U.S. Fish & Wildlife Service

Kootenai National Wildlife Refuge

Draft Comprehensive Conservation Plan and Environmental Assessment

A Vision of Conservation

In a bend of the Kootenai River, nestled in a glacial valley flanked by Idaho's Selkirk Mountain Range to the west and the Purcells to the east, lies the Kootenai National Wildlife Refuge. For thousands of years, spring floods of the Kootenai River inundated the valley floor, creating the largest complex of wetlands and floodplain forests in the State of Idaho. Multitudes of ducks, geese, and swans passed through this natural funnel as they migrated between nesting areas in Canada and wintering grounds to the south.

During the 1920s, wetlands were drained to make way for farms, and dikes were built to hold back the floodwaters. In 1964, Kootenai NWR was established to restore a small remnant of the once-vast wetlands--a vital link between protected habitats in Canada and the U.S. Tens of thousands of ducks, geese and swans visit Refuge wetlands, now managed to mimic the natural cycles of flooding and drying. Croplands complement the productivity of wetland habitats and sanctuary areas ensure that waterfowl can feed and rest undisturbed. When the winter snows blanket the land, deer and elk descend from the mountains to find food and shelter here.Spring brings not only waterfowl, but songbirds that nest in the Refuge's forests and grasslands.

The Refuge also provides a respite for people, where visitors of all ages and abilities can experience nature directly, and develop an appreciation for the unique natural character of the Kootenai River Valley.

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.

Mature and immature bald eagles
©Stan Bousson

Kootenai
National Wildlife Refuge

Draft Comprehensive Conservation Plan
and
Environmental Assessment

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USFWS

Chapter 1 Introduction and Background

Chapter 1. Introduction and Background

1.1 Introduction

Nestled in a glacial valley, flanked on the west by the Selkirk Mountains and on the east by the Purcell Range, lies the Kootenai River. For thousands of years, spring floods of the Kootenai River inundated the valley floor, creating a mixture of floodplain forests, river meanders, old oxbows, and wet meadows—the largest wetland complex in what would eventually become the State of Idaho. The river also laid down rich soils that would later attract farmers to the region.

The Kootenai River and its tributaries teemed with white sturgeon, burbot, kokanee, redband trout, cutthroat trout, and bull trout. In spring and fall, multitudes of ducks, geese, and swans passed through the valley as they migrated between nesting areas in Canada and wintering grounds to the south. In winter, the valley provided food and shelter for deer, elk, and moose. This was the ancestral home of the Kootenai (Ktunaxa) people. They were a "river people" who gained much of the livelihood from the valley's abundant fish and waterfowl. Their material culture, from their fish traps and weirs to their unique sturgeon-nosed bark canoes, reflected their focus on wetland and river resources.

David Thompson's 1808 expedition marked the first Euro-American incursion into the region, but the valley changed little until the discovery of gold in Canada increased traffic through the area on the Wildhorse Trail. As the mines played out, northern Idaho became known for its vast timber resources, attracting large timber interests from the East. As the easily accessible timber was cut over, farms and ranches appeared in the fertile river valley and its surrounding benchlands.

Beginning in 1921, 47 miles of the Kootenai River, and many of its tributaries, were diked in order to drain the bottomland for agriculture. In 1925, the area that would one day become a national wildlife refuge was established as Drainage District # 7. By 1947, farming dominated the fertile river valley and 95 percent of the original wetlands had been lost. The huge flocks of waterfowl that once darkened the skies became a distant memory.

In the early 1960s, the Migratory Bird Conservation Commission (MBCC) realized that there was "a pressing need for the restoration of waterfowl habitat in this part of the Pacific Flyway." The MBCC noted that waterfowl "generally pass over the Kootenai Valley for lack of resting or feeding areas." So, on June 24, 1964, the MBCC authorized the acquisition of land to create Kootenai National Wildlife Refuge.

Until 1972 when the Libby Dam in Montana became operational, the Kootenai River rose dramatically in June, with snowmelt rushing down from the mountains. Despite the dike building projects along the river, spring floods remained a threat to the valley farmers. Libby Dam construction eliminated the spring floods and removed the bottomlands from the influence of the river. Today, only remnants of the diverse floodplain habitats that once covered the Kootenai River Valley remain.

