garcia et al. 1980; Lee and Scott 1989; Wipfli et al. 1994). However, other ingredients in formulated Bti products are potentially toxic. The acute toxicity response of fish exposed to the formulated Bti product Teknar HPD was attributed to xylene (Fortin et al. 1986; Wipfli et al. 1994). Field studies indicated no acute toxicity to several fish species exposed to Bti (Merritt et al. 1989; Jackson et al. 2002); no detectable adverse effects to breeding redwing black birds using and nesting in Bti treated areas (Hanowski et al. 1997; Niemi et al. 1999); and no detectable adverse effects to tadpole shrimp 48 hours post Bti treatment (Dritz et al. 2001). Therefore, risks to sensitive wildlife resources resulting from direct exposure to a single Bti application are expected to be negligible.

In addition to mosquitoes, Bti affects blackflies and several members of the *Nematocera* suborder within the order *Diptera* (Boisvert and Boisvert 2000; Garcia et al. 1980). The most commonly observed Bti effects to non-target organisms were to larvae of some chironomids in laboratory settings when exposed to relatively high doses (Boisvert and Boisvert 2000; Lacey and Mulla 1990; Miura et al. 1980). In field studies, effects to target and susceptible non-target invertebrates have been variable and difficult to interpret. Field study results are apparently dependent on the number, frequency, rate and aerial extent of Bti applications; Bti formulation; sample type (e.g., benthic, water column, or drift); sampling interval (e.g., from 48 hours to one or more years after treatment); habitat type (e.g., lentic or lotic); biotic (e.g., aquatic communities) and abiotic factors (e.g., suspended organic matter or other suspended substrates, temperature, water depth); mode of feeding (e.g., filter feeder, predator, scraper or gatherer); larval development stage; and larval density (Ali 1981; Boisvert and Boisvert 2000; Lacey and Mulla 1990). Bti activity against target and susceptible non-target invertebrates is also related to Bti persistence and environmental fate (Dupont and Boisvert 1986; Mulla 1992). Simulated field studies resulted in the suppression of two unicellular algae species, *Closterium* species and *Chlorella* species, resulting in secondary effects to turbidity and dissolved oxygen of aquatic habitats, with potential trophic effects (Su and Mulla 1999). For these reasons, Bti effects to target susceptible non-target organisms and potential indirect trophic impacts in the field are difficult to predict. However, single applications to limited areas are not expected to cause significant food chain effects. The ability for a population to re-colonize a wetland following multiple larvicide treatments would depend on the intensity and frequency of applications at different spatial scales.

Treatment/Larvicide (Methoprene): Methoprene has moderate acute fish toxicity, slight acute avian toxicity and practically no acute mammalian toxicity (EPA 2000; U.S. Fish and Wildlife Service 1984). In mallard ducks, dietary concentrations of 30 parts per million (ppm) caused some reproductive impairment (EPA 1991). This figure exceeds the estimated environmental concentration by a factor of 10. Methoprene residues have been observed to bioconcentrate in fish and crayfish by factors of 457 and 75, respectively (EPA 1991). Up to 95 percent of the residue in fish was excreted within 14 days (EPA 1991). Risk quotients for birds, fish and mammals are below EPA levels of concern for endangered species, indicating negligible risk to those taxa resulting from direct exposure using maximum labeled rates for mosquito control (Urban and Cook 1986). In field studies no detectable adverse effects to breeding red-winged blackbirds using and nesting in areas treated with methoprene were observed (Niemi et al. 1999).

There has been speculation and some preliminary data to suggest that methoprene causes limb malformations in amphibians (La Clair et al. 1998). However, experiments with methoprene and its degradation products have failed to demonstrate developmental toxicity even at concentrations exceeding 100 times that expected for mosquito control (Ankley et al. 1998; Degitz et al. 2003). Therefore, current data do not support a role of methoprene in amphibian malformations.

Risk assessment for Methoprene.

Animal	Acute Toxicity (ppm)	EEC[1] (ppm)	RQ	LOC (ES)
Bird	>4640 (8 D LC 50)	3.0 (short grass)	0.0006	0.1
Fish	0.4 (96 hr LC 50)	0.01 (6 inches)	0.025	0.05
Mammal	>34,000 (LD 50[2])	3.0 (short grass)	0.00001	0.1

[1] EEC calculated using a rate of 0.013 lbs ai/ac (1.0 fluid oz/ac Altosid 20% methoprene).
[2] LD 50 for mammals converted to 1 Day LC50 using a conversion factor of 0.1 for RQ calculation.

The amount of methoprene necessary for mosquito control is < 1.0 part per billion (ppb). The initial concentrations of methoprene when applied to aquatic habitats may reach 4-10 ppb, but residual concentrations are approximately 0.2 ppb (Ross et al. 1994). Once released into the aquatic environment, it is non-persistent, with a half-life of about 30-40 hours. Because methoprene is a juvenile hormone (JH) mimic, and all insects produce JH, there is concern about potential adverse impacts to non-target aquatic insects when this pesticide is used for mosquito control. There is particular concern regarding potential negative impacts to chironomid larvae due to their importance in food webs. With regard to exposure, chironomid larvae occur primarily in the benthos, either within the sediments and/or within cases constructed of silk and detritus. Thus, there may be differences with regard to exposure to methoprene between chironomid and mosquito larvae, the latter occurring primarily in the water column where the methoprene exposure is expected to occur.

There is evidence for potential toxicity to chironomid and other aquatic invertebrates from methoprene treatments. Some early experiments indicated approximately 50 percent mortality of *Chironomus stigmaterus* (*Chironomidae*) and 70 percent of *Brachydeutera argentata* (*Diptera: Ephydridae*) larvae when exposed to 0.01 ppm of technical grade methoprene (Miura and Takahashi 1973). Mulla et al. (1974) noted up to 100 percent inhibition of emergence for some midge species, although the lowest concentration tested was 0.1 ppm. Breaud et al. (1977) observed reductions in several aquatic invertebrate taxa, including chironomids, after six applications of methoprene over an 18-month period in a Louisiana marsh. The application rate in this latter study was 0.028 kg/ha of active ingredient, although the formulation was not specified (Breaud et al. 1977).

In testing different formulations of methoprene against chironomids in experimental ponds, Ali (1991) found that sustained-released formulations inhibited emergence of midges by 38-98 percent, in some cases for up to seven weeks. A liquid, microencapsulated formulation applied at mosquito control rates resulted in a 60 percent inhibition of emergence in the tribe *Chironomini* for 14 days post-treatment. A pelletized, sustained-release (30 days) formulation applied at mosquito control rates inhibited all chironomid emergence by 64-98 percent for seven weeks. A briquet formulation (30 days sustained-release) produced 38-98 percent inhibition of all chironomids for seven weeks. The granular formulation applied at the high end of mosquito control rates reduced chironomid emergence by 61-87 percent (Ali 1991).

In the multi-year Minnesota study cited above, a three-week sustained-release, granular formulation of methoprene was applied to treatment wetlands at a label-recommended rate of 5-10 kg/ha (Hershey et al. 1998; Niemi et al. 1999). The pesticide was applied six times per season at three-week intervals. The impacts from methoprene in this study were very similar to those observed for Bti. Negative impacts were not observed until the second and third years of treatment. In those years, significant declines in aquatic insect density and biomass were detected in methoprene-treated

wetlands compared to controls. Total insect biomass was 70 percent and 81 percent lower in the second and third years of treatment, respectively, than in control wetlands (Hershey et al. 1998). Reductions were observed across many insect taxa, including predators and non-predators, suggesting direct (pesticide) and indirect (food web) effects from methoprene treatments (Hershey et al. 1998).

Although the application rate of methoprene used in the Minnesota study was well within operational rates used in mosquito control, the frequency of application exceeded what would probably occur under most field situations. Using a three-week sustained release formulation and applying that every three weeks ensured a nearly constant exposure of methoprene to aquatic invertebrates in the treated wetlands throughout the season. Under such a scenario, it is unlikely that most impacted invertebrate populations would be able to re-colonize the wetlands during the treatments. However, this does not discount the conclusion that non-target aquatic invertebrates were indeed impacted by methoprene at rates and concentrations used for mosquito control. Whether or not the observed food web effects would have been lessened under a more realistic pesticide application regime is debatable.

Studies of adverse impacts from methoprene on insect taxa other than chironomids are less conclusive. Because methoprene affects insect development and does not directly kill larvae, traditional toxicity testing over a few days is often inadequate when looking for potential impacts. Methoprene toxicity can only be observed at the point in which the immature insects reach (or fail to reach) adulthood. Thus, many published laboratory and field studies looking at non-target impacts from methoprene were of insufficient duration to detect actual negative impacts (e.g., Miura and Takahashi 1973).

Breaud et al. (1977) observed adverse effects from methoprene on 14 aquatic invertebrate taxa, including *Callibaetis* species, mayflies, odonates (dragonflies and damselflies), predaceous diving beetles, and chironomids. Negative impacts to *Callibaetis* mayflies from methoprene treatments have been observed by others (Norland and Mulla 1975; Steelman et al. 1975). Miura and Takahashi (1973) did not observe any mortality on *Callibaetis* from methoprene in laboratory or field studies, but neither was of sufficient duration (48 hours and one week, respectively) to adequately detect developmental effects (Miura and Takahashi 1973). Pinkney et al. (2000) observed consistently lower numbers of mayflies emerging from methoprene-treated wetlands compared to controls, but these differences were not statistically significant (Pinkney et al. 2000).

There is evidence of methoprene impacts to non-insects as well. McKenney and Celestial (1996) noted significant reductions in number of young produced in mysid shrimp at 2 ppb (McKenney and Celestial 1996). Sub-lethal effects on the cladoceran, *Daphnia magna*, in the form of reduced fecundity, increased time to first brood and reduced molt frequency have also been observed at concentrations <0.1 ppb (Olmstead and LeBlanc 2001).

In summary, there is evidence for significant adverse non-target effects from methoprene even when applied at mosquito control rates. With regard to negative impacts to chironomid midges, there may be differences in susceptibility among species and differences depending on the formulation used. One study in particular suggested that methoprene formulations with short-term residual activity may have smaller impacts to chironomids (Ali 1991). However, even the “ineffective” liquid formulation used in this study reduced emergence of *Chironomini* midges by 60 percent for two weeks. Certainly, not all midges will be affected by a single application of methoprene for mosquito control. However, the apparent differences in pesticide formulations, the varied susceptibility of species, and perhaps

even the influence of some as-yet-undetermined environmental factors, make predicting the degree of any impacts nearly impossible.

Because methoprene does not immediately kill susceptible chironomid larvae, they are still available for predators. However, repeated applications of methoprene over a mosquito breeding season would eventually hinder recruitment as adults repeatedly fail to emerge (Hershey et al. 1998). Longer-term studies conducted over the course of a season or over multiple seasons are especially necessary for examining non-target impacts from methoprene in order to detect potential impacts on longer-lived larvae (e.g., odonates, mayflies and aquatic beetles) and to detect potential impacts to long-term recruitment. The ability for a population to re-colonize a wetland following multiple larvicide treatments would depend on the intensity and frequency of applications at different spatial scales.

Conclusion

Because the majority of mosquito treatment occurs during the summer months of May through August, when waterfowl populations are very low, overall effects to wildlife and non-target organisms are not expected to be significant. While treatment on the ground may seem ideal because the impact area is small and can be accomplished from existing roads and levees, there is the potential for some disturbance to wildlife and the spreading of noxious weed seed. The former can be reduced by limiting access or timing to especially sensitive areas which will be discussed at the annual meetings and prior to treatment, while the latter can be reduced by the requirement written into the SUP that equipment be washed of any vegetation/seed sources after each use in all areas containing noxious weeds.

Impacts of aerial applications to the ground are non-existent, and the amount of coverage is larger, less time-consuming and effective over a large area; however, low-flying aircraft will undoubtedly cause disturbances to wildlife. On the other hand, the number of treatment days per year would be fairly low, and if the applicator (pilot or ground) follows the stipulations previously outlined and within the SUP, mosquito abatement practices should not materially interfere with or detract from CNWR's purposes or the mission of the NWRS. If additional biological monitoring of this activity documents substantial negative impacts to migratory birds or other wildlife, this determination would be re-analyzed on the basis on new evidence.

Public Review and Comment

This CD was prepared concurrent with the CNWR's CCP. An open house was held and written comments were solicited from the public during the scoping period for the CCP. Public review and comment were solicited during the draft CCP comment period.

If through monitoring it is determined that targeted mosquito species are known carriers of encephalitis or WNV, the public will be notified. However, given the nature of potential serious health risks and the rapid development of mosquito larvae, applications may occur simultaneously with public notification or before.

Determination

For many years CNWR has worked cooperatively with MCDs and their associated mosquito control activities. After a review of these activities, the Service has determined that allowing these uses to

continue would not materially interfere with, or derogate from, the purposes for which CNWR was established, or the mission of the NWRS.

_____ The use is not compatible.

___X___ The use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility

Mosquito management will follow an IPM approach, and any compatible cultural and/or mechanical control methods will be identified and implemented before chemical control is permitted.

- All application of pesticides/biological agents must be coordinated and approved by the CNWR Manger based on the phased response plan to avoid conflicts with nesting birds, public use, management activities, etc. Prior to all applications, MCDs will provide a map and dip net counts to the CNWR Manager and obtain verbal approval.
- Threshold levels, as outlined above, will determine whether treatments will be authorized by the CNWR Manager.
- The Service and MCDs will meet each year to discuss the past year's program and plan any changes needed for the coming year. Each year the CNWR Manager will issue a SUP, which will specify special use conditions and restrictions on the operations of MCDs on Refuge lands.
- MCDs will provide the Service with interim (monthly) and final reports regarding the arbovirus studies on CNWR and in their respective counties, including data on dip netting and CO_2 and light traps. Maintaining careful records of immature mosquito occurrence, developmental stages treated, source size and control effectiveness can provide an early warning to forecast the size of the adult population.
- MCDs will notify the CNWR Manager immediately if an arbovirus-induced mortality is observed in wild birds in Grant or Adams Counties.
- MCDs will consider environmental conditions—including water temperature, the density of mosquito larvae and the presence of mosquito predators—when deciding mosquitoes on CNWR pose a serious threat to human health and that treatment should be implemented.
- At the end of the permitting period, MCDs will provide the CNWR Manager with a list of all pesticides/biological agents used, the quantities of each that were applied, the dates of application and the acres treated.
- Application of mosquito control measures is to be conducted in accordance with approved Pesticide Use Proposals (PUPs).
- Only Service-approved pesticides may be applied on Refuge wetlands and only after PUPs have been approved.
- Mosquito control will be authorized on an annual basis by a SUP. SUP conditions will stipulate that all mosquito control work will be carried out under the guidance of pre-approved PUP.
- The MCD(s) will contact the Refuge Manager at least one day in advance of each application. The Refuge Manager has final approval over all pesticide treatments.
- Larvae control is to be conducted only when the MCD(s) has determined that breeding in specific units is widespread.
- The Refuge may rescind this CD at any time based on future Service policy determinations or scientific studies of the effects of pesticides on the environment or non-target organisms.

- This CD will be reviewed when the NWRS finalizes its pending policy on mosquito management, and a new CD will be issued if this CD is not in full compliance with the new policy.

Justification

Species of mosquito—like *Culex tarsalis*, *Aedes vexans* and *Culex pipiens*—which are the most commonly found species on the Refuge, are known to be vectors for SLE and WEE. Additionally, *Culex tarsalis* is particularly known to transmit WNV, which has been isolated in birds, horses, and humans in Washington.

In order to protect neighboring communities from potential health threats from vector carrying mosquitoes, CNWR will continue to allow mosquito control to take place on the Refuge following the guidance of the stipulations within this document, signed PUP and an annual SUP.

Determining the human health threat posed by mosquito populations which either rest on, or emanate from, CNWR lands is the first step in a phased response mosquito management plan. To do so, managers need to consult with health agencies early and frequently and most of all before a human WNV event occurs. Determining the potential for human mosquito-borne health concerns resulting from mosquito populations is the responsibility of local MCDs, local health districts, and the State of Washington. The Washington State Department of Health published the *West Nile Virus Response Guide* in the spring of 2004 and the *Mosquito-borne Disease Response Plan* in December of 2003 to guide local, State, and Federal agencies in a coordinated response to a WNV disease outbreak. Copies of both plans are found online at www.doh.wa.gov/ehp/ts/Zoo/WNV/LocalHealth.html.

Monitoring activities are designed to locate mosquito larva, pupa and adults; estimate their abundance; and determine species composition for the purpose of making treatment decisions. While mosquitoes are considered a nuisance because of their biting, many species are known vectors of serious diseases in Washington. WNV was found in 16 counties in Washington in 2009 and four counties in 2010 (www.doh.wa.gov). WNV has been detected in humans, mosquito pools and horses in Idaho and in crows in eastern Oregon. While WNV is mainly an avian disease—it can cause serious diseases in horses and emus and kills a wide variety of endemic and imported birds—it can spread to humans and can be fatal if not treated properly. Mosquito control is the only known practical method of protecting people and animals from WEE, SLE and WNV (California Department of Health Services 2003).

Vector control, implemented with the above stipulations, will not materially detract or interfere with achieving CNWR purposes or the NWRS mission and is supportive of public safety.

Mandatory 10- or 15-year Re-evaluation Date

Provide month and year for "allowed" uses only.

_____Mandatory 15-year re-evaluation date (for wildlife-dependent public uses).

____X___Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses).

NEPA Compliance for Refuge Use Decision

_____Categorical Exclusion without Environmental Action Statement.

_____Categorical Exclusion and Environmental Action Statement.

____X___Environmental Assessment and Finding of No Significant Impact.

_____Environmental Impact Statement and Record of Decision.

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D.7 Compatibility Determination – Mosquito/Vector Control

Signatures

Prepared by: Larry Klimek (Signature) 9/26/11 (Date)

Refuge Manager/Project Leader Approval: Mary M. Howland (Signature) 9/26/11 (Date)

Concurrence

Refuge Supervisor: (Signature) 9/27/11 (Date)

Regional Chief, National Wildlife Refuge System: Ed S. West (Signature) 9/28/11 (Date)

D.8 Compatibility Determination – Research

Use: Research and Management Studies

Refuge Name: Columbia National Wildlife Refuge (CNWR)

Establishing and Acquisition Authorities

The CNWR was established June 13, 1944, when the first parcel of land was purchased under the authority granted the Migratory Bird Conservation Commission (Migratory Bird Conservation Act of 1929); the purchase was approved at the August 1943 meeting of the Commission. Subsequently, on September 6, 1944, Public Land Order 243 expanded the CNWR. Pursuant to land acquisition authorities granted the Secretary of the Interior through Executive Order 9337 (April 24, 1943), Public Land Order 243 dictated that " … the following-described public lands in Washington are hereby withdrawn … for the use of the Department of the Interior as a refuge … [Columbia National Wildlife Refuge]."

Refuge Purposes

National wildlife refuges are established " … for the development, advancement, management, conservation, and protection of fish and wildlife resources … " (16 U.S.C. §742f(a)(4)) and also " … 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. §42f(b)(1); Fish and Wildlife Act of 1956, 16 U.S.C. §742(a)-754, as amended).