The U.S. Fish and Wildlife Service manages Kootenai NWR habitats in a highly altered ecosystem. Thousands of ducks, geese, and swans visit Refuge wetlands, now managed to partially mimic the natural cycles of flooding and drying. Croplands complement the productivity of wetland habitats and sanctuary areas ensure that waterfowl can feed and rest undisturbed. When the winter snows blanket the land, elk descend from the mountains to find food and shelter here. Spring brings not only waterfowl, but songbirds that nest in the Refuge's forests and grasslands. The Refuge is also a place where people can share a bond with nature, and each other by passing on outdoor traditions to new generations. As the population of the region increases, the Refuge will become even more important to wildlife and those seeking to connect with nature.

The Kootenai NWR's boundary encompasses 2,774.29 acres of Kootenai River bottomlands and uplands in Boundary County, Idaho (see Maps 1 and 2). The Kootenai National Wildlife Refuge is part of the Inland Northwest National Wildlife Refuge Complex, which also includes Turnbull and Little Pend Oreille National Wildlife Refuges, both located in Washington State.

1.2 Proposed Action

We, the U.S. Fish and Wildlife Service (Service), manage the Kootenai NWR as part of the National Wildlife Refuge System. This document is the Refuge's Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA). A CCP sets forth management guidance for a refuge for a period of 15 years, as required by the National Wildlife Refuge System Administration Act (16 U.S.C. 668dd et seq.) as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). The Administration Act requires CCPs to identify and describe:

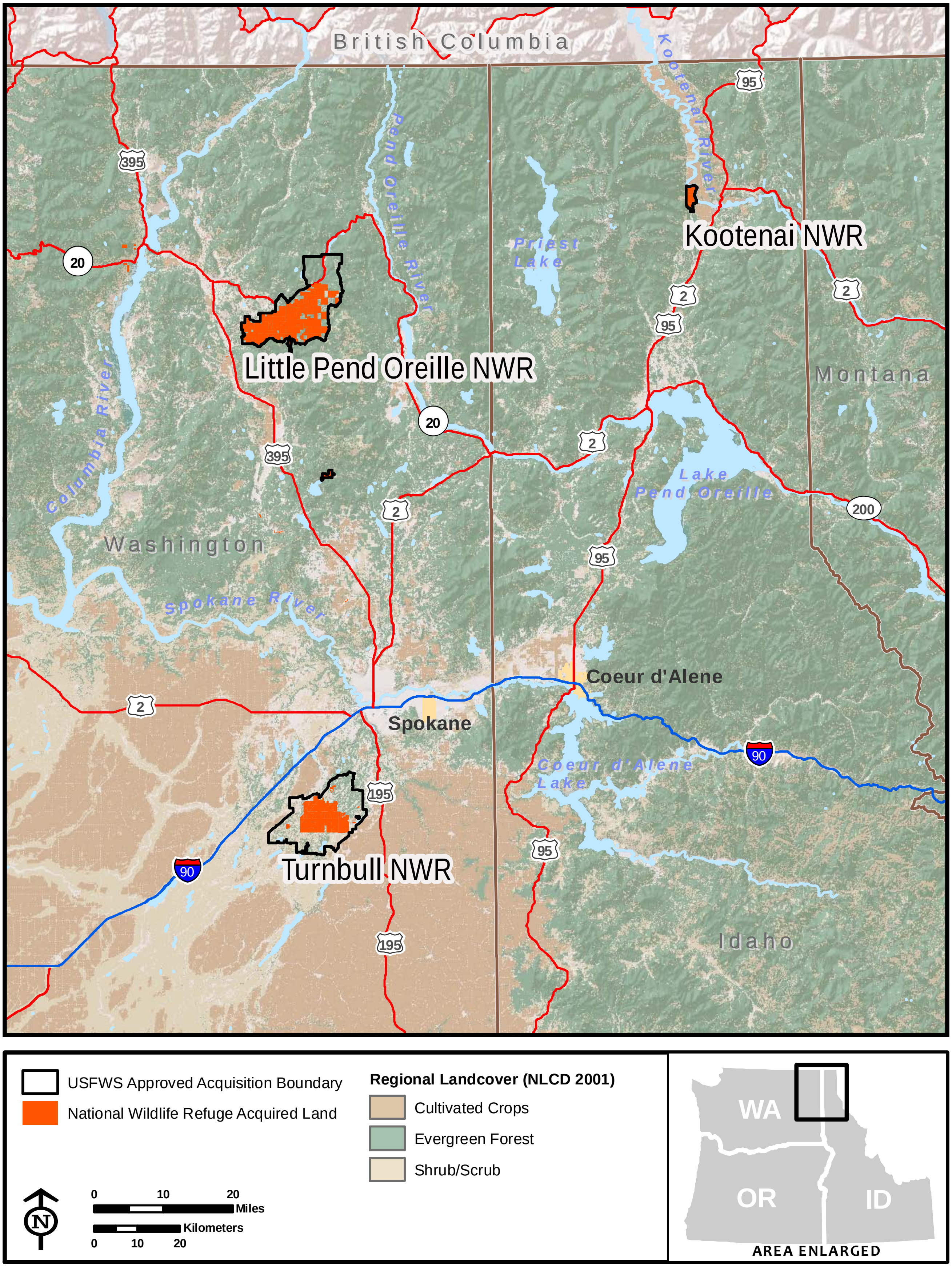
- The purposes of the refuge;
- The fish, wildlife and plant populations, their habitats, and the archaeological and cultural values found on the refuge;
- Significant problems that may adversely affect wildlife populations and habitats and ways to correct or mitigate those problems;
- Areas suitable for administrative sites or visitor facilities; and
- Opportunities for fish- and wildlife-dependent recreation.