CNWR was established " … as a refuge and breeding ground for migratory birds and other wildlife" and as " … an inviolate sanctuary, or for any other management purpose, for migratory birds."

National Wildlife Refuge System Mission

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

Description of Use

The Service receives periodic requests from non-Service entities (e.g., universities, State, or territorial agencies, other Federal agencies, non-governmental organizations) to conduct research, scientific collecting, and surveys on CNWR. 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, refuge-specific, or evaluate the relative contribution of the refuge lands to larger landscapes (e.g., ecoregion, region, flyway, national, international), issues, and trends.

The Service's Research and Management Studies (4 RM 6) and Appropriate Refuge Uses (603 FW1.10D(4)) policies indicate priority for scientific investigatory studies that contribute to the enhancement, protection, use, preservation and management of native wildlife populations and their habitat, as well as their natural diversity. Projects that contribute to refuge-specific needs for resource and/or wilderness management goals and objectives, where applicable, would be given a higher priority over other requests.

Research applicants are required to submit a proposal that outlines:

1) The objectives of the study;

2) A justification for the study;

3) A detailed methodology and schedule;

4) The potential impacts on wildlife or its habitat, including disturbance (short- and long-term), injury, or mortality (including a description of measures the researcher will take to reduce disturbance or impacts);

5) The research personnel required;

6) Costs to the Service, if any; and

7) A time line for submitting progress reports and final products (i.e., reports, theses, dissertations, publications).

Research proposals are reviewed by Service staff. If the proposal is approved, a Special Use Permit (SUP) is issued by the Project Leader. Evaluation criteria and specific provisions for approval of studies include, but are not limited to, the following list. Future research proposals will also be subject to these criteria and provisions. This would also apply to any properties acquired in the future within the approved boundary of the CNWR.

- Research that contributes to specific CNWR management issues is given a higher priority over other research requests.
- Research that conflicts with other ongoing research, monitoring, or management programs will not be allowed.
- Research projects that can be accomplished off the CNWR are less likely to be approved.
- Research which causes undue disturbance or is intrusive is not likely to be allowed.
- The level and type of disturbance will be carefully evaluated when considering a request. Strategies to minimize disturbance through study design, including location, timing, scope, number of permittees, study methods, number of study sites, etc., will be encouraged.
- If staffing or logistics make it impossible for the Service to monitor the researcher, the permit is likely to be denied.
- If the activity is in a sensitive area, the research request may be denied, depending on the specific circumstances.
- The length of the project will be considered and agreed upon before approval.

- Projects will be reviewed annually.

SUPs would be issued for monitoring and investigations which contribute to the enhancement, protection, preservation, management of native plant and wildlife populations and their habitats, public use, and other important resources, especially as they relate to CNWR lands and management activities. Other proposals (e.g., social science research) would be subject to even stricter considerations of the potential impacts to wildlife and its habitats, geological resources, cultural resources, aesthetics and visitor use and enjoyment.

Availability of Resources

CNWR staff responsibilities for projects by non-Service entities will primarily be limited to the review of proposals, preparation of SUP(s) and other compliance documents (e.g., Section 7 of the Endangered Species Act, Section 106 of the National Historic Preservation Act) and monitoring project implementation to ensure that impacts and conflicts remain within acceptable levels (compatibility) over time. Additional administrative support, logistical and operational support may also be provided, depending on each specific request. Estimated costs for one-time (e.g., preparing a SUP) and annually reoccurring tasks by CNWR staff and other Service employees will be determined for each project. Sufficient funding in the general operating budget of CNWR must be available to cover expenses for these projects. The terms and conditions for funding and staff support necessary to administer each project on CNWR will be clearly stated in the SUP(s).

The following funding would be required to administer and manage research activities as described above. CNWR has the funding to administratively support and monitor research that is currently taking place on the Refuge. Any substantial increase in the number of projects would create a need for additional resources to oversee the administration and monitoring of the investigators and their projects. Any substantial additional costs above those itemized below may result in finding a project not compatible unless expenses are offset by the investigator(s), sponsoring agency, or organization. No special equipment, facilities, or improvements are anticipated.

Activity or Project	One-Time Expense	Recurring Expense
Administration (Evaluation of Applications, Management of Permits, Oversight)		$2,000
Monitoring		$2,000
Totals		**$4,000**

Itemized costs are current estimates calculated using 2 percent of the base cost for a GS-11 Refuge Biologist and a 2 percent cost of a GS-12 Refuge Manager.

Anticipated Impacts of the Use

Use of CNWR to conduct research, scientific collecting, and surveys will generally provide information that would benefit fish, wildlife, plants, and their habitats. Scientific findings gained through these projects provide important information regarding life-history needs of species and species groups, as well as identify or refine management actions to achieve resource management

objectives in Refuge management plans (especially CCPs). Reducing uncertainty regarding wildlife and habitat responses to Refuge management actions in order to achieve desired outcomes reflected in resource management objectives is essential for adaptive management in accordance with 522 DM 1.

If project methods impact or conflict with Refuge-specific resources, priority wildlife-dependent public uses, other high-priority research, wilderness and Refuge habitat and wildlife management programs, then it must be clearly demonstrated that its scientific findings will contribute to resource management, and that the project cannot be conducted off Refuge lands, for the project to be compatible. The investigator(s) must identify methods/strategies in advance required to minimize or eliminate the potential impact(s) and conflict(s). If unacceptable impacts cannot be avoided, then the project will not be compatible. Projects that represent public or private economic use of the natural resources of any national wildlife refuge (e.g., bioprospecting), in accordance with 16 U.S.C. 715s, must contribute to the achievement of the national wildlife refuge purposes or the NWRS mission to be compatible (50 CFR. 29.1).

Impacts would be project- and site-specific, where they will vary depending upon nature and scope of the fieldwork. Data collection techniques will generally have minimal animal mortality or disturbance, habitat destruction, no introduction of contaminants, or no introduction of non-indigenous species. In contrast, projects involving the collection of biotic samples (plants or animals), or requiring intensive ground-based data or sample collection, will have short-term impacts. To reduce impacts, the minimum number of samples (e.g., water, soils, vegetative litter, plants, macroinvertebrates, vertebrates) will be collected for identification and/or experimentation and statistical analysis. Where possible, researchers will 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, territorial, and/or Federal collecting permits will also ensure minimal impacts to fish, wildlife, plants, and their habitats. If, after incorporating the above strategies, projects will not be compatible if they will result in long-term or cumulative effects. A Section 7 consultation under the Endangered Species Act (16 U.S.C. 1531-1544, 87 Stat. 884, as amended, Public Law 93-205) will be required for activities that may affect a federally listed species and/or critical habitat. Only projects which have no effect, or will result in “not likely to adversely affect” determinations, will be considered compatible.

The spread of invasive plants and/or pathogens is possible from ground disturbance and/or transportation of project equipment and personnel, but it will be minimized or eliminated by requiring proper cleaning of investigator equipment and clothing, as well as implementation of quarantine methods where necessary. If, after all practical measures are taken and unacceptable spread of invasive species is anticipated to occur, then the project will be found not compatible without a restoration or mitigation plan.

There also could be localized and temporary effects from vegetation trampling, collecting of soil and plant samples, or trapping and handling of wildlife. Impacts may also occur from infrastructure necessary to support a projects (e.g., permanent transects or plot markers, exclosure devices, monitoring equipment, solar panels to power unattended monitoring equipment). Some level of disturbance is expected with these projects, especially if investigator(s) enter areas closed to the public and collect samples or handle wildlife. However, wildlife disturbance (including altered

behavior) will usually be localized and temporary in nature. Where long-term or cumulative unacceptable effects cannot be avoidable, the project will not be found compatible. Project proposals will be reviewed by Service staff and others, as needed, to assess the potential impacts (short-term, long-term and cumulative) relative to the benefits of the investigation to Refuge management issues and understanding of natural systems.

At least six months before initiation of fieldwork (unless an exception is made by prior approval of the Project Leader), project investigator(s) must submit a detailed proposal using a standard format (www.fws.gov/mcriver/research/). Project proposals will be reviewed by Service staff and others, as needed, to assess the potential impacts (short-term, long-term and cumulative) relative to the benefits of the investigation to Refuge management issues and understanding of natural systems. This assessment will form the primary basis for allowing or denying a specific project. Projects that result in unacceptable Refuge impacts will not be found compatible. If allowed and found compatible after approval, all projects also will be assessed during implementation to ensure impacts and conflicts remain within acceptable levels.

If the proposal is approved, then the Project Leader will issue a SUP(s) with required stipulations (terms and conditions) for the project to avoid and/or minimize potential impacts to Refuge resources as well as conflicts with other public-use activities and Refuge field management operations. After approval, projects also 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) will ensure that proposed projects contribute to the enhancement, protection, conservation and management of native wildlife populations and their habitats on CNWR. As a result, these projects will help fulfill Refuge purposes, contribute to the mission of the NWRS, and maintain the biological integrity, diversity, and environmental health of the Refuge.

Projects that are not covered by the CCP (objectives under Goal 5 [Gathering Scientific Information]) will require additional National Environmental Policy Act documentation.

Public Review and Comment

This CD was prepared concurrent with the CNWR's CCP. An open house was held and written comments were solicited from the public during the scoping period for the CCP. Public review and comment were solicited during the draft CCP comment period.

Determination

_____ The use is not compatible.

___X___ The use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility

If proposed research methods are evaluated and determined to have potential adverse impacts on wildlife or habitat, then the Project Leader will determine the utility and need of such research to conservation and management of wildlife and habitat. If the need is demonstrated by the research permittee, and accepted by the Refuge, then measures to minimize potential impacts (e.g., reduce the numbers of researchers entering an area, restrict research in specified areas) will be developed and

included as part of the study design and included on the SUP (each project will require a SUP). Other stipulations and provisions include:

- Projects will adhere to scientifically defensible protocols for data collection, where available and applicable.
- Investigators must possess appropriate and comply with conditions of State, territorial and/or Federal permits for their projects.
- Special use permits will contain specific terms and conditions that the researcher(s) must follow relative to activity, location, duration, seasonality, etc., to ensure continued compatibility. All refuge rules and regulations (50 CFR) must be followed, unless otherwise exempted in writing by Service management.
- Annual or other short-term SUPs are preferred; however, some permits will be a longer period, if needed, to allow completion of the project. All SUPs will have a definite termination date in accordance with 5 RM 17.11. Renewals will be subject to Project Leader review and approval based timely submission of and content in progress reports, compliance with SUP stipulations and required permits.
- Continuation of existing projects will require approval by the Project Leader.
- 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) (see www.fws.gov/mcriver/research/).
- Final reports are due one year after completion of the project unless negotiated otherwise with the Project Leader.
- Service staff will be given the opportunity to review draft manuscript(s) from the project before being submitted to a scientific journal(s) for consideration of publication.
- Service staff will be provided with copies (reprints) of all publications resulting from a Refuge project.
- The NWRS, specific refuge, names of Service staff that supported or contributed to the project will be appropriately cited and acknowledged in all written and oral presentations resulting from projects on refuge lands.
- Service staff will be provided with copies of raw data (preferably electronic database format) at the conclusion of the project.
- Sampling equipment, as well as investigator(s) clothing and vehicles (e.g., ATV, boats), will be thoroughly cleaned (free of dirt and plant material) before being allowed for use on Refuge lands to prevent the introduction and/or spread of disease or pests. Where necessary, quarantine methods will be implemented (see www.fws.gov/mcriver/research/).
- Upon completion of the project (or annually if the project is multi-year), all equipment and markers (unless required for long-term projects), must be removed and sites must restored to the Refuge Manager's satisfaction. Conditions for clean-up and removal of equipment and physical markers will be stipulated in the SUP(s). Failure to remove research "paraphernalia" will result in a principal investigator not being permitted to conduct future scientific studies on Refuge lands within the Mid-Columbia River refuges.
- Sensitive wildlife habitat areas will be avoided unless sufficient protection from research activities (i.e., disturbance, collection, capture and handling) is implemented to limit the area and/or wildlife potentially impacted by the proposed research.
- All samples collected on refuge lands are the property of the Service even while in the possession of the investigator(s). Any future work with previously collected samples not clearly identified in the project proposal will require submission of a subsequent proposal for review and approval. In addition, a new SUP will be required for additional project work. For

samples or specimens to be stored at other facilities (e.g., museums), a memorandum of understand will be necessary (see www.fws.gov/mcriver/research/).

- Investigator(s) and support staff will follow all CNWR-specific regulations that specify access and travel on the Refuge.
- When and where needed, some areas may be temporarily/seasonally closed to researchers; research can be permitted to resume when impacts to wildlife and habitat are no longer a concern.
- Research activities will be modified to avoid harm to sensitive wildlife and habitat when unforeseen impacts arise, such as a wildfire altering landscape conditions or large declines in a population.
- If unacceptable impacts to natural resources or conflicts arise, or are documented by Service staff, then the Project Leader can suspend, modify conditions of, or terminate an on-going project already permitted by SUP(s) on CNWR.
- At any time, Service staff may accompany investigator(s) in the field.
- The criteria for evaluating a research proposal, outlined in the Description of Use section above, will be used when determining whether a proposed study will be approved on CNWR.

Service staff will monitor researcher activities for compliance with conditions outlined on the SUP. The Project Leader may determine that previously approved research and SUP be terminated:

1) If the researcher is out of compliance with permit conditions;

2) To ensure wildlife and habitat protection; and/or

3) To protect visitor and public safety.

Justification

Natural resource inventories, monitoring and research are not only provisions of the National Wildlife Refuge Improvement Act, but they are necessary tools to maintain biological integrity, diversity and environmental health, which are also key provisions of the act. Inventories, monitoring and research are intended to improve habitat, wildlife populations, biological integrity, diversity and environmental health, and to monitor public use impacts. Monitoring and research will directly benefit and support CNWR goals, objectives and management plans and activities, as well as contribute to recovery of endangered/threatened species.

Research, scientific collecting, and surveys on refuge lands are inherently valuable to the Service because they expand scientific information available for resource management decisions. In addition, only projects which directly or indirectly contribute to the enhancement, protection, use, preservation and management of refuge wildlife populations and their habitats generally will be authorized on refuge lands. In many cases, if it were not for Service staff providing access to refuge lands and waters, along with some support, the project would never occur and less scientific information would be available to the Service to aid in managing and conserving the refuge resources.

Monitoring and research investigations are also an important component of adaptive management. Standardized monitoring would be used to ensure data compatibility for comparisons from across the landscape.

Wildlife-dependent public uses (wildlife viewing and photography, environmental education and interpretation, fishing and hunting) would also benefit as a result of increased biodiversity, wildlife and native plant populations. Service staff would ensure research projects contribute to the enhancement, protection, preservation and management of wildlife populations and their habitats, thereby helping CNWR fulfill the purposes for which it was established, the mission of the NWRS, and the need to maintain ecological integrity.

By allowing the use to occur under the stipulations described above, it is anticipated that wildlife species which could be disturbed during the use will find sufficient food resources and resting places so that their abundance and use will not be measurably lessened on CNWR. Additionally, it is anticipated that monitoring, as needed, will prevent unacceptable or irreversible impacts to fish, wildlife, plants and their habitats. As a result, these projects will not materially interfere with, or detract from, fulfilling CNWR's purposes, contributing to the mission of the NWRS and maintaining the biological integrity, diversity, and environmental health of the Refuge.

Mandatory 10- or 15-year Re-evaluation Date

Provide month and year for "allowed" uses only.

_____Mandatory 15-year re-evaluation date (for wildlife-dependent public uses).

___X___Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses).

NEPA Compliance for Refuge Use Decision

_____Categorical Exclusion without Environmental Action Statement.

_____Categorical Exclusion and Environmental Action Statement.

___X___Environmental Assessment and Finding of No Significant Impact.

_____Environmental Impact Statement and Record of Decision.

D.8 Compatibility Determination – Research

Signatures

Prepared by: Larry Klaindt (Signature) 9/20/11 (Date)

Refuge Manager/Project Leader Approval: Mary M. Howland (Signature) 9/26/11 (Date)

Concurrence

Refuge Supervisor: (Signature) 9/27/11 (Date)

Regional Chief, National Wildlife Refuge System: Richard S. West (Signature) 9/28/11 (Date)

Appendix E. Management Priorities

E.1 Priority Species

National Mammal Priority Species

Common Name	Scientific Name	Fed T&E	WA T&E	CWCS
Merriam's shrew	*Sorex merriami*		SC	SGCN
Townsend's big-eared bat	*Plecotus townsendii*	FCo	SC	SGCN
Black-tailed jack rabbit	*Lepus californicus*		SC	SGCN
Washington ground squirrel	*Spermophilus washingtoni*	FC	SC	SGCN
Badger	*Taxidea taxus*			SGCN

Key
FCo = Federal Species of Concern
SC = State Species of Concern
SGCN = Species of Greatest Concern

National Reptile and Amphibian Priority Species

Common Name	Scientific Name	Fed T&E	WA T&E	CWCS
Columbia spotted frog	*Rana luteiventris*		SC	SGCN
Northern leopard frog	*Rana pipiens*	FCo	SE	SGCN
Sagebrush lizard	*Sceloporus graciosus*	FCo	SC	SGCN
Striped whipsnake	*Masticophis taeniatus*		SC	SGCN

Key
FCo = Federal Species of Concern
SC = State Species of Concern
SE = State Endangered
SGCN = Species of Greatest Concern

National Bird Priority Species

Common Name	FED T&E	FED BCC	FED BMC	BCR9	PIF Nat	Shorebird	Waterbird	NAWMP	WCR9	State T&E	CWCS	Audubon
WATERFOWL												
Greater White-fronted Goose^		Tule-BDC	ADC					Tule-High	Highest		SGCN	
Snow Goose			ADC						NA			
Ross' Goose			ADC						NA			
Brant			NA						NA			NA
Cackling Goose			Tav-ADC					Tav-Mod	High			
Canada Goose^			ADC					Les-High	Highest			
Trumpeter Swan^			BDC					RM-High	High		SGCN	Yel High
Tundra Swan			ADC					Mod Low	High			
Wood Duck			BDC					Mod	Mod Low			
Gadwall			ADC					Mod	Mod High			
Eurasian Wigeon			NA						NA			
American Wigeon			ADC/ BDC					Mod High	Mod High			
Mallard^			BDC					High	High			
Blue-winged Teal			ADC					Mod High				
Cinnamon Teal			ADC					Mod High	Mod High			
Northern Shoveler			ADC					Mod	Mod High		SGCN	
Northern Pintail^			BDC					High	High			
Green-winged Teal			ADC					Mod	Mod High			
Canvasback			BDC					Mod High	Mod High			EW

Common Name	FED T&E	FED BCC	FED BMC	BCR9	PIF Nat	Shorebird	Waterbird	NAWMP	WCR9	State T&E	CWCS	Audubon
Redhead^			BDC					Mod High	Mod High		SGCN	EW
Ring-necked Duck			BDC					Mod	Mod Low			
Tufted Duck			NA						NA			
Greater Scaup			BDC					Mod	Mod Low		SGCN	
Lesser Scaup^			BDC					High	Mod		SGCN	
Harlequin Duck			NA						NA			
Surf Scoter			NA						NA		SGCN	
White-winged Scoter			NA						NA		SGCN	
Long-tailed Duck			ADC						NA		SGCN	
Bufflehead			ADC					Mod	Mod Low			
Common Goldeneye			ADC					Mod High	Mod Low			
Barrow's Goldeneye			ADC					Mod	Mod High			EW
Hooded Merganser			ADC					Mod Low				EW
Common Merganser			ADC					Mod Low				
Red-breasted Merganser			ADC						NA			
Ruddy Duck			ADC					Mod Low	Mod			
GALLINACEOUS BIRDS												
Chukar												
Gray Partridge												
Ring-necked Pheasant												
Greater Sage-Grouse^	FC			21 IM	WLCS 16					ST	SGCN	Yel IC!
California Quail				15 PR								

Common Name	FED T&E	FED BCC	FED BMC	BCR9	PIF Nat	Shorebird	Waterbird	NAWMP	WCR9	State T&E	CWCS	Audubon
LOONS												
Red-throated Loon												
Pacific Loon												
Common Loon				Mod						SS	SGCN	EW
GREBES												
Pied-billed Grebe				Mod								
Horned Grebe				Mod								
Red-necked Grebe												
Eared Grebe^				High			C-MC					
Western Grebe^				High			NA-MC			SC	SGCN	High
Clark's Grebe				High								Yel EW
PELICANS, CORMORANTS												
American White Pelican^				High			NA-MC			SE	SGCN	EW
Double-crested Cormorant			OA									
WADERS, VULTURES												
American Bittern^				Mod								IC!
Great Blue Heron				Mod							SGCN	
Great Egret												
Snowy Egret				NA			NA					
Cattle Egret												
Green Heron												
Black-crowned Night-Heron				Mod			C-MC					
White-faced Ibis				Mod								

Common Name	FED T&E	FED BCC	FED BMC	BCR9	PIF Nat	Shorebird	Waterbird	NAWMP	WCR9	State T&E	CWCS	Audubon
Turkey Vulture												
HAWKS, EAGLES, FALCONS												
Osprey												
Bald Eagle^	FCo	L48	Yes		CS10					ST	SGCN	
Northern Harrier		Nat	Yes	15 PR								
Sharp-shinned Hawk												
Cooper's Hawk												
Northern Goshawk	FCo			NA	NA					SC		NA
Swainson's Hawk		Nat	Yes	14 PR	WL14							Yel EW
Red-tailed Hawk												
Ferruginous Hawk^	FCo	Nat	Yes	18 MA						ST	SGCN	IC!
Rough-legged Hawk					CS8							
Golden Eagle^				17 MA						SC	SGCN	
American Kestrel				14 PR								
Merlin										SC		
Gyrfalcon					CS8							
Peregrine Falcon^	FCo	Nat	Yes		CS8					SS	SGCN	
Prairie Falcon^		Nat	Yes	19 MA							SGCN	High
RAILS, CRANES												
Virginia Rail			ADC	15 MA			Mod					
Sora			ADC	Mod								
American Coot			ADC									
Sandhill Crane^				High						SE	SGCN	EW

Common Name	FED T&E	FED BCC	FED BMC	BCR9	PIF Nat	Shorebird	Waterbird	NAWMP	WCR9	State T&E	CWCS	Audubon
SHOREBIRDS												
Black-bellied Plover						3						
(American Golden-Plover)						NA						NA
Semipalmated Plover						3						
Killdeer						3						
Black-necked Stilt						3						
American Avocet						3						
Greater Yellowlegs						3						
Lesser Yellowlegs						3						
Solitary Sandpiper^		Nat	Yes			4* PS5						
Willet						NA					SGCN	
Spotted Sandpiper						2						
Whimbrel			NA			NA						NA
Long-billed Curlew^		Nat	Yes			5*						Yel IC!
(Hudsonian Godwit)						NA						NA
Marbled Godwit		Nat	Yes			4* PS5					SGCN	Yel
Ruddy Turnstone						4* PS5						
Sanderling			Yes	BCC		4* PT5						Yel
Semi-palmated Sandpiper						3						Yel
Western Sandpiper						4* PT5						Yel
Least Sandpiper						3* PT5						
Baird's Sandpiper						2						
Pectoral Sandpiper						2						
Sharp-tailed Sandpiper						NA						
Dunlin						4* NA High						
Stilt Sandpiper		Nat	Yes			3						Yel EW

Common Name	FED T&E	FED BCC	FED BMC	BCR9	PIF Nat	Shorebird	Waterbird	NAWMP	WCR9	State T&E	CWCS	Audubon
Short-billed Dowitcher						4* PT5						EW
Long-billed Dowitcher						2						
Wilson's Snipe			ADC			3* PT5						
Wilson's Phalarope^		Nat	Yes			4* PT5						EW
Red-necked Phalarope						3* PT5						
(Red Phalarope)						NA						
GULLS, TERNS												
(Long-tailed Jaeger)												
Franklin's Gull				Mod			WH=MC					
Bonaparte's Gull							WH=MC					
Black-tailed Gull												
(Mew Gull)												
Ring-billed Gull												
California Gull				Mod			NA-MC					
Am Herring Gull												
Thayer's Gull							NA					
Glaucous-winged Gull												
Glaucous Gull												
Sabine's Gull												
Caspian Tern												
Common Tern												
(Arctic Tern)							NA					
Forster's Tern				Mod			NA-MC					
Black Tern^				High			C-MC					EW

Common Name	FED T&E	FED BCC	FED BMC	BCR9	PIF Nat	Shorebird	Waterbird	NAWMP	WCR9	State T&E	CWCS	Audubon
PIGEONS, DOVES												
Rock Dove												
Eurasian Collared-Dove												
Mourning Dove			BDC									
OWLS												
Barn Owl												
Great Horned Owl												
Snowy Owl					CS9							
Burrowing Owl^	FCo	Nat	Yes							SC	SGCN	High
Long-eared Owl												
Short-eared Owl^		Nat	Yes	16 MA	WL13							Yel High
Northern Saw-whet Owl												
GOATSUCKERS												
Common Nighthawk												
Common Poorwill				15 PR								
SWIFTS												
Black Swift			NA	NA	NA							NA
Vaux's Swift				17 MA						SC	SGCN	
White-throated Swift				15 PR	WL14							EW
HUMMINGBIRDS												
Black-chinned Hummingbird												EW

Common Name	FED T&E	FED BCC	FED BMC	BCR9	PIF Nat	Shorebird	Waterbird	NAWMP	WCR9	State T&E	CWCS	Audubon
Calliope Hummingbird				17 PR	WLCS 14							Yel
Rufous Hummingbird		Nat	Yes	12 PR	WLCS 14							
KINGFISHERS												
Belted Kingfisher												
WOODPECKERS												
Lewis' Woodpecker^		Nat	Yes	21 IM	WLCS 15					SC	SGCN	Red High
Red-naped Sapsucker		Nat	Yes		CS12							EW
Downy Woodpecker												
Hairy Woodpecker												
Northern Flicker												
FLYCATCHERS												
Olive-sided Flycatcher				15 IM	WL14							Yel IC!
Western Wood-Pewee												
Willow Flycatcher				17 IM	WL14							Yel EW
Hammond's Flycatcher												
Gray Flycatcher				16 PR	CS11							
Dusky Flycatcher				17 MA	CS13							
Pacific-slope Flycatcher					CS13							
Say's Phoebe												
Ash-throated Flycatcher												
Western Kingbird												

Common Name	FED T&E	FED BCC	FED BMC	BCR9	PIF Nat	Shorebird	Waterbird	NAWMP	WCR9	State T&E	CWCS	Audubon
Eastern Kingbird												
SHRIKES												
Loggerhead Shrike^	FCo	Nat	Yes	14 MA						SC	SGCN	IC!
Northern Shrike					CS11							
VIREOS												
Cassin's Vireo												
Warbling Vireo												
Red-eyed Vireo												
CROWS, JAYS, MAGPIES												
(Blue Jay)												
Black-billed Magpie				15 PR								
American Crow												
Common Raven												
LARKS, SWALLOWS												
Horned Lark												
(Purple Martin)										NA	SGCN	NA
Tree Swallow												
Violet-green Swallow												
Northern Rough-winged Swallow												
Bank Swallow												
Cliff Swallow												

Common Name	FED T&E	FED BCC	FED BMC	BCR9	PIF Nat	Shorebird	Waterbird	NAWMP	WCR9	State T&E	CWCS	Audubon
Barn Swallow												
CHICKADEES, NUTHATCHES												
Black-capped Chickadee												
Mountain Chickadee				NA								
(Chestnut-backed Chickadee)					NA							
(Bushtit)												
Red-breasted Nuthatch												
(White-breasted Nuthatch)												
Brown Creeper												
WRENS												
Rock Wren^				15 PR								
Canyon Wren												
Bewick's Wren												
House Wren												
Winter Wren					CS7							
Marsh Wren												
DIPPERS, KINGLETS												
American Dipper												
Golden-crowned Kinglet												
Ruby-crowned Kinglet												
THRUSHES												

Common Name	FED T&E	FED BCC	FED BMC	BCR9	PIF Nat	Shorebird	Waterbird	NAWMP	WCR9	State T&E	CWCS	Audubon
Western Bluebird											SGCN	
Mountain Bluebird					CS8							
Townsend's Solitaire												
(Swainson's Thrush)												
Hermit Thrush												
American Robin												
Varied Thrush					CS11							Yel
MIMIC THRUSHES												
Gray Catbird												EW
Northern Mockingbird												
Sage Thrasher^				18 MA	CS10					SC	SGCN	High
STARLING, PIPITS												
European Starling												
American Pipit												
WAXWINGS												
Bohemian Waxwing					NA							
Cedar Waxwing												
WARBLERS, TANAGERS												
Orange-crowned Warbler												
Nashville Warbler					CS9							
Yellow Warbler												EW
Chestnut-sided Warbler												

Common Name	FED T&E	FED BCC	FED BMC	BCR9	PIF Nat	Shorebird	Waterbird	NAWMP	WCR9	State T&E	CWCS	Audubon
Yellow-rumped Warbler												
Townsend's Warbler				15 MA								
American Redstart												
MacGillivray's Warbler				15 MA								EW
Common Yellowthroat												
Wilson's Warbler												
Yellow-breasted Chat												EW
Western Tanager												
SPARROWS												
Spotted Towhee												
American Tree Sparrow					CS10							
Chipping Sparrow												
Brewer's Sparrow^		Nat	Yes	19 IM	WLCS 13							Yel High
Vesper Sparrow												
Lark Sparrow												
Black-throated Sparrow				14	CS12							
Sage Sparrow^				18 MA	CS13					SC	SGCN	Yel High
Savannah Sparrow												
Grasshopper Sparrow^		Nat	Yes		CS12							
Fox Sparrow					CS8							
Song Sparrow												
Lincoln's Sparrow					CS7							
(Swamp Sparrow)					NA							
White-throated Sparrow					NA							

Common Name	FED T&E	FED BCC	FED BMC	BCR9	PIF Nat	Shorebird	Waterbird	NAWMP	WCR9	State T&E	CWCS	Audubon
Harris' Sparrow					WLCS 14							
White-crowned Sparrow												
Golden-crowned Sparrow					CS10							
Dark-eyed Junco												
Lapland Longspur					NA							
(Snow Bunting)					NA							
Black-headed Grosbeak												
Lazuli Bunting^				16 PR								EW
Indigo Bunting					NA							
BLACKBIRDS, ORIOLES												
Red-winged Blackbird												
Tri-colored Blackbird^				19 CR	WLCS 18							Red
Western Meadowlark												
Yellow-headed Blackbird					CS9							
(Rusty Blackbird)					NA							NA
Brewer's Blackbird				14 PR								
Brown-headed Cowbird												
Bullock's Oriole												
FINCHES												
Gray-crowned Rosy-Finch												
(Purple Finch)												
Cassin's Finch				16 PR	CS13							
House Finch												

Common Name	FED T&E	FED BCC	FED BMC	BCR9	PIF Nat	Shorebird	Waterbird	NAWMP	WCR9	State T&E	CWCS	Audubon
Red Crossbill												
Common Redpoll												
Pine Siskin												
American Goldfinch												
Evening Grosbeak												
House Sparrow												

KEY

Numbers Indicated Ranked Score

Common Name Column
^ = Priority Management

Federal T&E Column
FC = Candidate
FCo = Concern
NA = Rare & Not Considered

Federal BCC Column
BDC = Below Desired
L48 = Lower 48 States
Nat = National
ADC = Above Desired
BDC = Below Desired

Federal BMC Column
ADC = Above Desired

BCR9 Column
Mod = Moderate
PR = Planning & Responsibility
MA = Management Attention
IM = Immediate Management
CR = Critical Recovery

PIF National Column
WL = Continental Watchlist
CS = Continental Stewardship

Shorebird Column
PT = Population Trend
PS = Population Size
NA = North American Population

Waterbird Column
C = Cosmopolitan
NA = North America
WH = Western Hemisphere

State T&E Column
SE = State Endangered
ST = State Threatened
SS = State Sensitive

CWCS Column
SGCN = Species of Greatest Concern

Audubon Column
Yel = yellow list
Red = red list
EW = early warning
IC! = immediate concern

E.2 Columbia National Wildlife Refuge – Specific Conservation Targets

E.2.1 Geese and Swans (Breeding, Migrant, and Wintering)

Species of Management Concern or Priority from Plans

- Lesser Canada and Taverner's Cackling Goose (Managed to reduce nuisance on private lands.)
- Western Canada Goose (Managed to reduce nuisance on private lands.)
- Pacific and Rocky Mountain Populations Trumpeter Swan
- Western Population Tundra Swan

Other Species With Service Management Plans, Not A Management Priority

- Pacific and Tule Greater White-fronted Goose

Causes of Decline or Concern and Continued or Impending Threats

- All populations are increasing.
- Only Tule white-front numbers are low (haven't reached their management target); no significant role for CNWR.
- Depredation on neighboring crop lands is a concern.

Population Trends On/Off CNWR

- All populations may be are increasing, although data are insufficient on Lesser Canada and Taverner's Cackling geese.
- White-fronted geese may be altering their migration patterns to use the Refuge more frequently.
- There is increasing use of alfalfa and corn in the spring on the Refuge by all geese.
- Trumpeter swan sightings are increasing on and off the Refuge since restoration flock translocations.

Role of CNWR in Population or Habitat Management

- Primarily migratory habitat.
- Spring feeding in part for depredation control.
- Incidental Western Canada Goose nesting.
- Swan habitat use at CNWR is highest of all surveyed areas.
- Provide hunting and bird-watching opportunities.

Propose Population or Habitat Targets

- Minimum 300 acres green browse for 50,000 small geese.
- Maintain resting or loafing areas close to feeding areas. White-fronted geese use marsh areas for this purpose.
- Maintain a peak of 100 swans.

Avenues to Achieve Targets

- Continue farm operations using alfalfa/hay, winter wheat, and corn, making feed available until mid-April.
- Use mowing, discing and prescribed fire for suitable feeding, resting and loafing areas.

- Maintain a complete closure at Royal Lake/Management Unit IV and a closure at Hampton Lakes and Lake Marie until April 1.
- Maintain a quality hunt program and consider expanding it to the Corfu fields.

Research or Monitoring Needs

- Monitor populations on/off the Refuge, with an emphasis on actively managed areas (Marsh Units, Farm Units) and areas of concentration (Royal Lake/Slough, Hampton Lakes).
- Determine the extent of Taverner's and other cackling geese using Refuge lands.
- What is the source and association of trumpeter swans using this area of the Columbia Basin?

E.2.2 Ducks (Breeding, Migrant, Wintering)

Species of Management Concern or Priority from Plans

- Northern Pintail
- Lesser Scaup
- Mallard
- Redhead
- Canvasback
- Blue-winged Teal

Other Species With Service Management Plans, Not a Management Priority

- All other huntable species.

Causes of Decline or Concern and Continued or Impending Threats

- Private lands baiting during the waterfowl hunting season.
- Pintail habitat loss on traditional breeding grounds.
- The reason for the lesser scaup downward trend is unknown?
- Invasive species threats to wetlands and transition habitats primarily from carp, bullfrog, Phragmites, Russian olive, and saltcedar.
- Potential construction of the Crab Creek Dam/Reservoir.
- Suspected high predation during nesting/brooding.

Population Trends On/Off CNWR

- Breeding blue-winged teal declining locally.
- Mallard breeding in the Columbia Basin is trending downward.
- Increased pintail use in the spring, especially with on Farm Unit corn.
- Shift in use from Seep Lakes to Royal Lake associated with club changes and Refuge crops.

Role of CNWR in Population or Habitat Management

- Shifted away from breeding habitat management toward migration/wintering in managed wetlands in 1998; plan to continue this.
- Provide for winter and spring migration habitat for healthy breeding populations.
- Provide for a quality hunting opportunity.

Propose Population or Habitat Targets

- Provide fall/winter feed and roost/rest areas for 25,000 mallards and pintails.
- Supply 300 acres of emergent marsh with minimal disturbance for diver nesting and brood rearing.
- Provide spring feeding for 50,000 mallards and pintails.

Avenues to Achieve Targets

- Have corn, small grain, and/or buckwheat available from October 15 until April 15.
- Monitor and aggressively treat saltcedar, Russian olive, and Phragmites.
- Monitor and treat carp when populations reach three years of age with drawdowns and Rotenone.
- Continue moist soil drawdowns in Marsh Unit IV, discing in Marsh Units I and II for annual seed production, and a summer drawdown in Lake Marie for loafing.
- Flatten Marsh Unit impoundments to created a better moist soil production potential and improve water management.
- Investigate grazing for rejuvenation and shoreline loafing in Marsh Unit III.
- Maintain quality hunt areas.
- Consider a seasonal (until June 30) or complete closure of Royal Slough and Management Unit IV.

Research or Monitoring Needs

- What is predation factor in nesting and brood rearing?
- Will duck nesting increase with light to moderate grazing?
- Continue fall/winter/spring surveys and reestablish pair counts in selected areas.

E.2.3 Sandhill Crane (Breeding, Single Species Migration)

Species of Management Concern or Priority From Plans

- Greater Sandhill Crane (Nesting)
- Lesser Sandhill Crane (Migration)

Causes of Decline or Concern and Continued or Impending Threats

- Greater sandhill cranes breed in very limited locations in Washington.
- Lesser sandhill cranes have a limited use area within the Columbia Basin; CNWR represents a highly concentrated use area.
- Off the Refuge, earlier tillage of corn is increasing spring dependence on CNWR.
- Public demand for viewing, especially in spring, pushes viewing area access.

Population Trends On/Off CNWR

- Ninety plus percent of lesser sandhill cranes in the Pacific population use CNWR and Potholes area more than any other location in both the spring and fall.
- There is increasing spring use (number using and length of stay) on CNWR.
- The total population (and trend) uncertain.

Role of CNWR in Population or Habitat Management

- Provides foraging for up to 90 percent of the Pacific population of lesser sandhill cranes in spring.
- Maintains grain until mid-April, well past most cultivation of private fields.
- Provides viewing opportunities for the public in the spring, including roost sites.