National Wildlife Refuge System (Refuge System) planning policy (Service Manual Part 602, 602 FW 3, June 21, 2000) states that the purpose of CCPs is to: "describe the desired future conditions of a refuge and provide long-range guidance and management direction to achieve refuge purposes; help fulfill the National Wildlife Refuge System mission; maintain and, where appropriate, restore the ecological integrity of each refuge and the Refuge System; . . . and meet other mandates."

The Service has developed and examined alternatives for future management of Kootenai NWR through the CCP process. The various alternatives address the major issues and relevant mandates identified during the process and are consistent with the principles of sound fish and wildlife management. We evaluated three alternatives for the Refuge's Draft CCP/EA and selected Alternative 2 as the preferred alternative.

The draft preferred alternative represents the most balanced approach for: Achieving the Refuge's purposes, vision, and goals; contributing to the Refuge System's mission; addressing relevant issues and mandates; and managing the Refuge consistent with the sound principles of fish and wildlife management. However, the draft preferred alternative may be modified between the draft and final documents depending upon comments received from the public or other agencies and organizations. The Service's Pacific Region Regional Director will make the final decision of which alternative will be implemented. For details on the specific components and actions comprising the range of alternatives, see Chapter 2.

Map 1 ***Inland Northwest National Wildlife Refuge Complex***



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Data Source: ESRI StreetMap North America, ShadedRelief_World_2D

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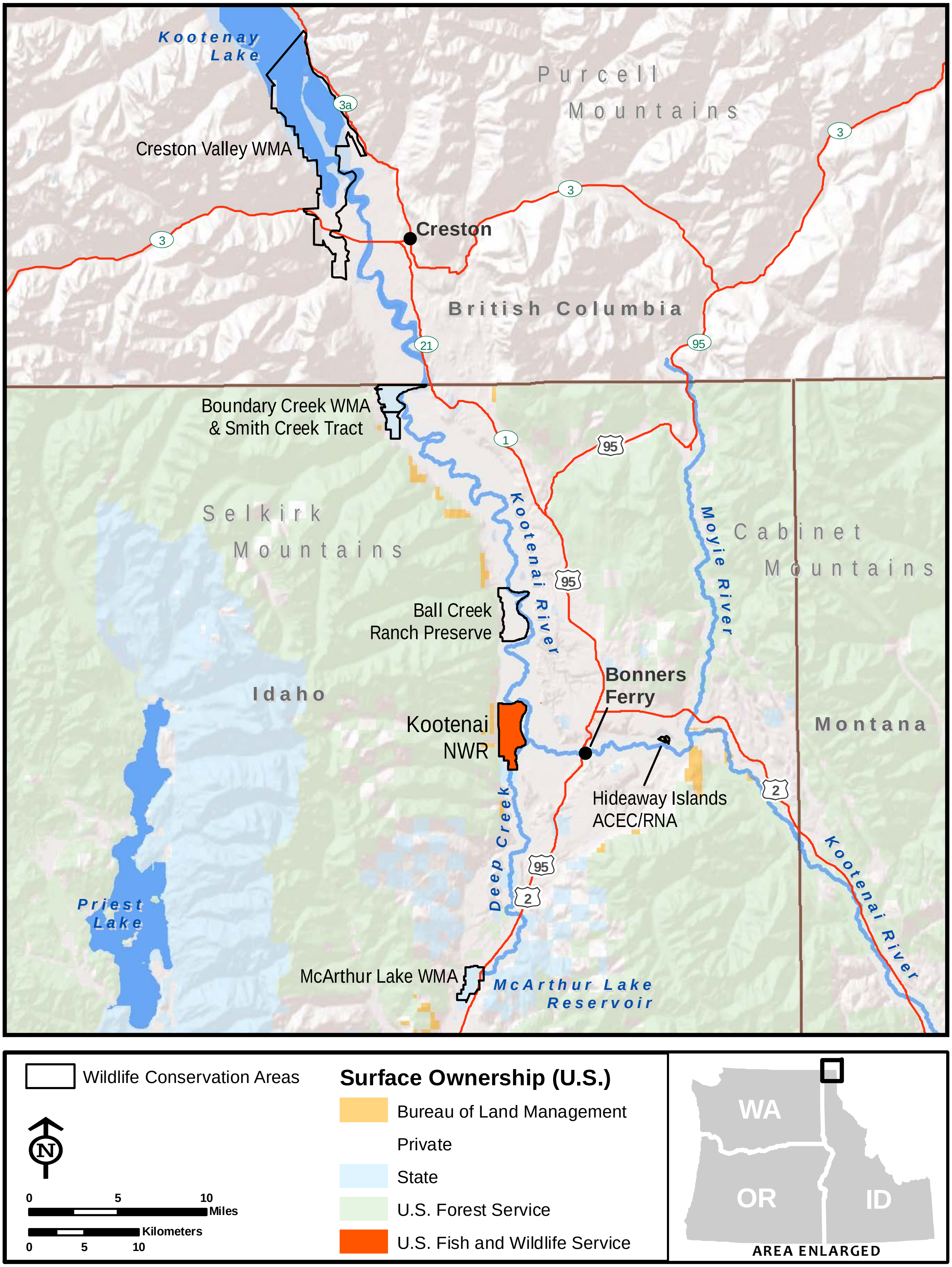
Map 2 *Kootenai National Wildlife Refuge and Vicinity*



Map Date: 7/9/2011 File: 11-071-8.mxd
Data Source: ESRI StreetMap North America, ShadedRelief_World_2D, BLM Surface Ownership

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1.3 Purpose and Need for the CCP

The purpose of the CCP is to provide the Service, the Refuge System, partners, and the public with a 15-year management plan for improving the Refuge's habitat conditions and infrastructure, for fish, wildlife, and public use. An approved CCP will ensure that the Service manages the refuge to achieve its purposes, vision, goals, and objectives; and help fulfill the mission of the Refuge System.

The CCP will provide reasonable, scientifically grounded guidance for the long-term conservation of native plants and animals, with emphasis on migratory birds and improving the Refuge's wetland, grassland, riparian, and forest habitats. The CCP will identify appropriate actions for protecting and sustaining the biological features of the refuge; migrating and breeding waterfowl and their habitats; the migratory landbird and waterbird populations that use the refuge; and threatened, endangered, or rare species. A final purpose of the CCP is to provide guidance and evaluate the priority public use programs on the refuge, including hunting, fishing, wildlife observation, photography, environmental education, and interpretation.