Propose Population or Habitat Targets

- Provide foraging areas through crop plantings held until April 15 for up to 10,000 cranes.
- Provide protected and undisturbed roost opportunities at three sites on the Refuge and coordinate with other entities for 10 sites off Refuge.
- Offer public viewing of cranes for six weeks during the spring migration.

Avenues to Achieve Targets

- Provide sanctuary from disturbance (complete closure) of Marsh Unit I, Royal Slough, and Corfu Farm Unit.
- Establish screened viewing areas at Corfu and overlooking Marsh Unit I to assist security of use areas.
- Manage Royal Slough and Marsh Unit IV for open-visibility roosting areas.
- Secure easements or management agreements to protect major staging sites.

Research or Monitoring Needs

- Determine use (period and numbers) on the Refuge by greater sandhill cranes and where they are nesting.
- Determine the total population of lesser sandhill cranes using the Refuge and adjacent areas.
- Determine all roost areas holding more than 100 cranes and monitor use there through the migration period.
- Determine limiting factors locally for nesting greater sandhill cranes.

E.2.4 Washington Ground Squirrel (Anchor of Grassland Species Guild)

Species of Management Concern or Priority From Plans

- Washington Ground Squirrel (State and Federal Candidate Species)

Other Benefitting Species

- Badger
- Ferruginous Hawk
- Prairie Falcon
- Burrowing Owl

Causes of Decline or Concern and Continued or Impending Threats

- Loss of deeper soil shrub-steppe habitat due to cropland conversion.
- Conversion of other areas from native cover.
- Shooting and poisoning.
- Loss of shrub cover, due to clearing and fire, that protects from predators.
- Increase of cheatgrass cover that increases fire and decreases visibility for squirrels.
- Loss of irrigated pasture and grazing economy that provides forage and open views.
- Habitat fragmentation due to roads, canals and waterways created by irrigation projects.
- Loss of genetic diversity due to fragmentation.

Population Trends On/Off CNWR

- Refuge populations have declined over last 30 years, possibly due to grazing removal and cheatgrass increases.
- Off-Refuge populations declined for similar reasons, habitat loss/conversion, and fragmentation of the remaining habitat, trending toward extinction.
- Climate/weather plays an important role in year-to-year productivity, with some colony extinction in poor years.

Role of CNWR in Population or Habitat Management

- Focal areas for research and funding coordination.
- Habitat restoration and monitoring for species recovery.
- Experimental translocation sites.

- Target areas for land acquisition and exchange.

Propose Population or Habitat Targets

- Establish eight viable populations on CNWR each within ½ mile of another colony.
- Connect populations with corridors for safe travel between.

Avenues to Achieve Targets

- Determine suitable soils from historical records and restore habitat there from cheatgrass to native grasses and shrubs.
- Establish shrub and other (artificial) cover within and connecting colonies for population genetic exchange.
- Pursue management priorities on adjacent land through exchange, purchase, or easement.
- Use private lands and interagency programs to improve habitat off the Refuge.
- Use translocation to populate new sites with "unwanted" animals.

Research or Monitoring Needs

- Continue behavioral ecology study to understand traits that limit populations.
- Determine species-wide genetic linkage and habitat fragmentation limitations.
- Determine the most desirable habitat qualities for establishing restoration criteria.
- Monitor all Refuge breeding sites annually for occupancy and general population trends.
- Monitor restoration sites adjacent to known populations for utilization.

E.2.5 Shrub-Steppe Habitat (Sagebrush-Obligate Species, Health Indicators)

Species of Management Concern or Priority From Plans

- Ferruginous Hawk
- Greater Sage-Grouse
- Long-billed Curlew
- Burrowing Owl
- Loggerhead Shrike
- Brewer's Sparrow
- Sage Sparrow
- Sage Thrasher
- Short-eared Owl
- Black-tailed Jackrabbit
- Washington Ground Squirrel
- Sagebrush Lizard
- Striped Whipsnake

Causes of Decline or Concern and Continued or Impending Threats

- Conversion of shrub-steppe to cropland.
- Overgrazing and degradation/loss of perennial bunchgrass component.
- Cheatgrass invasion and large sagebrush losses due to wildfire.
- Habitat fragmentation associated with water/land development, transmission lines, tree plantings, etc.
- Invasive plants creating continuous cover that blocks open foraging lanes.
- Decadent plants and lack of young sagebrush in some areas.
- Conversion of shrub-steppe to reservoir from the Crab Creek Dam/Reservoir.
- Predation/depredation from artificially elevated predator populations?

Population Trends On/Off CNWR

- The species included are mostly listed or possibly listed species (Endangered, Threatened, Candidate, Sensitive, or Species of Concern), which indicate decline.
- Several of these species no longer or barely occur on CNWR (ferruginous hawk, sage-grouse, burrowing owl, sage sparrow, sage thrasher, jackrabbit, sagebrush lizard, striped whipsnake) and have declined off the Refuge.

Role of CNWR in Population or Habitat Management

- Shrub-steppe habitats should be protected from wildfire and restored where feasible.
- CNWR provides corridors/links between larger areas of shrub-steppe.

Propose Population or Habitat Targets

- Maintain or increase required components to provide habitat for a minimum of 25 pairs of loggerhead shrikes, five of burrowing owls, five of sage thrashers, three of ferruginous hawks, five of sage sparrows, sage-grouse according to the recovery plan, and sustainable populations of resident mammals and reptiles.
- Restore 100-300 acres per year of degraded shrub-steppe or steppe habitat.

Avenues to Achieve Targets

- Reduce fuel corridors along roadways through cheatgrass control.
- Maintain aggressive wildfire control to keep burned areas small.
- Actively restore disturbed areas to prevent noxious plant invasion.
- Remove Russian olive where trees exist within all uplands sites.
- Limit access to ferruginous hawk nesting areas during the March-June period.
- Consider artificial burrows to enhance burrowing owl occupancy.
- Use cooperative programs and funding to improve adjacent private lands habitat.
- Coordinate with partner agencies to maintain or increase habitat corridor linkage.

Research or Monitoring Needs

- Determine an accurate acreage and condition of sagebrush-steppe habitat.
- Determine the extent of cowbird parasitism, non-native species competition, and predation and whether they are limiting factors.
- Increase inventory effort for rarer species and monitor where they exist, especially along Lower Crab Creek.
- Increase inventory and monitoring efforts in sandy soils where lizards are more likely.
- Pesticides have an uncertain impact that requires investigation adjacent to private cropland.

E.2.6 Riparian Habitat (Riparian Woody Vegetation Health Indicators)

Species of Management Concern or Priority From Plans

- Black Cottonwood
- Willow Species in Mixed Sizes/Stages
- Wood's Rose
- Golden Currant
- Yellow-breasted Chat
- Willow Flycatcher
- Song Sparrow
- Bullock's Oriole
- Lazuli Bunting

- Yellow Warbler
- Ash-throated Flycatcher
- Downy Woodpecker

Causes of Decline or Concern and Continued or Impending Threats

- Overgrazing and other disturbance that changes vegetative structure.
- Brown-headed cowbird parasitism and increased predation.
- Loss of floodplain connectivity associated with incised channels, dams and water diversions that prevent "scour" and regeneration of willow/cottonwood.
- Continuous flow associated with constant seepage, increasing evaporation, and soil alkalinity.
- Invasive species (Russian olive, saltcedar) competition.
- Beaver populations have increased and threaten mature trees or their establishment (problems to woodpeckers and ash-throated flycatcher).
- Possible loss of tree/shrub stands from establishment and operation (i.e., fluctuations) of Crab Creek Dam/Reservoir. Could also increase tree stands depending on actual operations, topography and soil types.
- Changes in operations of the Potholes Reservoir (Odessa Aquifer recharge).

Population Trends On/Off CNWR

- Crab Creek is losing peachleaf willow and gaining Russian olive and Phragmites, resulting in a loss of cavity-nesting species (e.g., the ash-throated flycatcher is now extirpated).
- Yellow-breasted chat occurrence has declined, and willow flycatcher and yellow warbler are probably no longer breeding.
- Riparian habitat throughout the Columbia Basin is being degraded by salt cedar, Russian olive, etc.

Role of CNWR in Population or Habitat Management

- CNWR has 14 miles of Crab Creek and willow seep areas along Potholes Canal and Royal Lake.
- CNWR has become mitigation for much of the riparian habitat lost within the Columbia River system from dam construction.

Propose Population or Habitat Targets

- Improve 23 miles of riparian habitat.
- Establish viable stands of peachleaf willow within each section along Crab Creek within 10 years.
- Re-establish breeding populations (five pairs each) of ash-throated flycatcher, willow flycatcher, and yellow warbler within 15 years.

Avenues to Achieve Targets

- Eliminate 95 percent of Russian olive larger than 4-inch dbh within Management Units I-IV within 10 years.
- Prioritize wildfire control in mature peachleaf willow areas.
- Systematically use fire to achieve resprouting in decadent willow stands, while maintaining snags over a 30-year rotation.
- Use planting, periodic flooding, and drawdowns to establish willows where they have been lost.

- Repair riparian corridors along Crab Creek through channel restoration and active planting where incision exists.
- Establish at least one one-acre stand of black cottonwood through active planting along Crab Creek within 10 years.
- Secure a management agreement or easement on the private portions of Crab Creek and Black Lake outflow in Management Unit III.
- Work with the WDFW, BOR, irrigation districts, and private owners to reduce the impact of Russian olive.
- Replant Russian olive removal areas with adapted native trees and shrubs.

Research or Monitoring Needs

- Determine an accurate acreage and condition of riparian habitat.
- Establish and run point counts that effectively monitor riparian species populations.
- Establish MAPS stations at up to four locations (Corfu Woods, Crab Creek Trail, Upper Hampton-Seep Lakes seeps, Royal Lake seeps) to determine productivity within riparian.
- Evaluate changes due to Russian olive invasion and removal on dependent species.
- Evaluate the impact of predation and cowbird parasitism on riparian nesting species.

E.2.7 Long-Billed Curlew (Grassland Indicator)

Species of Management Concern or Priority From Plans

- Long-billed Curlew

Other Species With Service Management Plans, Not A Management Priority

- N/A

Causes of Decline or Concern and Continued or Impending Threats

- Habitat loss and fragmentation, including encroachment of woody vegetation.
- Loss of grazing economy.
- Conversion of pasturelands, etc., to vineyards and orchards.
- Spread of exotic invasive plants.

Population Trends On/Off CNWR

- Local populations are variable, but the trend is uncertain due to limited monitoring in the past.
- The overall population is trending downward.

Role of CNWR in Population or Habitat Management

- Breeding and/or foraging habitat remains protected and manageable to a great extent. CNWR may be able to increase the acres available, balanced against other priorities. All refuges are critical to maintain populations within the Columbia Basin.

Propose Population or Habitat Targets

- Achieve or maintain 20 breeding pairs using CNWR for nesting or foraging habitat.

Avenues to Achieve Targets

- Rehabilitate 100-300 acres per year of shrub-steppe and steppe and maintain open landscape.
- Continue a farming program that includes alfalfa and other hay production.

- Cooperate with other agencies/partners to restore or enhance nesting habitat adjacent to Refuge and private farm fields.

Research or Monitoring Needs

- Determine the relationship between nesting and foraging areas on and off Refuge.
- Determine nest success, brood survival, and limiting factors on curlews using CNWR.
- Survey at traditional locations on and near CNWR during mid-April for five years and resurvey by late-May each year.

E.2.8 American Bittern (Emergent Marsh Indicator)

Species of Management Concern or Priority from Plans

- American Bittern

Causes of Decline or Concern and Continued or Impending Threats

- Loss of quality emergent marsh due to drainage, water diversion, filling, sedimentation, chemical contamination, weed invasion, and stabilized water levels.

Population Trends On/Off CNWR

- Undetermined on the Refuge due to the short term of monitoring. CNWR consistently reports more bitterns than any other area within the Columbia Basin.
- Limited information off the Refuge, but habitat trends are negative due to a loss of open emergent marsh habitat.

Role of CNWR in Population or Habitat Management

- Marsh management with opportunities for water level control and periodic burning are positive factors which no other entity in the area is doing.

Propose Population or Habitat Targets

- Maintain a minimum of 25 breeding pairs with at least 10 in Management Unit I.

Avenues to Achieve Targets

- Maintain some flooded emergent marsh through early July in all marsh units.
- Use prescribed fire, grazing, and drawdowns on a periodic and rotational basis to maintain interspersed emergent and open water without large displacement in any one year.

Research or Monitoring Needs

- Determine nest success and limiting factors on bitterns using CNWR.
- Resume marsh bird surveys first established in 2003 to monitor Refuge breeding populations.
- Determine responses to specific management activities, especially prescribed fire in Marsh Unit I and water management in Marsh Unit IV.

E.2.9 Amphibians (Wetland Health Indicators)

Species of Management Concern or Priority From Plans

- Columbia Spotted Frog
- Northern Leopard Frog
- Tiger Salamander
- Long-toed Salamander

Causes of Decline or Concern and Continued or Impending Threats

- Introduction of bullfrogs and fish, mosquito control and pesticides, habitat loss and fragmentation, disease and parasites, acid precipitation, ultraviolet radiation, and water quality degradation.

Population Trends On/Off CNWR

- Leopard frogs are considered extirpated since the late 1980s and are in danger of extinction within Washington.
- Spotted frogs and long-toed salamanders have not been verified on CNWR but have been found nearby.
- Tiger salamanders are present but mostly restricted to ponds without fish.
- Nearly all species of native amphibians have declined from historical levels.

Role of CNWR in Population or Habitat Management

- CNWR has relatively clean water and management options, including protecting isolated wetlands and seeps.

Propose Population or Habitat Targets

- Maintain healthy populations and increase to 30 wetlands with tiger salamanders within five years.
- Establish a minimum of three breeding ponds for northern leopard frogs.

Avenues to Achieve Targets

- Identify the best potential areas for northern leopard frogs and remove bullfrogs and predator fish before reintroduction. Build drift fence as needed to exclude bullfrog immigration.
- Prioritize fish versus amphibian waters and coordinate management with the WDFW to avoid conflicting objectives.
- Eliminate fish stocking from key waterways.
- Continue drawdowns where possible and treatments to control carp, predatory fish, and reduce source populations of bullfrogs.
- Allow bowfishing for carp and legal take of bullfrogs in selected waters while protecting migratory bird resources.
- Take all reasonable activity-related measures possible to maintain water quality.
- Explore the feasibility of a captive breeding and/or reintroduction program.

Research or Monitoring Needs

- Complete the tiger salamander inventory for wetlands that were not sampled or dry during 2003-2005. Continue monitoring.
- Complete a leopard frog survey in most suitable wetlands.
- Determine the extent and life history needs of neotenic tiger salamanders.
- Survey one or more traditional salamander wetlands and a subset of others annually.
- Inventory amphibian habitat to establish waterway priorities related to fish stocking.

E.2.10 Cliff/Talus-Dependent Species (Rock Formation Obligates)

Species of Management Concern or Priority From Plans

- Prairie Falcon
- Ferruginous Hawk
- Night Snake

- Western Rattlesnake
- Peregrine Falcon

Other Species Benefitting

- Mule Deer
- Bats
- Canyon Wren
- Rock Wren
- Violet-green Swallow
- Cliff Swallow
- Say's Phoebe
- Great Horned Owl
- Barn Owl
- Red-tailed Hawk
- Common Raven
- American Kestrel
- White-throated Swift
- Bushy-tailed Woodrat
- Yellow-bellied Marmot
- Western Skink

Causes of Decline or Concern and Continued or Impending Threats

- Quarry/rock mining.
- Loss of prey.
- Human disturbance, persecution.
- Pesticides.
- Habitat loss and fragmentation within connecting habitats.

Population Trends On/Off CNWR

- Declining or unknown.

Role of CNWR in Population or Habitat Management

- Cliff/talus areas within the Refuge are protected.
- CNWR provides linkages with other rocky areas.

Propose Population or Habitat Targets

- Provide secure nesting territories for three ferruginous hawk and five prairie falcon pairs.
- Maintain or increase current snake population levels.

Avenues to Achieve Targets

- Protect all snake hibernacula.
- Maintain prohibition on rock climbing.
- Maintain prohibition on killing or collecting snakes.
- Consider additional seasonal access closures in traditional ferruginous hawk nest areas.
- Work with the WDFW to eliminate shooting from March to September in conjoined areas.
- Protect bat roosts.

Research or Monitoring Needs

- A Refuge-wide raptor survey to establish baseline for cliff-nesting populations, then monitor falcon and ferruginous hawk nest sites annually.
- Survey all south and southwest cliffs and talus during April for reptiles to establish baseline occurrence and presence of dens, then systematically sample sites for a population index.
- Determine bat occurrence through baseline inventory.

E.2.11 Shorebirds (Breeding, Migrant)

Species of Management Concern or Priority From Plans

- American Avocet
- Black-necked Stilt
- Wilson's Phalarope (Shallow Wetlands)
- Wilson's Snipe (Wet Meadows, Seeps)
- Long-billed Curlew (Addressed Separately)

Causes of Decline or Concern and Continued or Impending Threats

- Habitat loss through drainage, development and flooding.
- Invasive weed establishment.
- Pollution and chemical effects affecting bird health and prey populations.
- Increased populations or efficiency of predators.
- Increases in shoreline use by humans.

Population Trends On/Off CNWR

- Nationally undetermined or declining.
- Locally unknown.

Role of CNWR in Population or Habitat Management

- CNWR has water management options that allow for drawdown or low water in spring when the Columbia Basin Project has most shorebird habitat flooded.
- The Crab Creek Dam/Reservoir may increase habitat.

Propose Population or Habitat Targets

- Increase breeding population of alkali wetland species by 50 percent.
- Provide >150 acres of shallow wetland foraging habitat during spring and fall migration.
- Maintain >100 acres of shallow water during breeding seasons in potential nesting areas.

Avenues to Achieve Targets

- Integrate drawdowns and irrigation in moist soil areas with shorebird migration periods.
- Use prescribed fire, tillage and grazing to open densely vegetated areas.
- Manage beaver in priority areas to maintain water level and flow options where water control structures allow.
- Determine weed management needs and implement control measures to avoid habitat degradation.

Research or Monitoring Needs

- Establish a habitat inventory.
- Conduct annual monitoring of priority shorebird breeding and migration populations.
- Determine predation and impacts to nest success to evaluate need for predator control.

- Determine whether mosquito control or other chemicals are reducing food supplies in foraging areas.

Appendix F. Statement of Compliance

F.1 Statement of Compliance for Implementation of the Columbia National Wildlife Refuge Comprehensive Conservation Plan

Adams and Grant Counties, Washington

The following executive orders and legislative acts have been reviewed as they apply to implementation of the Comprehensive Conservation Plan (CCP) for Columbia National Wildlife Refuge (CNWR).

1. National Environmental Policy Act (1969). (42 U.S.C. 4321 et seq.) The planning process has been conducted in accordance with National Environmental Policy Act (NEPA) Implementing Procedures, Department of the Interior (DOI), and U.S. Fish and Wildlife Service (Service) procedures, and has been performed in coordination with the affected public. The requirements of the NEPA and its implementing regulations in 40 CFR Parts 1500-1508 have been satisfied in the procedures used to reach this decision. These procedures included the development of a range of alternatives for the CCP; analysis of the likely effects of each alternative; and public involvement throughout the planning process. An environmental assessment (EA) was prepared for the project that integrated the draft CCP management objectives and alternatives into the EA and NEPA process. The draft CCP and EA were released for a 30-day public comment period. The affected public was notified of the availability of these documents through a *Federal Register* notice, news releases to local newspapers, the CNWR's planning website, and a planning update. Copies of the draft CCP and/or planning updates were distributed to an extensive mailing list. The CCP was revised based on public comment received on the draft documents.

2. National Historic Preservation Act (1966). (16 U.S.C. 470 et seq.) The management of archaeological and cultural resources of CNWR will comply with the regulations of Sections 106 and 110 of the National Historic Preservation Act (NHPA). CNWR contains a number of prehistoric and historic sites, likely eligible for inclusion in the National Register of Historic Places (National Register). No historic properties are known to be affected by the proposed action, based on the criteria of an effect or adverse effect as an undertaking defined in 36 CFR 800.9 and Service Manual 614 FW 2. However, determining whether a particular action has the potential to affect cultural resources is an ongoing process that occurs as step-down and site-specific project plans are developed. The Service will comply with the NHPA if any management actions have the potential to affect any historic properties that may be present.

3. Executive Order 12372—Intergovernmental Review. Coordination and consultation with affected Tribal, local, and State governments; other Federal agencies; and local interested persons has been completed through personal contact by the Project Leader and Refuge Manager.

4. Executive Order 13175—Consultation and Coordination with Indian Tribal Governments. As required under Secretary of the Interior Order 3206 American Indian Tribal Rights, Federal-Tribal Responsibilities, and the Endangered Species Act, the Project Leader consulted and coordinated with the Confederated Tribes of the Colville Reservation, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, and Yakama Indian Nation regarding the proposed action. Specifically, the Service coordinated with Native American Tribes throughout the Service's

planning process over the past two years in developing the CCP. The Tribes had the opportunity to review and provide input to the CCP alternatives.

5. Executive Order 12898—Federal Actions to Address Environmental Justice in Minority and Low-Income Populations. All Federal actions must address and identify, as appropriate, disproportionally high and adverse human health or environmental effects of its programs, policies and activities on minority populations, low-income populations, and Native American Tribes in the United States. The CCP was evaluated and no adverse human health or environmental effects were identified for minority or low-income populations, Native American Tribes, or anyone else.

6. Wilderness Act. (16 U.S.C. 1131-1136) The Service has evaluated the suitability of CNWR for wilderness designation and concluded that the Refuge does not meet the basic criteria for inclusion into the National Wilderness Preservation System (see Chapter 2, Wilderness and Wild and Scenic Rivers Review and Appendix H).

7. Wild and Scenic Rivers Act of 1968. (16 U.S.C. 1271-1287) The Service has evaluated the eligibility of streams on CNWR, specifically Crab Creek, for wild and scenic river designation and concluded no streams meet the basic criteria for inclusion into the National Wild and Scenic Rivers System (see Chapter 2, Wilderness and Wild and Scenic Rivers Review).

8. National Wildlife Administration Act of 1966, as amended by The National Wildlife Refuge System Improvement Act of 1997. (16 U.S.C. 668dd-668ee) The National Wildlife Refuge System Improvement Act (Public Law 105-57, Improvement Act) requires the Service to develop and implement a CCP for each refuge. The CCP identifies and describes refuge purposes; refuge vision and goals; fish, wildlife and plant populations and related habitats; archaeological and cultural values of the refuge; issues that may affect populations and habitats of fish, wildlife and plants; actions necessary to restore and improve biological diversity on the refuge; and opportunities for wildlife-dependent recreation, as required by the Improvement Act. During the CCP process the Project Leader and Refuge Manager evaluated all existing and proposed Refuge uses. 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. Uses that were found not appropriate include camping, rock climbing and bouldering, and swimming (Appendix C). Compatibility determinations (CDs) have been prepared for hunting; fishing; wildlife observation; photography; interpretation; and environmental education, and associated activities like hiking, biking, boating, and picnicking; horseback riding; mosquito and disease vector control; farming and grazing; commercial uses; and research. All of these were found to be compatible with Refuge purposes and the National Wildlife Refuge System mission, with stipulations specified where appropriate (Appendix B).

9. Executive Order 13186—Responsibilities of Federal Agencies to Protect Migratory Birds. This order directs departments and 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 (Management) Concern (BCC). 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. The effects to Refuge habitats used by migratory birds are assessed within the CCP.

10. Endangered Species Act of 1973. (16 U.S.C. 1531-1544) 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. Section 7 of the Endangered Species Act (ESA) requires consultation before initiating projects that affect or may affect endangered species. One Federal candidate species for listing currently occurs on CNWR, the Washington ground squirrel. However, CNWR could provide habitat for several other listed or potentially listed species—pygmy rabbit (endangered), northern leopard frog (under review), sage-grouse (candidate), Upper Columbia River and redband trout (species of concern). Currently, Adams and Grant Counties support, or may support several species, listed below, and these species will be considered in implementation of the CCP. When the CCP is adopted, and implementation begins, consultation on specific projects will be conducted prior to undertaking any management actions to avoid any adverse impacts to these species and their habitats. In most instances, CCP implementation would result in positive effects to these species; the CCP has goals and objectives directly related to improving populations where feasible.

Adams County:

- Pygmy Rabbit (*Brachylagus idahoensis*) – Endangered
- Spalding's Catchfly (*Silene spaldingii*) – Threatened
- Ute Ladies'-Tresses (*Spiranthes diluvialis*) – Threatened
- Washington Ground Squirrel (*Urocitellus washingtoni*) – Candidate
- Yellow-Billed Cuckoo (*Coccyzus americanus*) – Candidate

Grant County:

- Pygmy Rabbit (*Brachylagus idahoensis*) – Endangered
- Columbia River Chinook Salmon, Fall Run (*Oncorhynchus tshawytscha*) – Threatened
- Upper Columbia River Steelhead (*Oncorhynchus mykiss*) – Threatened
- Greater Sage-Grouse (*Centrocerus urophasianus*) – Candidate
- Northern Wormwood (*Artemisia campestris wormskioldii*) – Candidate
- Washington Ground Squirrel (*Urocitellus washingtoni*) – Candidate
- Yellow-Billed Cuckoo (*Coccyzus americanus*) – Candidate

11. Executive Order 11990—Protection of Wetlands. The CCP is consistent with Executive Order 11990 because CCP implementation would protect and enhance existing wetlands and associated riparian areas.

12. 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 as CCP implementation would protect floodplains from adverse impacts as a result of modification or destruction. In fact, the CCP calls for extensive restoration of floodplains. An emergency release of water from the Potholes Reservoir through O'Sullivan Dam could cause significant damage to the Crab Creek floodplain, as it has in the past; however, the dam is not owned by the Service and therefore is outside the Service's management control.

13. Integrated Pest Management (IPM), 517 DM 1 and 569 FW 1. In accordance with 517 DM 1 and 569 FW 1, an integrated pest management (IPM) approach has been adopted to eradicate, control, or contain pest and invasive species on the Refuge. In accordance with 517 DM 1, only pesticides registered with the U.S. Environmental Protection Agency (EPA)—in full compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and as provided in regulations, orders, or permits issued by the EPA—may be applied on lands and waters under Refuge jurisdiction.

Chief, Division of Planning,
Visitor Services, and Transportation

9-27-2011
Date

Appendix G. Integrated Pest Management

G.1 Background

Integrated Pest Management (IPM) is an interdisciplinary approach using 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 FWS personnel, FWS 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 strategies in Chapter 2 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 CCP:

- 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 CNWR's biological resources and environmental quality in accordance with effects analyses presented in Chapter 4 of this CCP. 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 CNWR.

This appendix does not describe the more detailed process to evaluate potential effects associated with aerial applications of pesticides. However, the basic framework to assess potential effects to refuge biological resources and environmental quality from aerial application of pesticides 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 FWS policy 569 FW 1 (Integrated Pest Management), plant, invertebrate, and vertebrate pests on units of the NWRS 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 U.S.C. 668dd-668ee).
- Plant Protection Act of 2000 (7 U.S.C. 7701 et seq.).
- Noxious Weed Control and Eradication Act of 2004 (7 U.S.C. 7781-7786, Subtitle E).
- Federal Insecticide, Fungicide, and Rodenticide Act of 1996 (7 U.S.C. 136-136y).
- National Invasive Species Act of 1996 (16 U.S.C. 4701).
- Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (16 U.S.C. 4701).
- Food Quality Protection Act of 1996 (7 U.S.C. 136).
- Executive Order 13148, Section 601(a).
- Executive Order 13112.
- Animal Damage Control Act of 1931 (7 U.S.C. 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" according to DOI 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 CCP, 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; and
- 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 FWS 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 or refuge lands represent a natural process beneficial for maintaining wetland habitats. Exotic nutria, whose denning and burrowing activities in wetland dikes cause 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 staff and public (e.g., along 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 FWS directives (including Executive Order 11643). Disposed wildlife specimens may be donated or loaned to public institutions. Donation or loans of resident wildlife species will only be made after securing state approval (50 CFR 30.11 [Donation and Loan of Wildlife Specimens]). 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 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 of 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:[1]

- Before beginning ground-disturbing activities (e.g., discing, scraping), inventory and prioritize pest infestations in project operating areas and along access routes. CNWR staff would identify pest species on-site or within reasonably expected potential invasion vicinity. Where possible, the staff would begin project activities in un-infested areas before working in pest-infested areas.
- The Refuge staff would locate and use pest-free project staging areas. They would avoid or minimize travel through pest-infested areas, or restrict travel to those periods when spread of seed or propagules of invasive plants would be least likely.
- CNWR 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 will remain on roadways. Seeds and plant parts of pest plants would need to be collected, where practical. Staff would remove mud, dirt and plant parts from project equipment before moving it into a project area.
- CNWR staff would clean all equipment, before leaving the project site, if operating in areas infested with pests. Staff would determine the need for, and when appropriate, identify sanitation sites where equipment can be cleaned.
- CNWR staff, authorized agents and 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).
- CNWR staff would evaluate options, including closure, to restrict the traffic on sites with ongoing restoration of desired vegetation. 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. Staff would use native material, where appropriate and feasible. Staff would use certified weed-free or weed-seed-free hay or straw where certified materials are reasonably available.

[1] These prevention methods to minimize/eliminate the introduction and/or spread of pests were taken verbatim or slightly modified from Appendix E of a U.S. Forest Service Manual (2005).

- CNWR staff would provide information, training, and appropriate pest identification materials to Refuge staff, permit holders, and recreational visitors. Staff would educate them about pest identification, biology, impacts, and effective prevention measures.
- CNWR staff would require grazing permittees to use preventative measures for their livestock while on Refuge lands.
- CNWR staff would inspect borrow material for invasive plants prior to use and transport onto and/or within Refuge lands.
- CNWR staff would consider invasive plants in planning for road maintenance activities.
- CNWR 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:

- CNWR would inspect boats (including air boats), trailers and other boating equipment. Where possible, staff would remove any visible plants, animals, or mud before leaving any waters or boat launching facilities. Where possible, staff would drain water from motors, live wells, bilges and transom wells while on land before leaving the site. If possible, 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, CNWR would maintain a l00-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, staff would inspect and clean equipment before moving to new sites or one project area to another.

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 tools (manual), or power tools (mechanical) and include pulling, grubbing, digging, tilling/discing, cutting, swathing, grinding, sheering, girdling, mowing, and mulching of the pest plants.

For animal species, FWS 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 plants root system. Although some mechanical tools (e.g., discing, 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; using 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 will develop resistance to agents. Disadvantages would include limited availability of agents from their native lands, the dependence of control on target species density, slow rate at which control occurs, biotype matching, the difficulty and expense of conflicts over control of the target pest, and host specificity when host populations are low.

A reduction in target species populations from biological controls is typically a slow process, and efficacy can be highly variable. It may not work well in a particular area although it does work well in other areas. Biological control agents would require specific environmental conditions to survive over time. Some of these conditions are understood; whereas, others are only partially 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 (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. John's wort (Klamath weed), and tansy ragwort. Emerging success stories include Dalmatian toadflax, diffuse knapweed, leafy spurge, purple loosestrife, and yellow star thistle. However, historically, each new introduction of a biological control agent in the United States has only about a 30 percent success rate (Coombs et al. 2004). (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).

CNWR staff would ensure introduced agents are approved by the applicable authorities. Except for a small number of formulated biological control products registered by the EPA under FIFRA, most biological control agents are regulated by the USDA's 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 biocontrol agents from another state. Form 526 may be obtained by writing:

USDA-APHIS-PPQ
Biological Assessment and Taxonomic Support
4700 River Road
Unit 113
Riverdale, Maryland 20737
www.aphis.usda.gov/ppq/permits/bioligical/weedbio.html

The FWS 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) 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, CNWR staff would follow the International Code of Best Practice for Classical Biological Control of Weeds (sric.ucdavis.edu/exotic/exotic.htm) as ratified by delegates to the Xth International Symposium on Biological Control of Weeds, Bozeman, Montana, July 9, 1999. This code identifies release-only approved biological control agents, use of the most effective agents, documenting of releases, and monitoring for impacts to the target pest, non-target species and the environment.

Biological control agents formulated as pesticide products and registered by the EPA (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 BLM, U.S. Forest Service (USFS), National Park Service (NPS), USDA-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 an FWS NEPA document, which only must identify the documents that are incorporated by reference. In addition, relevant portions must be summarized in the FWS 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; the capability to use BMPs to reduce/eliminate potential effects to non-target species and sensitive habitats; and the 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 FWS's intranet (systems.fws.gov/pups). Only FWS 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 CNWR 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 the 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 (Brooks et al. 2004; Masters et al. 1996; Masters and Shelly 2001). The three components of succession that could be manipulated through habitat maintenance and restoration are 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 with 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 the total number of invasive populations and decrease 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 CNWR 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 DOI Pesticide Use Policy (517 DM 1) and the FWS Pest Management Policy and Responsibilities (30 AM 12), 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 used, 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.
- CNWR staff would empty, triple rinsed pesticide containers that can be recycled at local herbicide container collections.
- 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.
- CNWR 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 CNWR spill respond plan.

G.5.2 Applying Pesticides

- Pesticide treatments would only be conducted by or under the supervision of FWS personnel and non-FWS applicators with the appropriate State or BLM certification to safely and effectively conduct these activities on Refuge lands and waters.
- CNWR staff would comply with all Federal, State, and local pesticide use laws and regulations as well as DOI, FWS, and NWRS pesticide-related policies. For example, the 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, material safety data sheets (MSDSs) and PUPs for each pesticide, determining the target pest, appropriate mix rate(s), necessary personal protective equipment (PPE) and other requirements listed on the pesticide label.
- A one-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<7mph 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 percent forecast for rain within six hours, except for pesticides that are rapidly rain fast (e.g., glyphosate in one 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 overspray 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 setup and application techniques, buffer zones may be identified to protect sensitive areas downwind of applications. CNWR staff would only apply adjacent to sensitive areas when the wind is blowing the opposite direction.
- Applicators would use scouting for early detection of pests to eliminate unnecessary pesticide applications.
- CNWR staff would consider timing of application so native plants are protected (e.g., senescence) while effectively treating invasive plants.
- 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.
- Rinsate from cleaning spray equipment after application would be recaptured and reused or applied to an appropriate pest plant infestation.

G.6 Safety

Safety is the highest priority in pest management.

G.6.1 Personal Protective Equipment

All applicators would wear the specific PPE identified on the pesticide label. The appropriate PPE will be worn at all times during handling, mixing and applying. PPE can include 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 will be consistent with label requirements, EPA and OSHA requirements and FWS policy.

If a respirator is necessary for a pesticide use, then the following requirements would be met in accordance with FWS 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 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 FWS, 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. CNWR staff would also notify appropriate private property owners of an intended application, including any private individuals who have requested notification. 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 FWS 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, FWS 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 FW7.7A, Frequent Pesticide Use means when a person is "applying pesticide handles, mixes, or applies pesticides, with a Health Hazard rating of three or higher, for eight 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 G.7.7 below), experience an acute exposure (sudden, short-term), or use pesticides with a health hazard ranking of one or two. 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 CNWR 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 CNWR 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 EPA 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 MSDSs would be maintained at the CNWR 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 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 FWS guidelines (Director's memo [December 12, 2007]), staff may receive up to five-year approvals for Washington Office and field reviewed proposed pesticide uses based upon meeting identified criteria including an approved IPM Plan, where necessary (see www.fws.gov/contaminants/Issues/IPM.cfm). For a refuge, an IPM Plan (requirements described herein) can be completed independently or in association with a CCP 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, which is centralized database on the FWS's intranet (systems.fws.gov/pups). Only FWS employees can access PUP records.

Pesticide Usage

In accordance with 569 FW 1, the Refuge Manager 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 FWS permission. For clarification, pesticide means all insecticides, insect and plant growth regulators, dessicants, herbicides, fungicides, rodenticides, acaricides, nematicides, fumigants, avicides, and piscicides.

The following usage information can be reported for approved PUPs in the Pesticide Use Proposal System database:

- Pesticide trade name(s).
- Active ingredient(s).
- Total acres treated.
- Total amount of pesticides used (pounds or gallons).
- Total amount of active ingredient(s) used (pounds).
- Target pest(s).
- Efficacy (percent 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, percent 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

CNWR personnel must have an approved PUP to use pesticides for habitat management, as well as croplands/facilities maintenance. 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 a minimal potential to degrade environmental quality.

Evaluation of PUPs is not done at the refuge level. Once the Refuge submits PUPs to the FWS Regional Office, they are evaluated and approved either at the regional or national level. FWS staff at the regional or national level conduct a thorough review of the proposed use, including an assessment of effects to target and non-target species as well as an assessment of ecological risks associated with the proposed use. 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 the potential to degrade environmental quality for pesticides, would be documented in Chemical Profiles (see Section G.7.5 below). 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 G.4) for habitat management and cropland/facilities maintenance on CNWR 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 EPA (2004). Assumptions for these risk assessments are presented in Section G.6.

The toxicological data used in ecological risk assessments are typically results of standardized laboratory studies provided by pesticide registrants to the EPA to meet regulatory requirements under the 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 used 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 G.7.5 below.

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]

[1] Measurement endpoints typically include a variety of reproductive parameters (e.g., number of eggs, number of offspring, eggshell thickness and number of cracked eggs).
[2] Measurement endpoints for early life stage/life cycle typically include embryo hatch rates, time to hatch, growth and time to swim-up.
[3] Measurement endpoints include maternal toxicity, teratogenic effects or developmental anomalies, evidence of mutagenicity or genotoxicity, and interference with cellular mechanisms such as DNA synthesis and DNA repair.