The CCP is needed for a variety of reasons. Primary among these is the need to provide migration habitat for waterfowl in the Kootenai River Valley. There is a need to improve habitat conditions on the Refuge's wetland, grassland, riparian, and forest habitats to improve productivity and species diversity, and control invasive species. There is a need to address the Refuge's contributions to the recovery of Federal and State listed species native to the lower Kootenai River and northern Idaho, including the bull trout and the Kootenai River white sturgeon. There is also the need to protect and restore habitat values for other sensitive, rare, and declining species of the Kootenai River Valley.

There is a need to analyze Refuge public use programs for the Refuge System's wildlife-dependent priority public uses and to determine what improvements or alterations should be made in the pursuit of compatible, higher quality programs, and to accommodate increasing numbers of visitors while providing for the needs of wildlife.

1.4 Content and Scope of the CCP

This Draft CCP/EA provides guidance for management of refuge habitats and wildlife and administration of public uses on refuge lands and waters. This Draft CCP/EA is intended to comply with both the Refuge System Administration Act and the National Environmental Policy Act (NEPA), as amended (42 U.S.C. 4321-4347). The Draft CCP/EA includes the following information.

- An overall vision for the refuge and its role in the local ecosystem (Chapter 1).
- Goals and objectives for specific habitats, research, inventory, monitoring, and public use programs, as well as strategies for achieving the objectives (Chapter 2).
- A description of the Refuge's physical environment (Chapter 3).
- A description of the Refuge's wildlife species and species groups identified as priority resources of concern and their habitats; their condition and trends on the refuge and within the local ecosystem; the desired ecological conditions for sustaining them, and a short analysis of threats to resources of concern and their habitats (Chapter 4).
- A description of the Refuge's administrative and public use facilities, and public use programs (Chapter 5).

- A description of the Refuge's historic and cultural resources, socioeconomic environment, and special designation areas (Chapter 6).
- An analysis of the effects of the proposed action as compared to current management, including cumulative effects (Chapter 7).
- Evaluations of existing and proposed public uses for appropriateness and compatibility with the Refuge's purposes (Appendices A and B).
- An outline of the projects, staff and facilities needed to support the alternatives considered (Appendix C).

1.5 Refuge Planning and Management Guidance

The refuge is managed as part of the Refuge System within a framework provided by legal and policy guidelines. This Draft CCP/EA is primarily guided by the provisions of the mission and goals of the Refuge System, the purposes of the refuge as described in its acquisition authority, Service policy, and Federal laws. The following summaries are provided as background for the Draft CCP/EA.

1.5.1 The U.S. Fish and Wildlife Service

The refuge is managed by the Service, an agency within the Department of the Interior. The Service is the principal Federal agency responsible for conserving, protecting, and enhancing the Nation's fish and wildlife populations, and their habitats.

The mission of the Service is "working with others, to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people." Although we share this responsibility with other Federal, state, tribal, local, and private entities, the Service has specific trust responsibilities for migratory birds, endangered and threatened species, and certain anadromous fish and marine mammals. The Service has similar trust responsibilities for the lands and waters we administer to support the conservation and enhancement of fish, wildlife, plants, and their habitats. The Service also enforces Federal wildlife laws and international treaties for importing and exporting wildlife, assists with state fish and wildlife programs, and helps other countries develop wildlife conservation programs.

1.5.2 National Wildlife Refuge System

The Service manages the 150-million acre Refuge System. The Refuge System is the world's largest network of public lands and waters set aside specifically for conserving wildlife and protecting ecosystems. From its inception in 1903, the Refuge System has grown to encompass more than 550 national wildlife refuges; thousands of small wetlands and other special management areas; and millions of acres of islands and their surrounding marine environments in remote areas of the Pacific Ocean. The needs of wildlife and their habitats come first on refuges, in contrast to other public lands that are managed for multiple uses.

National Wildlife Refuge System mission and goals. The mission of the Refuge System is:

> "to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of

> present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended)(16 U.S.C. 668dd et seq.)

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

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

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

Key concepts and guidance of the Refuge System derive from the National Wildlife Refuge System Administration Act of 1966 (Administration Act) as amended (16 U.S.C. 668dd-668ee); the Refuge Recreation Act of 1962 as amended (16 U.S.C. 460k-460k-4); Title 50 of the Code of Federal Regulations; and the Service Manual. The Administration Act is implemented through regulations covering the Refuge System, 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 Refuge System.