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 EPA's Ecological Risk Assessment Process (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., LC_{50} and oral LD_{50}]) to evaluate the potential for adverse effects to species groups (birds, mammals, and fish) representative of legal mandates for managing units of the NWRS. This integration is achieved through risk quotients (RQs) calculated by dividing the EEC by acute and chronic toxicity values selected from standardized toxicological endpoints or published effect (Table G.1).

$$RQ = EEC/Toxicological\ Endpoint$$

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 the EPA (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 LC_{50} and LD_{50} 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 ESA (16 U.S.C. 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, a 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 (EPA 1998)

Risk Presumption		Level of Concern	
		Listed Species	Non-listed Species
Acute	Birds	0.1	0.5
	Fish	0.05	0.5
	Mammals	0.1	0.5
Chronic	Birds	1	1
	Fish	1	1
	Mammals	1	1

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; Butler et al. 1998; EXTOXNET

1993; Pope et al. 1999, Ramsay et al. 1995,). 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 estimated environmental concentration (ECC) for exposure to terrestrial wildlife would be quantified using an EPA screening-level approach (EPA 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 Kanaga nomogram method (EPA 2004, 2005a*;* Pfleeger et al. 1996) through the EPA's Terrestrial Residue Exposure model (T-REX) version 1.2.3 (EPA 2005b). To estimate the maximum (initial) pesticide residue on short grass (<20 cm tall) as a general food item category for terrestrial vertebrate species, T-REX input variables would include from the pesticide label maximum pesticide application rate (pounds active ingredient [acid equivalent]/acre) and the pesticide half-life (days) in soil. Although there are other food item categories (tall grasses; broadleaf plants and small insects; fruits, pods, seeds and large insects), short grass was selected because it would yield maximum EECs (240 ppm per lb ai/acre) for worse-case risk assessments. Short grass is not representative of forage for carnivorous species (e.g., raptors), but it would characterize the maximum potential exposure through the diet of avian and mammalian prey items. Consequently, this approach 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 G.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 Kanaga 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)		Species	Body Weight (kg)
Mammal (15 grams)	0.015		Bobwhite quail	0.178
House sparrow	0.0277		Rat	0.2
Mammal (35 grams)	0.035		Rock dove (aka pigeon)	0.542

Species	Body Weight (kg)		Species	Body Weight (kg)
Starling	0.0823		Mammal (1000 grams)	1
Red-winged blackbird	0.0526		Mallard	1.082
Common grackle	0.114		Ring-necked pheasant	1.135
Japanese quail	0.178			

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 (ai) exposed (e.g., EEC) on the surface of an area equal to 1 square foot by the appropriate LD_{50} value multiplied by the surrogate's body weight (Table G.3). An adjustment to surface area calculations would be made for broad-cast, 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 percent 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 percent of the applied granules remain available to wildlife. It would be assumed that only 1 percent 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 percent 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 (LD_{50}/square feet) for comparison to EPA Level of Concerns (EPA 1998). The T-REX version 1.2.3 (EPA 2005b) contains a submodel that automates Kanaga exposure calculations for granular pesticides and treated seed.

The following formulas will be used to calculate EECs depending upon the type of granular pesticide application:

- In-furrow applications assume a typical value of 1 percent granules, bait, or seed remain unincorporated.

$$mg\ a.i./ft.^2 = [(lbs.\ product/acre)(\%\ a.i.)(453{,}580\ mg/lbs)(1\%\ exposed))] / \{[(43{,}560\ ft.^2/acre)/(row\ spacing\ (ft.))] / (row\ spacing\ (ft.)\}$$

or

$$mg\ a.i./ft^2 = [(lbs\ product/1000\ ft.\ row)(\%\ a.i.)(1000\ ft\ row)(453{,}580\ mg/lb.)(1\%\ exposed)$$

$$EEC = [(mg\ a.i./ft.^2)(\%\ of\ pesticide\ biologically\ available)]$$

- Incorporated banded treatments assume that 15 percent of granules, bait, seeds are unincorporated.

$$mg\ a.i./ft.^2 = [(lbs.\ product/1000\ row\ ft.)(\%\ a.i.)(453{,}580\ mg/lb.)(1\text{-}\%\ incorporated)] / (1{,}000\ ft.)(band\ width\ (ft.))$$

$$EEC = [(mg\ a.i./ft.^2)(\%\ of\ pesticide\ biologically\ available)]$$

- Broadcast treatment without incorporation assumes 100 percent of granules, bait, seeds are unincorporated.

$$mg\ a.i./ft.^2 = [(lbs.\ product/acre)(\%\ a.i.)(453{,}590\ mg/lb.)] / (43{,}560\ ft.^2/acre)$$

$$EEC = [(mg\ a.i./ft.^2)(\%\ of\ pesticide\ biologically\ available)]$$

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 used to calculate a RQ based on the EEC calculated by one of the above equations. The EEC would be divided by the surrogate LD_{50} toxicological endpoint multiplied by the body weight (Table G.3) of the surrogate.

$$RQ = EEC / [LD_{50}\ (mg/kg) * body\ weight\ (kg)]$$

As with other risk assessments, a RQ>LOC would be a presumption of unacceptable ecological risk. A 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 G.4) would be 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 G.4.2 above) 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 percent 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)		Lbs/acre	EEC (ppb)
0.1	36.7		2	735.7
0.2	73.5		2.25	827.6
0.25	91.9		2.5	919.4
0.3	110.2		3	1103.5
0.4	147		4	1471.4
0.5	183.7		5	1839
0.75	275.6		6	2207
1	367.5		7	2575
1.25	459.7		8	2943
1.5	551.6		9	3311
1.75	643.5		10	3678

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 EPA pesticide registration spray drift data requirements and as a scientific basis to evaluate off-target movement of pesticides from particle drift and assess potential effects of exposure to wildlife. Several versions of the computer model have been developed (i.e., v2.01 through v2.10). The Spray Drift Task Force AgDRIFT model version 2.01 (AgDRIFT 2001; SDTF 2003) would be used to derive EECs resulting from drift of pesticides to Refuge aquatic resources from ground-based pesticide applications >25 feet from the high water mark. The Spray Drift Task Force AgDRIFT model is publicly available at 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 BLM, USFS, NPS, DOA-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 an FWS NEPA document, which only would identify the documents that are incorporated by reference. In addition, relevant portions would be summarized in the FWS 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 FWS would specifically incorporate through reference ecological risk assessments prepared by the USFS (www.fs.fed.us/r6/invasiveplant-eis/Risk-Assessments/Herbicides-Analyzed-InvPlant-EIS.htm) and BLM (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* (BLM 2007). In accordance with 43 CRF 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 USFS would be incorporated by reference:

- 2,4-D
- Chlorosulfuron
- Clopyralid
- Dicamba
- Glyphosate
- Imazapic
- Imazapyr
- Metsulfuron methyl
- Picloram
- Sethoxydim
- Sulfometuron methyl
- Triclopyr
- Nonylphenol polyethylate (NPE)–based surfactants

As a basis for completing "Chemical Profiles" for approving or disapproving Refuge PUPs, ecological risk assessments for the following herbicide uses as well as evaluation of risks associated with pesticide degradates and adjuvants prepared by the BLM would be incorporated by reference:

- Bromacil
- Chlorsulfuron
- Diflufenzopyr
- Diquat
- Diuron
- Fluridone
- Imazapic
- Overdrive (diflufenzopyr and dicamba)
- Sulfometuron methyl
- Tebuthiuron
- Pesticide degradates and adjuvants

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 using the EPA'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 (EPA 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 fish. However, sheepshead 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 will not be limited to the species previously listed as common surrogates.

The Kanaga nomogram outputs maximum EEC values that may be used to calculate an average daily concentration over a specified interval of time, which is referred to as a time-weighted-average (TWA). The maximum EEC would be selected as the exposure input for both acute and chronic risk assessments in the screening-level evaluations. The initial or maximum EEC derived from the Kanaga nomogram represents the maximum expected instantaneous or acute exposure to a pesticide. Acute toxicity endpoints are determined using a single exposure to a known pesticide concentration typically for 48 to 96 hours. This value is assumed to represent ecological risk from acute exposure to a pesticide. 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 that 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 will be applied judiciously considering the potential for an underestimate or overestimate of risk. For example, the number of days exposure exceeds a LOC may influence the suitability of a pesticide use. The greater the number of days the EEC exceeds the LOC translates into greater the ecological risk. This is a qualitative assessment, and is subject to reviewer's expertise in ecological risk assessment and tolerance for risk.

The length of time used to calculate the TWA can have a substantial effect on the exposure estimates and there is no standard method for determining the appropriate duration for this estimate. The T-REX model assumes a 21-week exposure period, which is equivalent to avian reproductive studies designed to establish a steady-state concentration for bioaccumulative compounds. However, this does not necessarily define the true exposure duration needed to elicit a toxicological response. Pesticides, which do not bioaccumulate, may achieve a steady-state concentration earlier than 21 weeks. The duration of time for calculating TWAs will require justification and it will not exceed the duration of exposure in the chronic toxicity test (approximately 70 days for the standard avian reproduction study). An alternative to using the duration of the chronic toxicity study is to base the TWA on the application interval. In this case, increasing the application interval would suppress both the estimated peak pesticide concentration and the TWA. Another alternative to using TWAs would be to consider the number of days that a chemical is predicted to exceed the LOC.

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 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 used, 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 (EPA 2004).

Exposure through incidental ingestion of pesticide contaminated soil is not considered in the EPA risk assessment protocols. Research suggests <15 percent of the diet can consist of incidentally ingested soil depending upon species and feeding strategy (Beyer et al. 1994). An assessment of pesticide concentrations in soil compared to food item categories in the Kanaga nomogram indicates incidental soil ingestion will not likely increase dietary exposure to pesticides. Inclusion of soil into the diet would effectively reduce the overall dietary concentration compared to the present assumption that the entire diet consists of a contaminated food source (Fletcher et al. 1994). An exception to this may be soil-applied pesticides in which exposure from incidental ingestion of soil may increase. Potential for pesticide exposure under this assumption may be underestimated for soil-applied pesticides and overestimated for foliar-applied pesticides. The concentration of a pesticide in soil would likely be less than predicted on food items.

Exposure through inhalation of pesticides is not considered in the EPA risk assessment protocols. Such exposure may occur through three potential sources: 1) spray material in droplet form at time of application; 2) vapor phase with the pesticide volatilizing from treated surfaces; and 3) airborne particulates (soil, vegetative matter, and pesticide dusts). The EPA (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 two to five microns. The spray droplet spectra covering the majority of pesticide application scenarios indicate that less than 1 percent 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 EPA 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: 1) direct application of spray to terrestrial wildlife in the treated area or within the drift footprint; 2) incidental contact with contaminated vegetation; or 3) 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 EPA 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 EPA for assessing dermal exposure to pesticides, they will 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 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 EPA is actively developing protocols to quantify drinking water exposures from puddles and dew. If and when protocols are formally established by the EPA for assessing exposure to pesticides through drinking water, these protocols will 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 EPA relies on Fletcher (1994) for setting the assumed pesticide residues in wildlife dietary items. The EPA (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 EPA represent a 95th percentile estimate. However, research conducted by Pfleeger et al. (1996) indicates EPA residue assumptions for short grass was not exceeded. Baehr and Habig (2000) compared EPA residue assumptions with distributions of measured pesticide residues for the EPA'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 LC_{50} 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 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 EPA 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.

The EPA 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, EPA 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 the FIFRA, the active ingredient(s) must be identified by name(s) on the pesticide label along with its relative composition expressed in percentage(s) by weight. In contrast, inert ingredient(s) are not intended to affect a target pest. Their role in the pesticide formulation is to act as a solvent (keep the active ingredient is a liquid phase), an emulsifying or suspending agent (keep the active ingredient from separating out of solution), or a carrier such as clay in which the active ingredient is impregnated on the clay particle in dry formulations. For example, if isopropyl alcohol would be used as a solvent in a pesticide formulation, then it would be considered an inert ingredient. The 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 EPA (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 EPA categorizes regulated inert ingredients into the following four lists (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 the 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 USFS (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:

- TOMES (a proprietary toxicological database including EPA's IRIS, the Hazardous Substance Data Bank, the Registry of Toxic Effects of Chemical Substances [RTECS]).
- EPA'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 degradate effects extremely difficult. For example, a less toxic and more mobile, bioaccumulative, or persistent degradate may have potentially greater effects on species and/or degrade environmental quality. The lack of data on the toxicity of degradates for many pesticides would represent a source of uncertainty for assessing risk.

An EPA-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 EPA 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 persistence, sorption coefficient (K_{oc}), groundwater ubiquity score (GUS) and solubility.

Persistence, which is expressed as half-life ($t_{½}$), represents the length of time required for 50 percent of the deposited pesticide to degrade (completely or partially). Persistence in the soil can be categorized as 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 percent 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 will be selected for quantitative analysis for both terrestrial and aquatic environments.

Mobility of a pesticide is a function of how strongly it is adsorbed to soil particles and organic matter, its solubility in water and its persistence in the environment. Pesticides strongly adsorbed to soil particles, relatively insoluble in water, and not environmentally persistent would be less likely to move across the soil surface into surface waters or to leach through the soil profile and contaminate groundwater. Conversely, pesticides that are not strongly adsorbed to soil particles, are highly water soluble, and are persistent in the environment would have greater potential to move from the application site (off-site movement).

The degree of pesticide adsorption to soil particles and organic matter (Kerle et al. 1996) is expressed as the soil adsorption coefficient (K_{oc}). The soil adsorption coefficient is measured as micrograms of pesticide per gram of soil (ìg/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 ppm). Pesticide with solubility <0.1 ppm are virtually insoluble in water, 100-1000 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 uses soil persistence and adsorption coefficients in the following formula.

$$GUS = log_{10}(t_{½}) \times [4 - log_{10}(K_{oc})]$$

The potential pesticide movement rating would be based upon its GUS value. Pesticides with a GUS <0.1 would considered to have an extremely low potential to move toward groundwater. Values of 1.0-2.0 would be low, 2.0-3.0 would be moderate, 3.0-4.0 would be high, and >4.0 would have a very high potential to move toward groundwater.

Water solubility describes the amount of pesticide dissolving in a specific quantity of water, where it is usually measured as mg/l or parts per million (ppm). Solubility is useful as a comparative measure because pesticides with higher values are more likely to move by runoff or leaching. GUS, water solubility, $t_{½}$, and K_{oc} values are available for selected pesticides from the OSU Extension Pesticide Properties Database at 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 runoff rather than infiltrate into

the soil profile. Soil moisture also would influence microbial and chemical activity in soil, which affects 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 (¼ to ½ inch), which is called the mixing zone (Baker and Miller 1999). The pesticide/water mixture in the mixing zone would tend to leach down into the soil or runoff depending upon how quickly the soil surface becomes saturated and how rapidly water can infiltrate into the soil. Leaching would decrease the amount of pesticide available near the soil surface (mixing zone) 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 (Oregon State University 1996). Vapor pressure values for pesticides are usually available in the pesticide product MSDS or the USDA Agricultural Research Service pesticide database.

G.7.6 Preparing a Chemical Profile

The following instructions would be used by FWS 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 the EPA. 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 using 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 G.5 above), 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: FWS 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): FWS 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. FWS personnel would record a trade name for each pesticide product with the same active ingredient.

Common chemical name(s): FWS 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: FWS personnel would record the type of pesticide for an active ingredient as herbicide, desiccant, fungicide, fumigant, growth regulator, insecticide, piscicide, or rodenticide.

EPA Registration Number(s): This number 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. FWS personnel would record the EPA Registration Number for each trade name product with an active ingredient based upon PUPs.

Pesticide Class: FWS 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 percentage composition.

Other Ingredients: From the most recent MSDS for the proposed pesticide product(s), FWS 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), 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 FWS 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 online database maintained by Crop Data Management Systems, Incorporated.

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 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 LD_{50}: For test species in the scientific literature, FWS personnel would record available data for oral lethal dose (LD_{50}) in mg/kg-bw (body weight) or ppm-bw. The most common test species in scientific literature are the rat and mouse. The lowest LD_{50} value found for a rat would be

used as a toxicological endpoint for dose-based RQ calculations to assess acute risk to mammals (see Table G.1 in Section G.7.1).

Mammalian LC_{50}: For test species in the scientific literature, FWS personnel would record available data for dietary lethal concentration (LC_{50}) as reported (e.g., mg/kg-diet or ppm-diet). The most common test species in scientific literature are the rat and mouse. The lowest LC_{50} value found for a rat would be used as a toxicological endpoint for diet-based RQ calculations to assess acute risk (see Table G.1 in Section G.7.1).

Mammalian Reproduction: For test species listed in the scientific literature, FWS 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). The most common test species available in scientific literature are rats and mice. The lowest NOEC, NOAEC, NOEL, or NOAEL test results found for a rat would be used as a toxicological endpoint for RQ calculations to assess chronic risk (see Table G.1 in Section G.7.1).

Avian LD_{50}: For test species available in the scientific literature, FWS personnel would record values for oral lethal dose (LD_{50}) in mg/kg-bw or ppm-bw. The most common test species available in scientific literature are the bobwhite quail and mallard. The lowest LD_{50} value found for an avian species would be used as a toxicological endpoint for dose-based RQ calculations to assess acute risk (see Table G.1 in Section G.7.1).

Avian LC_{50}: For test species available in the scientific literature, FWS personnel would record values for dietary lethal concentration (LC_{50}) as reported (e.g., mg/kg-diet or ppm-diet). The most common test species available in scientific literature are the bobwhite quail and mallard. The lowest LC_{50} value found for an avian species would be used as a toxicological endpoint for dietary-based RQ calculations to assess acute risk (see Table G.1 in Section G.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 G.7.1).

Fish LC_{50}: For test freshwater or marine species listed in the scientific literature, FWS personnel would record a LC_{50} in ppm or mg/L. The most common test species available in the scientific literature are the bluegill, rainbow trout and fathead minnow (marine). Test results for many game species may also be available. The lowest LC_{50} value found for a freshwater fish species would be used as a toxicological endpoint for RQ calculations to assess acute risk (see Table G.1 in Section G.7.1).

Fish Early Life Stage (ELS)/Life Cycle: For test freshwater or marine species available in the scientific literature, FWS personnel would record test results (e.g., LOEC, NOAEL, NOAEC, LOAEC) in ppm for test procedure(s) (e.g., early life cycle, life cycle). The most common test species available in the scientific literature are bluegill, rainbow trout and fathead minnow. Test results for other game species may also be available. The lowest test value found for a fish species

(preferably freshwater) would be used as a toxicological endpoint for RQ calculations to assess chronic risk (see Table G.1 in Section G.7.1).

Other: For test invertebrate as well as non-vascular and vascular plant species available in the scientific literature, FWS personnel would record $LC_{50,}$ $LD_{50,}$ LOEC, LOEL, NOAEC, NOAEL, or EC_{50} (environmental concentration) values in ppm or mg/L. The most common test invertebrate species available in scientific literature are the honey bee and the water flea (*Daphnia magna*). Green algae (*Selenastrum capricornutum*) and pondweed (*Lemna minor*) are frequently available test species for aquatic non-vascular and vascular plants, respectively.

Ecological Incident Reports: After a site has been treated with pesticide(s), wildlife may be exposed to these chemical(s). When exposure is high relative to the toxicity of the pesticides, wildlife may be killed or visibly harmed (incapacitated). Such events are called ecological incidents. The EPA 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.

Environmental Fate

Water Solubility: FWS 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 1000 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.

Sw would be used to evaluate potential for bioaccumulation in aquatic species [see **Octanol-Water Partition Coefficient (K_{ow})** below].

Soil Mobility: FWS personnel would record available values for soil adsorption coefficient (K_{oc} [ìg/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: FWS personnel would record values for soil half-life ($t_{½}$), which represents the length of time (days) required for 50 percent of the deposited pesticide to degrade (completely or partially) in the soil. Based upon the $t_{½}$ 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 $t_{½}$ ≤100 days, then a PUP would be approved without additional BMPs to protect water quality.
- If soil $t_{½}$ >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 groundwater table is <10 feet and average annual precipitation >12 inches.
    - Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.

Along with K_{oc}, soil $t_{½}$ 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 percent of the deposited pesticide to degrade and move from a treated site; whereas, soil $t_{½}$ describes the rate for degradation only. As for $t_{½}$, units of dissipation time are usually expressed in days. Field dissipation time would be the preferred data for use to estimate pesticide concentrations in the environment because it is based upon field studies compared to soil $t_{½}$, which is derived in a laboratory. However, soil $t_{½}$ is the most common persistence data available in the published literature. If field dissipation data 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 non-persistent <30 days, moderately persistent = 30 to 100 days and persistent >100 days.

Threshold for Approving PUPs

- If soil DT_{50} ≤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 groundwater table is <10 feet and average annual precipitation >12 inches.
    - Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.

Along with K_{oc}, soil DT_{50} values (preferred over soil $t_{½}$) would be used in evaluating the potential to degrade groundwater by leaching (see **Potential to Move to Groundwater** below), if available.

Aquatic Persistence: FWS personnel would record values for aquatic $t_{½}$, which represents the length of time required for 50 percent of the deposited pesticide to degrade (completely or partially) in water. Based upon the $t_{½}$ value, aquatic persistence would be categorized as non-persistent <30 days, moderately persistent = 30 to 100 days and persistent >100 days (Kerle et al. 1996).

Threshold for Approving PUPs

- If aquatic $t_{½} \leq 100$ days, then a PUP would be approved without additional BMPs to protect water quality.
- If aquatic $t_{½} > 100$ 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 groundwater table is <10 feet and average annual precipitation >12 inches.
    - Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.

Aquatic Dissipation: Dissipation time (DT_{50}) represents the time required for 50 percent of the deposited pesticide to degrade or move (dissipate); whereas, aquatic $t_{½}$ describes the rate for degradation only. As for $t_{½}$, units of dissipation time are usually expressed in days. Based upon the DT_{50} value, environmental persistence in aquatic habitats also would be categorized as 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 groundwater table is <10 feet and average annual precipitation >12 inches.
    - Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.

Potential to Move to Groundwater: Groundwater Ubiquity Score (GUS) = $\log_{10}(\text{soil } t_{½}) \times [4 - \log_{10}(K_{oc})]$. If a DT_{50} value is available, it would be used rather than a $t_{½}$ value to calculate a GUS score. Based upon the GUS value, the potential to move toward groundwater would be recorded as 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 groundwater table is <10 feet and average annual precipitation >12 inches.
    - Do not use on steep slopes if substantial rainfall is expected within 24 hours or 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 (Oregon State University 1996). Vapor pressure values for pesticides are usually available in the pesticide product MSDS or the USDA Agricultural Research Service pesticide database.

Threshold for Approving PUPs

- If I ≤1000, then a PUP would be approved without additional BMPs to minimize drift and protect air quality.
- If I >1000, 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°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} >1000 or S_w<1 mg/L AND soil $t_{½}$>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}>1000 or S_w<1 mg/L AND soil $t_{½}$>30 days), then the PUP would not approved, except under unusual circumstances where approval would only be granted by the Washington Office.

Bioaccumulation/Bioconcentration: 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 low - 0 to 300, moderate - 300 to 1000, or high >1000 (Calabrese and Baldwin 1993).

Threshold for Approving PUPs

- If BAF or BCF≤1000, then a PUP would be approved without additional BMPs.
- If BAF or BCF>1000, then a PUP would not approved, except under unusual circumstances where approval would only be granted by the Washington Office.

Worst-Case Ecological Risk Assessment

Max Application Rates (acid equivalent): FWS 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.

Estimated Environmental Concentrations: An estimated environmental concentration (ECC) represents potential exposure to fish and wildlife (birds and mammals) from using a pesticide. EECs would be derived by Service personnel using an EPA screening-level approach (EPA 2004). For each max application rate [see description under **Max Application Rates (acid equivalent)**], FWS personnel would record two 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 the 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: FWS 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 G.7.2 for a 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 percent 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 FWS 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 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 G.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 FWS 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 Kanaga nomogram method through the EPA's T-REX model version 1.2.3. T-REX input variables would include maximum 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 G.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 LOCs established by the EPA (see Table G.2 in Section G.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 species and nonlisted species. See Section G.7.2 for detailed descriptions of acute and chronic RQ calculations and comparison to LOCs to assess risk.

Threshold for Approving PUPs

- If RQs≤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≤LOCs.
    - For aquatic assessments (fish) associated with cropland/facilities maintenance, increase the buffer distance beyond 25 feet so RQs≤LOCs.

Justification for Use: FWS personnel would describe the reason for using the pesticide based control of specific pests or groups of pests. In most cases, the pesticide label will provide the appropriate information regarding control of pests to describe in the section.

Specific BMPs: FWS 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 FWS 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 G.4 above 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: FWS 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 online data resources are readily available for toxicological endpoint and environmental fate data for pesticides:

- California Product/Label Database. Department of Pesticide Regulation, California Environmental Protection Agency.
  (www.cdpr.ca.gov/docs/label/labelque.htm#regprods)
- ECOTOX database. Office of Pesticide Programs, Environmental Protection Agency, Washington, D.C.
  (cfpub.epa.gov/ecotox/)
- 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.
  (extoxnet.orst.edu/pips/ghindex.html)
- FAO specifications and evaluations for plant protection products. Pesticide Management Unit, Plant Protection Services, Food and Agriculture Organization, United Nations.
  (www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/Pesticid/)
- Human health and ecological risk assessments. Pesticide Management and Coordination, Forest Health Protection, U.S. Department of Agriculture, U.S. Forest Service.
  (www.fs.fed.us/foresthealth/pesticide/risk.htm)
- Pesticide Chemical Fact Sheets. Clemson University Pesticide Information Center.
  (entweb.clemson.edu/pesticid/Document/Labels/factsheet.htm)
- Pesticide Fact Sheets. Published by Information Ventures for Bureau of Land Management, Department of the Interior; Bonneville Power Administration, U.S. Department of Energy; and U.S. Forest Service, U.S. Department of Agriculture.
  (infoventures.com/e-hlth/pesticide/pest-fact.html)
- Pesticide Fact Sheets. National Pesticide Information Center.
  (npic.orst.edu/npicfact.htm)
- Pesticide Fate Database. Environmental Protection Agency, Washington, D.C.
  (cfpub.epa.gov/pfate/).

- Pesticide product labels and material safety data sheets. Crop Data Management Systems. (www.cdms.net/pfa/LUpdateMsg.asp) or multiple websites maintained by agrichemical companies.
- Registered Pesticide Products (Oregon database). Oregon Department of Agriculture. (www.oda.state.or.us/dbs/pest_products/search.lasso)
- Regulatory notes. Pest Management Regulatory Agency, Health Canada, Ontario, Canada. (www.hc-sc.gc.ca/pmra-arla/)
- Reptile and Amphibian Toxicology Literature. Canadian Wildlife Service, Environment Canada, Ontario, Canada. (www.cws-scf.ec.gc.ca/nwrc-cnrf/ratl/)
- Specific Chemical Fact Sheet – New Active Ingredients, Biopesticide Fact Sheet and Registration Fact Sheet. Environmental Protection Agency, Washington, D.C. (www.epa.gov/pestidides/factsheets/chemical_fs.htm)
- Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas. The Invasive Species Initiative. The Nature Conservancy. (tnsweeds.ucdavis.edu/handbook.html)
- Wildlife Contaminants Online. U.S. Geological Survey, Department of Interior, Washington, D.C. (www.pwrc.usgs.gov/contaminants-online/)
- One-liner database. 2000. Environmental Protection Agency, Office of Pesticide Programs, Washington, D.C.

G.8 Use Tables/Forms

Chemical Profile

Date:			
Trade Name(s):		**Common Chemical Name(s):**	
Pesticide Type:		**EPA Registration Number:**	
Pesticide Class:		**CAS Number:**	
Other Ingredients:			

Toxicological Endpoints

Mammalian LD_{50}:	
Mammalian LC_{50}:	
Mammalian Reproduction:	
Avian LD_{50}:	
Avian LC_{50}:	
Avian Reproduction:	
Fish LC_{50}:	
Fish ELS/Life Cycle:	
Other:	

Ecological Incident Reports

Environmental Fate

Water Solubility (S_w):	
Soil Mobility (K_{oc}):	
Soil Persistence ($t_{½}$):	
Soil Dissipation (DT_{50}):	
Aquatic Persistence ($t_{½}$):	
Aquatic Dissipation (DT_{50}):	

Potential to Move to Groundwater (GUS Score):	
Volatilization (mm Hg):	
Octanol-Water Partition Coefficient (K_{ow}):	
Bioaccumulation/Biocentration:	**BAF:** **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]	Treat ment 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/Season (lbs/acre/ season or gal/acre/ season)	Minimum Time Between Applications (Days)

[a] From each label for a pesticide identified in pesticide use proposals (PUPs), FWS personnel would record application information associated with possible/known uses on FWS lands.
[b] Treatment type: H – habitat management or CF – cropland/facilities maintenance. If a pesticide is labeled for both types of treatments (uses), then record separate data for H and CF applications.

Appendix H. Wilderness Review

H.1 Policy for Wilderness Reviews

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 re-evaluation of refuge lands existing during the initial 10-year review period of The Wilderness Act of 1964 (16 U.S.C. 1131-1136), as amended, as well as new lands and waters added to the National Wildlife Refuge System (NWRS) 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"). NWRS policy on Wilderness Stewardship (610 FW 1-5) includes guidance for conducting wilderness reviews (610 FW 4 – Wilderness Review and Evaluation).

H.2 Service Criteria for Evaluating Lands for 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 untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act 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 NWRS 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 5,000 acres of land, or is of a sufficient size as to make practicable its preservation and use in an unimpaired condition; and

4) May also contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

Criterion 3 is further defined in Section 3(c) of the 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 four-wheeled, motorized vehicles that are intended for highway use.

H.3 The Wilderness Review Process

A wilderness review is the process of determining whether the Service should recommend NWRS lands and waters to Congress for wilderness designation. The wilderness review process consists of three phases—wilderness inventory, wilderness study, and wilderness recommendation.

H.3.1 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 type 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.

H.3.2Wilderness Study

During the study phase, WSAs are further analyzed:

- For all values of ecological, recreational, cultural, economic and/or symbolic value.
- For all resources, including wildlife, vegetation, water, minerals and soils.
- For existing and proposed public uses.
- For existing and proposed refuge management activities within the area.
- To assess the refuge's ability to manage and maintain the wilderness character in perpetuity, given the current and proposed management activities. Factors for evaluation may include, but are not limited to, staffing and funding capabilities, increasing development, urbanization, public uses, and safety.

If areas are found that qualify as WSAs, the Service evaluates 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. The Service 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:

1) The benefits and impacts to wilderness values and other resources.

2) How each alternative will achieve the purposes of the Wilderness Act and the NWPS.

3) How each alternative will affect achievement of refuge purpose(s) and the refuge's contribution toward achieving the NWRS mission.

4) How each alternative will affect maintaining and, where appropriate, restoring biological integrity, diversity and environmental health at various landscape scales.

5) Other legal and policy mandates.

6) 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 Section 4(c) prohibited uses.

H.3.3 Wilderness Recommendation

If the wilderness study demonstrates that a WSA meets the requirements for inclusion in the National Wilderness Preservation System, a wilderness study report will 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 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 the Service amends 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, the Service includes appropriate interagency and tribal coordination, public involvement and documentation of compliance with NEPA" (610 FW 3.13).

H.4 Lands Considered Under This Wilderness Review

All Service-owned lands and waters (in fee title) within the CNWR acquired boundary were considered during this wilderness review.

H.5 Wilderness Inventory

The first step of the wilderness assessment is to divide the refuge or other management entity into preliminary wilderness evaluation units. The boundaries of these artificial units can follow the refuge boundary, but not cross permanent roadways, private or other non-Federal lands, or non-Service-owned waterways. These roads, non-Federal lands, or waterways can form the boundary for an individual evaluation unit. Other obvious incompatible wilderness uses or structures (such as refuge headquarters, residential areas, rights-of-way, non-jurisdictional waters) may also be eliminated from any evaluation units at this time. Once boundaries have been established for each individual evaluation unit, the criteria in 2.1 - 2.3 are applied to determine each unit's suitability as potential wilderness and need for further evaluation under the wilderness study.

H.5.1 Unit Size

Roadless areas meet the size criteria if any one of the following standards apply:

1) An area with over 5,000 contiguous acres solely in Service ownership.

2) 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.

3) 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.

4) 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 USFS, NPS, or BLM.

On CNWR, there are no areas of 5,000 acres or more that meet these criteria. In fact, there are no areas greater than 1,000 acres that meet these criteria, and of those (two), none are of sufficient size to be effectively managed as wilderness.

H.5.2 Naturalness and Wildness

The area must meet the criteria of generally appearing 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; road or trails; suppression of wildfires; invasions by non-native 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 natural, untrammeled, and 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 a 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 human-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. Non-native and invasive species should constitute 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 interspersion 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 it evolved and 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 human-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.

This section is somewhat redundant with the section on unit size in that many of the same standards that limit roadless area size are also defined here—infrastructure, human-made intrusions, etc. As noted above, infrastructure—roads, power lines, irrigation canals, farm fields, etc.—limits the size of areas on CNWR that might meet wilderness criteria. Here, taking into account the extreme "unnaturalness" of the landscape—the few large areas of CNWR that do not have human-made objects lie within artificial ecosystems. That is, the areas are altered by the CBIP to such an extent that one cannot reasonably argue that they are natural in character or are wild, as defined above.

H.5.3 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 refer to the ability of a visitor to be alone and secluded from other visitors in the area. Primitive and unconfined recreation means non-motorized, dispersed outdoor recreation activities that are compatible and do not require developed facilities or mechanical transport.

Primitive recreation activities may provide opportunities to experience challenge and risk, self-reliance and adventure.

Of the large areas on CNWR, these areas could provide for solitude, although given the developed nature of the area in general, there are little, if any, opportunities for challenge, risk, self-reliance and adventure in the manner generally thought of as wilderness.

H.5.4 Inventory Summary and Conclusion

As defined above, no areas on CNWR meet the minimum criteria for wilderness, other than the opportunity for solitude. In addition, not considered above is the presence of the CBIP and the BOR. In point of fact, the BOR holds secondary withdrawals on much of the Refuge and could use those withdrawals for irrigation and water storage in the future. Likewise, Crab Creek is the spillway for the O'Sullivan Dam, and major spills could effectively destroy both wilderness character and much of the "naturalness" of the area at any time. In short, no area could effectively be managed as wilderness. If the lands immediately surrounding Crab Creek were eliminated from consideration, the roadless areas become very small, and given the open nature of the landscape, true wilderness is not feasible.

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Appendix J. Distribution List

The U.S. Fish and Wildlife Service developed this list based on known interest, or a direct socio-economic interest, in the results of the planning process.

Tribal

Martin Bohl, Executive Director, Confederated Tribes of the Colville Reservation
Rex Buck, Spiritual Leader, Wanapum
Antone Minthorn, Board of Trustees Chair, Confederated Tribes of the Umatilla Indian Reservation
Rebecca Miles, Chair, Nez Perce Tribe
Lavina Washines, Chair, Confederated Tribes and Bands of the Yakama Indian Nation

Office of the Governor

The Honorable Christine Gregoire

United States Senators

The Honorable Maria Cantwell
The Honorable Patty Murray

United States Representatives

The Honorable Jamie Herrera Beutler
The Honorable Norman Dicks
The Honorable Doc Hastings
The Honorable Jamie Herrera Beutler
The Honorable Jay Inslee
The Honorable Rick Larsen
The Honorable Jim McDermott
The Honorable Cathy McMorris Rodgers
The Honorable Adam Smith
The Honorable David Reichert

Washington State Elected Officials

Washington State Senate

The Honorable Jerome Delvin
The Honorable Jim Honeyford
The Honorable Janéa Holmquist Newbry
The Honorable Mark Schoesler

Washington State House of Representatives

The Honorable Bruce Chandler
The Honorable Susan Fagan
The Honorable Larry Haler
The Honorable William Hinkle
The Honorable Brad Klippert
The Honorable Joe Schmick
The Honorable David Taylor
The Honorable Judith Warnick

County Commissioners

Adams County Commissioners

Roger Hartwig
Rudy Plager
Jeffrey Stevens

Benton County Commissioners

James Beaver
Leo Bowman
Shon Small

Franklin County Commissioners

Bob Koch
Rick Miller
Brad Peck

Grant County Commissioners

Cindy Carter
Richard Stevens
Carolann Swartz

Mayors

Judy Esser (Mattawa)
David Ferguson (Mesa)
John Fox (Richland)
Justin Jenks (Royal City)
Jon Lane (Moses Lake)
Donna Noski (West Richland)
Matt Watkins (Pasco)
Tim Wilson (Othello)
Steve Young (Kennewick)

Federal Agencies/Organizations

Bonneville Power Administration
Bureau of Indian Affairs
Bureau of Land Management
Bureau of Reclamation
Columbia River Inter-Tribal Fish Commission
Federal Energy Regulatory Commission
Federal Highway Administration
National Oceanic Atmospheric Administration
National Park Service
Natural Resources Conservation Service
United States Army Corps of Engineers
United States Department of Energy
United States Environmental Protection Agency
United States Forest Service
United States Geological Survey
United States Department of Transportation

State Agencies/Organizations

Washington Department of Agriculture
Washington Department of Ecology
Washington Department of Fish and Wildlife
Washington Department of Natural Resources
Washington Department of Transportation
Washington Fish and Wildlife Commission
Washington Interagency Committee for Outdoor Recreation
Washington State Historic Preservation Officer

Local Agencies/Organizations

Adams County Planning Department
Franklin County Planning Department
Grant County Planning Department

Interest Groups

American Bird Conservancy
American Birding Association
American Fisheries Society
American Sportfishing Association
American Rivers
Animal Protection Institute
Association of Fish and Wildlife Agencies
Backcountry Horsemen of Washington
Columbia River Conservation League
Columbia River Intertribal Fish Commission
Congressional Sportsman's Association
Defenders of Wildlife
Ducks Unlimited
Ecological Society of America
Franklin County Historical Society
Friends of the Mid-Columbia Refuges
Humane Society of the United States
Izaak Walton League of America
Lower Columbia Basin Audubon Society
National Audubon Society
National Fish and Wildlife Foundation
Native Plant Society
Natural Resources Defense Council
Northwest Ecosystem Alliance
Northwest Environmental Defense Center
Predator Defense Institute
Richland Rod & Gun Club
Rocky Mountain Elk Foundation
Safari Club International
Sagebrush Free Trappers
Sierra Club
Society for Conservation Biology
The Columbia Basin Bass Club
The Conservation Fund
The Fund for Animals
The Nature Conservancy
The Wilderness Society
The Wildlife Society
Trout Unlimited
Wahluke Farmers Association
Washington League of Voters
Washington Outfitters & Guides Association
Washington Waterfowl Association
Washington Kayak Club
Wildlife Management Institute

Economic Development/Tourism Organizations

Grant County Tourism Commission
Tri-Cities Visitor & Convention Bureau
Tri-City Area Chamber of Commerce

Utilities

Adams PUD
Benton County PUD
East Columbia Basin Irrigation District
Franklin County PUD
Grant County PUD
Quincy Irrigation District

Media

Associated Press – Yakima
Columbia Basin Herald – Moses Lake (Newspaper)
KEPR – Pasco (Television)
KNDU – Kennewick (Television)
KONA – Pasco (Radio)
KVEW – Kennewick (Television)
Mattawa Area News – Mattawa (Newspaper)
Oregonian – Portland (Newspaper)
Outlook – Othello (Newspaper)
Spokesman Review – Spokane (Newspaper)
Tri-Cities Area Journal of Business – Kennewick (Newspaper)
Tri-City Herald – Kennewick, Pasco, Richland, West Richland (Newspaper)

Reading Rooms/Libraries

Gonzaga University, Foley Center
Library of Congress

Individuals

In addition to the individuals listed below, distribution also included 10 interested people for whom we had only an email address. The email addresses are omitted for privacy.