Many other laws apply to the U.S. Fish and Wildlife Service and management of Refuge System lands. Examples include the Endangered Species Act of 1973, as amended, and the National Historic Preservation Act of 1966, as amended. Brief descriptions of laws pertinent to Kootenai NWR are included in this chapter. A complete list of laws pertaining to the Fish and Wildlife Service and the Refuge System can be found at http://laws.fws.gov.

Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4). The Refuge Recreation Act authorized the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use, when such uses do not interfere with the area's primary purposes. It provided for public use fees and permits, and penalties for violating regulations. It also authorized the acceptance of donated funds and real and personal property, to assist in carrying out its purposes. Enforcement provisions were amended in 1978 and 1984 to make violations misdemeanors in accordance with the uniform sentencing provisions of 18 U.S.C. 3551-3586.

National Wildlife Refuge System Administration Act (16 U.S.C. 668dd et seq.) as amended by the National Wildlife Refuge System Improvement Act (Public Law 105-57). Of all the laws governing activities on national wildlife refuges, the Refuge Administration Act exerts the greatest influence. The National Wildlife Refuge System Improvement Act of 1997 (Refuge Improvement Act) amended the Administration Act by defining a unifying mission for all refuges, including a new process for determining compatible uses on refuges, and requiring that each refuge be managed under a comprehensive conservation plan. Key provisions of the Refuge Administration Act follow.

- *Comprehensive conservation planning.* A CCP must be completed for each refuge by the year 2012, as is required by the Refuge Administration Act. Each CCP will be revised every 15 years or earlier if monitoring and evaluation determine that changes are needed to achieve the Refuge's purposes, vision, goals, or objectives. The Refuge Administration Act also requires that CCPs be developed with the participation of the public. Public comments, issues, and concerns are considered during the development of a CCP, and together, with the formal guidance, can play a role in selecting the preferred alternative. The CCP provides guidance in the form of goals, objectives, and strategies for refuge programs, but may lack some of the specifics needed for implementation. Therefore, step-down management plans will be developed for individual program areas as needed, following completion of the CCP. The step-down plans are founded on management goals, objectives and strategies outlined in a CCP, and require appropriate NEPA compliance.

- *Wildlife conservation; biological diversity, integrity and environmental health.* The Refuge Administration Act expressly states that the conservation of fish, wildlife and plants, and their habitats is the priority of Refuge System lands, and that the Secretary of the Interior shall ensure that the biological integrity, diversity, and environmental health of refuge lands are maintained. House Report 105–106 accompanying the Improvement Act states "… the fundamental mission of our System is wildlife conservation: wildlife and wildlife conservation must come first."

- *Refuge purposes.* Each refuge must be managed to fulfill the Refuge System mission and the specific purpose(s) for which the refuge was established. The purposes of a refuge are specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit. When a conflict exists between the Refuge System mission and the purpose of an individual refuge, the refuge purpose may supersede the mission.

- *Priority public uses on refuges.* The Administration Act superseded some key provisions of the Refuge Recreation Act regarding compatibility, and also provided significant additional guidance regarding recreational and other public uses on units of the Refuge System. The Refuge Administration Act identifies six priority wildlife-dependent recreational uses. These uses are hunting, fishing, wildlife observation and photography, and environmental education and interpretation. The Service is to grant these six wildlife-dependent public uses special consideration during planning for, management of, and establishment and expansion of units of the Refuge System. When determined compatible on a refuge-specific basis, these six uses assume priority status among all uses of the refuge in question. The Service is to make extra efforts to facilitate priority wildlife-dependent public use opportunities.

Compatibility and Appropriate Refuge Uses policies (603 FW 2 and 1). With few exceptions, lands and waters within the Refuge System are different from multiple-use public lands in that they are closed to all public access and use unless specifically and legally opened. No refuge use may be allowed or continued unless it is determined to be appropriate and compatible. Generally, an appropriate use is one that contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan. A compatible use is a use that in the sound professional judgment of the refuge manager will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge.