Carl Ahlquist
Bryan Anderson
Jacob Anderson
Eric and Coleen Bickel
John Brown
Tim Cameron
Ralph Engle
Ken Evans
Brad Forgey
Robert Fowler
Dixie Fultz
Gary Gibbs
Dave and Audre Goeke
Jane Grant
William Graves
Sam Hallsted
Dale Holpainen
Earl Huff
Bob Jorgenson
John and Claire Lackie
Charlie Liebert
Theresa Long
Jerome Martin
Mike Martin
David Odell
Gary Olsen
Leo Pfeifer
Jean Public
John Rauner
Ronald Riedasch
Ken Shields
Eric Sims
Renee Slocumb
Bob Sommer
John Talbot
Helen Thompson
Larry Trail
Jarin Whitby

Appendix K. Implementation Plan

K.1 Introduction

Implementation of the comprehensive conservation plan (CCP) will require increased funding, which will be sought from a variety of sources. This plan will depend upon additional congressional allocations, partnerships, and grants. There are no guarantees that additional Federal funds will be made available to implement any of these projects. Other sources of funds will need to be obtained, both public and private. Activities and projects identified will be implemented as funds become available.

The CCP proposes several projects to be implemented over the next 15 years. Most of these projects are included in the Refuge Operational Needs System (RONS – new staff), or the Service Asset Maintenance and Management System (SAMMS – deferred maintenance projects), which are used to request funding from Congress. Currently, a large backlog of maintenance needs exists for CNWR. In 2010, the deferred maintenance backlog for CNWR was $20,895,823, with more projects needing to be added. An attempt at reducing this backlog needs to be addressed and is included in the analysis of funding needs. Prioritized staffing needs identified in the RONS will be necessary to implement the CCP to meet Refuge goals and objectives and legal mandates.

Annual revenue-sharing payments, associated with CNWR in Grant and Adams Counties, will continue as deemed appropriate by Congress. Total payments made in 2011 were $5,508 in Grant County and $5,627 in Adams County. Land associated with CNWR scattered tracts is public domain. Monitoring activities will be conducted on a percentage of all new and existing projects and activities to document wildlife populations and changes across time, habitat conditions, and responses to management practices.

K.2 Costs to Implement the CCP

The following sections detail both one-time and recurring costs for various projects in the plan. One-time costs reflect the initial costs associated with a project, whether it is purchase of equipment, contracting services, construction, a research project, etc. Recurring costs reflect the future operational and maintenance costs associated with the project. The following tables primarily document projects with a physically visible, trackable “on-the-ground” component, such as structures, habitat restoration, research, and monitoring and surveys. The scope and costs for “administrative” activities, such as MOUs, reporting, and establishment of partnerships, are difficult to estimate in advance and thus are not accounted for in the tables below.

K.2.1 One-time Costs

One-time costs are project costs that have a start-up cost associated with them, such as purchasing a new vehicle for wildlife and habitat monitoring, or designing and installing an interpretive sign. Some are full project costs for those projects that can be completed in three years or less. One-time costs can include the cost of temporary or term salary associated with a short-term project. Salary for existing and new positions, and operational costs, are reflected in operational (or recurring) costs.

Funds for one-time costs will be sought through increases in Refuge base funding, special project funds, and grants. Projects listed below in Table K-1 show one-time costs, such as those associated with building and facility needs including offices, public use facilities, road improvements, and new signs. One-time costs are also associated with projects such as habitat restoration, invasive plant and animal control, and research. New research projects, because of their short-term nature, are considered one-time projects and include costs of contracting services or hiring temporary staff for the short-term project. Some project costs are taken from 2010 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 K-1. Estimated one-time costs associated with implementation of the CCP.

Project Identifier	Project Description	Cost
Deferred Maintenance		
05138487	Replace twin culverts – Para Tract Road, Lower Crab Creek	$28,200
02121735	Repair safety deficiencies at Coyote Lake Dam	$371,815
02121734	Repair Marsh Unit I and II dams	$51,000
2007721382	Repair 23 miles of boundary fence on Unit 23 (Section 2)	$502,875
2007721402	Replace pump in Corfu Farm Unit irrigation system	$87,783
Visitor Facility Enhancements		
02122428	Construct interpretive facilities at the sub-headquarters entrance to the Refuge	$197,000
00100085	Replace boat ramp at Hutchinson Lake	$30,210
97122426	Construct additional interpretive signs for foot trails	$135,000
00100084	Replace damaged boat ramp and repair parking lot at Lower Hampton Lake (Rte 922)	$181,000
2008858432	Replace 13 vandalized interpretive displays at 7 sites	$90,300
99123923	Construct universally accessible Corfu Unit Birding Trail and Boardwalk	$413,000
Refuge Operational Needs (Projects)		
FY08-1928	Rehabilitate Marsh Unit III	$400,000
FY08-1922	Conduct Habitat mapping and inventory with weed mapping and treatment	$80,000
TBD	Restore Lower Crab Creek Floodplain, Marsh Unit IV	$150,000
TBD	Restore 5,000 acres of shrub-steppe to native vegetation	$1,500,000
TBD	Purchase additional lands for habitat connectivity and wildlife protection	$700,000
Research		
TBD	Define specific Washington ground squirrel limiting factors through behavioral, genetic, and dispersal patterns.	$70,000
TBD	Assess the populations and spread of bullfrogs, carp, and other undesirable open water invasive species	$40,000
TBD	Determine the effects of fish and bullfrog presence on native amphibian populations.	$100,000
TBD	Identify key elements for long-term cheatgrass suppression and shrub-steppe habitat restoration.	$100,000

TBD	Determine species assemblages associated with seepage interconnecting waterways and streams.	$30,000

K.2.2 Annual Operational (Recurring) Costs

Operational costs reflect refuge spending of base funds allocated each year. These are also known as recurring costs and are usually associated with day-to-day operations and projects that last longer than three years. Operational costs are funded through allocations in 126X accounts.

The CCP will require increased funding for new or expanded public uses and facilities, habitat restoration and conservation activities, and new monitoring needs. This includes such things as salary and operational expenditures such as travel, training, supplies, utilities, and maintenance costs. Project costs include permanent and seasonal staff needed year after year to accomplish each project.

Table K-2. Recurring costs associated with implementation.

Surveys and Scientific Assessments	$145,000
Inventory and Monitory Activities	$95,000
Research	$66,000
Habitat Management and Restoration	$252,000
Regulatory and Enforcement Actions	$97,168
Public Use Opportunities and Education	$127,295
Facilities Maintenance	$220,000

K.2.3 Maintenance Costs

The maintenance need over the next 15 years is defined as funds needed to repair or replace buildings, equipment, and facilities. Maintenance includes preventative maintenance; cyclic maintenance; repairs; replacement of parts, components, or items of equipment; adjustments, lubrication, and cleaning (non-janitorial) of equipment; painting; resurfacing; rehabilitation; special safety inspections; and other actions to ensure continuing service and to prevent breakdown. Maintenance costs include the maintenance "backlog"—maintenance needs that have come due but are as yet unfunded, as well as the increased maintenance need associated with new facilities.

The facilities associated with CNWR that require maintenance include trails, interpretive panels, regulatory signs, roads, water delivery systems, buildings, docks, and boat launches. Major equipment includes boats, vehicles, tractors, ATVs, and generators. Approximately 10-15 percent of operational (non-project) maintenance funding for the MCRNWRC is expended on CNWR; the other approximately 85-90 percent is used to maintain the majority of facilities, including buildings and equipment, which are located on the other seven MCRNWRC refuges and are not included in this Implementation Plan.

K.2.4 Staffing

Current and proposed staffing are shown in Table K-3. Three positions serve CNWR and all other current positions serve the other refuges within the MCRNWRC; because there is no separate budget for individual refuges, we have chosen to present the entire MCRNWRC staff in Table K-3.

Approximately 10 percent of current MCRNWRC staff time is expended on CNWR, covered under this CCP; the other approximately 90 percent of staff time is expended on the other refuges.

Table K-3. Current positions within MCRNWRC supporting CNWR and proposed staff positions for CNWR.

Staff-Refuge Operations	FTE	Staff Position	Complex Cost	Percent Time on CNWR	CNWR Cost	RONS Number
Project Leader	1	GS-0485-14	140,692	10	14,069	NA
Deputy Project Leader	1	GS-0485-13	115,657	10	11,566	NA
Deputy Project Leader	1	GS-0485-13	119,060	20	23,812	NA
W/L Biologist - LMRD	1	GS-0486-13	119,002	1	1,190	NA
Supervisory W/L Biologist	1	GS-0486-12	95,263	15	14,289	NA
Planner	1	GS-0401-12	108,705	25	27,176	NA
Visitor Services Manager	1	GS-0025-12	94,468	15	14,170	NA
Resource Contaminants Spec.	1	GS-0401-12	102,538	5	5,127	NA
Administrative Officer	1	GS-0341-11	79,129	15	11,869	NA
Park Ranger (VS)	1	GS-0025-11	93,078	5	4,654	NA
Supervisory Park Ranger (LE)	1	GL-0025-11	80,334	VACANT	0	NA
Volunteer Coordinator	1	GS-0485-09	71,011	15	10,652	NA
Park Ranger (LE)	1	GL-0025-09	62,690	50	31,345	NA
Park Ranger (LE)	1	GL-0025-09	63,797	5	3,190	NA
Park Ranger (LE)	1	GL-0025-09	67,579	5	3,379	NA
Budget Technician	1	GS-0561-07	51,980	15	7,797	NA
Office Automation Clerk	1	GS-0303-05	50,770	10	5,077	NA
Office Automation Clerk	1	GS-0303-04	37,909	VACANT	0	NA
Office Automation Clerk	1	GS-0303-03	31,417	VACANT	0	NA
Refuge Manager	1	GS-0485-12	94,402	1	944	NA
Refuge Manager	1	GS-0485-12	89,342	100	89,342	NA
Refuge Manager	1	GS-0485-12	89,342	1	893	NA
W/L Biologist	1	GS-0486-09	76,927	100	76,927	NA
W/L Biologist - Complex	1	GS-0486-09	61,585	10	6,159	NA
W/L Biologist - Toppenish	1	GS-0486-07	48,369	VACANT	0	NA
Engineering Equip. Oper.	1	WG-5716-08	65,799	5	3,290	NA
Engineering Equip. Oper.	1	WG-5716-08	61,120	0	0	NA
Maintenance Worker	1	WG-4749-08	65,799	100	65,799	NA
Engineering Equip. Oper.	1	WG-5716-10	75,185	0	0	NA
Engineering Equip. Oper.	1	WG-5716-10	75,185	5	3,759	NA
Maintenance Worker	1	WG-4749-08	65,799	5	3,290	NA
Engineering Equip. Oper.	1	WG-5716-08	65,799	5	3,290	NA
W/L Refuge Specialist	1	GS-0485-09	67,067	1	671	NA

W/L Refuge Specialist	1	GS-0485-07	48,369	0	0	NA
Park Ranger*	1	GS-0025-5/7/9	61,585	100	61,585	FY08-1907
Park Ranger*	1	GS-0025-05	40,710	100	40,710	FY08-6379
Park Ranger (LE)*	1	GL-0025-09	62,690	100	62,690	TBD
Engineering Equip. Oper.*	1	WG-5716-10	75,185	100	75,185	TBD
Maintenance Worker*	1	WG-4749-06	48,131	100	48,131	FY08-1914
Maintenance Worker*	1	WG-4749-06	48,131	100	48,131	FY08-1913
W/L Biologist*	1	GS-0486-11	74,630	100	74,630	TBD
Biological Science Technician*	1	GS-0404-5/6	45,380	100	45,380	FY08-1912
W/L Refuge Specialist*	1	GS-0485-5/7/9	61,585	100	61,585	FY08-1910
Office Automation Clerk*	1	GS-0303-05	40,710	100	40,710	TBD
Total					**$1,002,463**	

*Additional staffing needs for CNWR

Table K-1 shows a 10 full-time-equivalent (FTE) increase in staffing over current levels. Proposed additions include two in Visitor Services (Park Ranger), one Law Enforcement (Park Ranger), one Engineering Equipment Operator, two Maintenance Workers, one Wildlife Biologist, one Biological Technician, one Wildlife Refuge Specialist, and one Office Automation Clerk.

The two Visitor Services (Park Ranger) positions will be responsible for the environmental education and interpretation programs, as well as other wildlife-dependent recreational activities taking place on CNWR. The environmental education program for CNWR is currently volunteer-run by a few extremely ambitious and dedicated individuals. This program, if supported by a full-time staff member, could provide year-round environmental education to an underserved population within the Columbia Basin. The interpretive and outreach program would be expanded to include bilingual signage and programs, as well as focused expansion of recreational opportunities to more appropriately incorporate the social demographic of the surrounding communities.

The Law Enforcement Officer (Park Ranger) position is needed to help prevent the increase in illegal actions currently taking place on CNWR. Over the last decade there has been an increase in drug trafficking, drug production, vandalism, gang activity, and violent crimes within the surrounding communities and on CNWR. This position will provide active law enforcement for both natural resource and general law enforcement issues currently on the Refuge.

With a backlog of over 20 million dollars in deferred maintenance, the two additional Maintenance Workers and the Engineering Equipment Operator will help decrease the maintenance backlog, providing habitat management support (i.e., spraying of invasive species) and restoration activities (i.e., Lower Crab Creek channel reconstruction). These positions will help prevent additional facilities and assets from falling into disrepair and thus further increasing the maintenance backlog.

The two Biology positions will fill out the biological staff to conduct inventory and monitoring, research, and surveys to fully assess the biological capacity of CNWR. These positions will support the outlined needs in Goal 4 to further the management of CNWR, both as a Refuge and in a larger scope as part of the Great Northern Landscape Conservation Cooperative.

The Wildlife Refuge Specialist and Office Automation Clerk will provide administrative support for all aspects relating to the management of CNWR. The Wildlife Refuge Specialist will work on

additional habitat and restoration needs, as well as complete the step-down plans enumerated in the next section.

K.2.5 Budget Summary

Table K-4 summarizes the data from Tables K-1 and K-2.

Table K-4. Budget Summary – One-time projects and annual funding needs for CNWR as identified in the CCP.

Activity Description	One-Time Costs	Recurring
Surveys and Scientific Assessments	$80,000	$145,000
Inventory and Monitory Activities	$70,000	$95,000
Research	$270,000	$66,000
Habitat Management and Restoration	$2,050,000	$252,000
Regulatory and Enforcement Actions	$700,000	$97,168
Public Use Opportunities and Education	$1,046,510	$127,295
Facilities Maintenance	$1,041,673	$220,000
Total Costs	$5,258,183	$1,002,463

K.3 Step-Down Plans

Step-down plans are prepared when they are required by Service policy or when they are needed to provide additional details to implement the CCP. The following table identifies step-down plans, their status, and relationship to this CCP.

Step-down Plan	Status
Inventory and Monitoring Plan (IMP)	Within five year of CCP approval
Visitor Services Plan	Within six years of CCP approval
Fire Management Plan	Current as Complex Plan
Cultural Resources Management Plan	Within six years of CCP approval
Fishery Resources Management Plan (Fishing and Fish Stocking)	Within one year of CCP approval
Safety Plan	Current - Updated annually
Habitat Management Plan	Within five years of CCP approval
Hunting Plan	Within five years of CCP approval
Landscape Design Standards/Aesthetics Plan	Within ten years of CCP approval
Law Enforcement and Emergency Response Plan	Within seven years of CCP approval
Mosquito Management Plan	Within three years of CCP approval
Land Protection Plan	Within five years of CCP approval

U.S. Department of the Interior
U.S. Fish & Wildlife Service
Columbia National Wildlife Refuge
64 Maple Street
Burbank, WA 99323

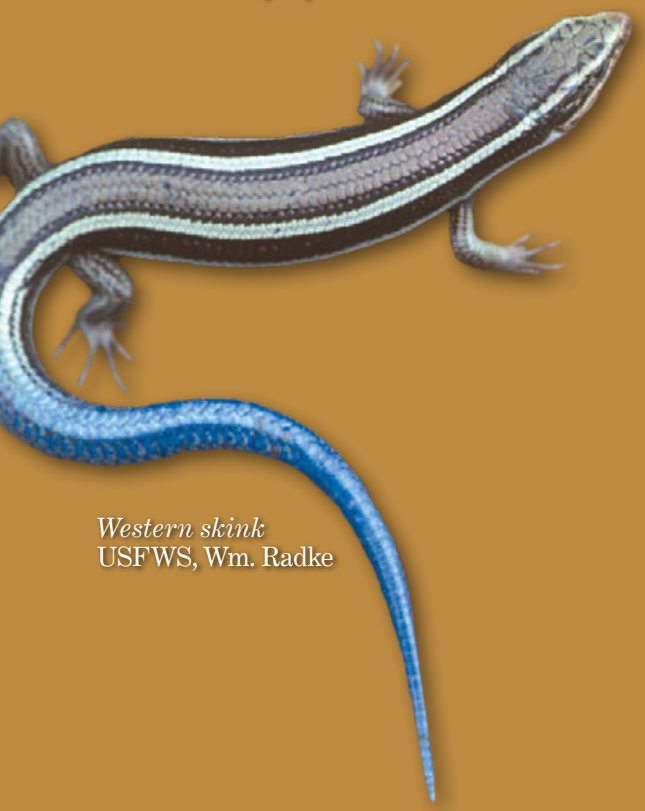
Phone: 509/546-8300
Fax: 509/546-8303
E-Mail: mcriver@fws.gov

http://www.fws.gov/columbia

National Wildlife Refuge System Information
1 800/344 WILD

September 2011

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



Western skink
USFWS, Wm. Radke

Cover Image:
Ferruginous hawk chick
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