The six wildlife-dependent recreational uses described in the Refuge Administration Act (hunting, fishing, wildlife observation and photography, and environmental education and interpretation) are defined as appropriate. When determined to be compatible, they receive priority consideration over other public uses in planning and management. Other nonwildlife-dependent uses on a refuge are reviewed by the refuge manager to determine if the uses are appropriate. If a use is determined appropriate, then a compatibility determination is completed.

When preparing a CCP, refuge managers must re-evaluate all general public, recreational, and economic uses (even those occurring to further refuge habitat management goals) occurring or proposed on a refuge for appropriateness and compatibility. Updated appropriate use and compatibility determinations for existing and proposed uses for the Kootenai NWR are in Appendices A (Appropriateness) and B (Compatibility) of this Draft CCP/EA.

Biological Integrity, Diversity, and Environmental Health policy (601 FW 3). The Refuge Administration Act directs the Service to "ensure that the biological integrity, diversity, and environmental health of the National Wildlife Refuge System are maintained for the benefit of present and future generations of Americans …" The policy is an additional directive for refuge managers to follow while achieving refuge purpose(s) and the Refuge System mission. It provides for the consideration and protection of a broad spectrum of native fish, wildlife, and habitat resources found on refuges and associated ecosystems. When evaluating the appropriate management direction for refuges (e.g., in compatibility determinations), refuge managers will use sound professional judgment to determine their refuge's contribution to biological integrity, diversity, and environmental health at multiple landscape scales. Sound professional judgment incorporates field experience, knowledge of refuge resources, an understanding of the refuge's role within an ecosystem, applicable laws, and best available science, including consultation with others both inside and outside the Service. The policy states that "the highest measure of biological integrity, diversity, and environmental health is viewed as those intact and self-sustaining habitats and wildlife populations that existed during historic conditions."

Wildlife-dependent Recreation policies (605 FW 1-7). The Refuge Administration Act states that "compatible wildlife-dependent recreation is a legitimate and appropriate general public use of the System." A series of recreation policies provide additional guidance and requirements to consider after a recreational use has been determined to be compatible. These policies also establish a quality standard for visitor services on national wildlife refuges. Through these policies, we are to simultaneously enhance wildlife-dependent recreational opportunities, provide access to quality visitor experiences, and manage refuge resources to conserve fish, wildlife, plants, and their habitats. New and ongoing recreational uses should help visitors focus on wildlife and other natural resources, and provide an opportunity to display resource issues, management plans, and how the refuge contributes to the Refuge System and the Service's mission. The policies also require development of a visitor services plan.

1.5.3 Biological Resource Protection Acts

The Refuge's plant and animal species are protected under several Federal laws, including the following.

Endangered Species Act of 1973 (16 U.S.C. 1531-1544). Through Federal action and by encouraging the establishment of State programs, the 1973 Endangered Species Act (ESA) provided for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend. The ESA:

- Authorizes the determination and listing of species as endangered and threatened;
- Prohibits unauthorized taking, possession, sale, and transport of endangered species;
- Provides authority to acquire land for the conservation of listed species, using land and water conservation funds;
- Authorizes establishment of cooperative agreements and grants-in-aid to States that establish and maintain active and adequate programs for endangered and threatened wildlife and plants;
- Authorizes the assessment of civil and criminal penalties for violating the act or regulations; and
- Authorizes the payment of rewards to anyone furnishing information leading to arrest and conviction for any violation of the act or any regulation issued there under.

Both the Service and the National Marine Fisheries Service (NMFS) implement and enforce the ESA. The Service has primary responsibility for terrestrial and freshwater organisms, while NMFS has jurisdiction over most marine and anadromous fish listed under the ESA. Under the ESA, the Service has primary responsibility for the Kootenai River white sturgeon and bull trout. Listed species and species of concern found on the Refuge are described in section 1.7.5 of this chapter and in Chapter 4, Section 4.9.

Section 7 of the ESA requires Federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of listed species, or modify critical habitat. The Service will consult internally regarding potential impacts of projects on listed species found within the refuge. For candidate species and species of concern, refuge management activities are focused on protecting habitat and reducing threats so that these species do not need the protection of the ESA.

Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712). The framers of the Migratory Bird Treaty Act were determined to put an end to the commercial trade in birds, and their feathers, that by the early years of the 20th century had wreaked havoc on the populations of many native bird species. The Migratory Bird Treaty Act decreed that all migratory birds and their parts (including eggs, nests, and feathers) were fully protected. It is the domestic law that affirms or implements the United States' commitment to four international conventions (with Canada, Japan, Mexico, and Russia) for the protection of a shared migratory bird resource. Each of the conventions between two nations protect selected species of birds that are common to both countries (i.e., they occur in both countries at some point during their annual life cycle). All of the Refuge's bird species are protected under this act, with the exception of nonnative species (European starling, house sparrow, and rock dove).

1.5.4 Historic Preservation Acts

The Refuge's historic resources are protected under several Federal laws, including:

- Archaeological Resources Protection Act of 1979, as amended (16 U.S.C. 470aa-470ll).
- Archeological and Historic Preservation Act of 1960, as amended (16 U.S.C. 469-469c).
- Historic Sites, Buildings and Antiquities Act of 1935 (16 U.S.C. 461-462, 464-467). National Historic Preservation Act of 1966 (16 U.S.C. 470-470b, 470c-470n).
- Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001-13)
- Executive Order 11593 Protection and Enhancement of the Cultural Environment. (May 6, 1971)

1.6 Refuge Establishment and Refuge Purposes

1.6.1 Refuge Purpose

The Refuge Administration Act directs the Service to manage refuges to achieve their purposes. The purposes for which a refuge is established form the foundation for planning and management decisions. Refuge purposes are the driving force in the development of the refuge vision statements, goals, objectives, and strategies in a CCP and are critical to determining the compatibility of existing and proposed refuge uses.

The purposes of a refuge are specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit. Unless these documents indicate otherwise, purposes dealing with the conservation, management, and restoration of fish, wildlife, and plants, and the habitats on which they depend take precedence over other purposes in the management and administration of any unit.

Where a refuge has multiple purposes related to fish, wildlife, and plant conservation, the more specific purpose will take precedence in instances of conflict. When an additional unit is acquired under an authority different from the authority used to establish the original unit, the addition takes on the purpose(s) of the original unit, but the original unit does not take on the purpose(s) of the newer addition. When a conflict exists between the Refuge System mission and the purpose of an individual refuge, the refuge purpose may supersede the mission.

On June 24, 1964 the MBCC approved 2,767.21 acres for acquisition under the funding authority of the Migratory Bird Conservation Act (MBCA) of 1929 (45 Stat. 1222), as amended, to create the Kootenai National Wildlife Refuge (Map 3). Refuge establishment was authorized by Section 5 of the Migratory Bird Conservation Act of February 18, 1929 (16 U.S.C. 715-715d, 715e, 715f-715r, as amended) (45 Stat. 1222), and Section 6 of the Act as amended by the Migratory Bird Hunting and Conservation Stamp Act of March 16, 1934 (16 U.S.C. 718-718h, as amended), (48 Stat. 451, as amended), and the Section 301 of the Act of June 15, 1935 (49 Stat. 381). Section 5 of the MBCA was amended by the Fish and Wildlife Improvement Act of 1978 (92 Stat. 3110). The Migratory Bird Conservation Act (MBCA) established the Refuge purpose: "for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." This purpose applies to all units of the Refuge, which were acquired using Migratory Bird Conservation funds under the authority of the MBCA.

The Service also has a conservation easement for 0.14 acres along the Kootenai River (Easement No. 4973) from the State of Idaho. This lease is authorized by the Fish and Wildlife Act of 1956 "… for the development, advancement, management, conservation, and protection of fish and wildlife resources …" (16 U.S.C. 742a-742j, as amended). This purpose applies only to the conservation easement, and not other Refuge units.

1.6.2 Refuge Acquisition History and Management Direction

Biological Ascertainment Reports were completed in 1961 and 1963. On December 10, 1963, the Regional Land Review Committee approved 2,050 acres of farmland in the Kootenai River Valley for acquisition, noting that "The restoration of habitat in this area completes a link of the Pacific Flyway, between Canadian breeding grounds, the Turnbull National Wildlife Refuge, and the Columbia River Basin in the State of Washington."

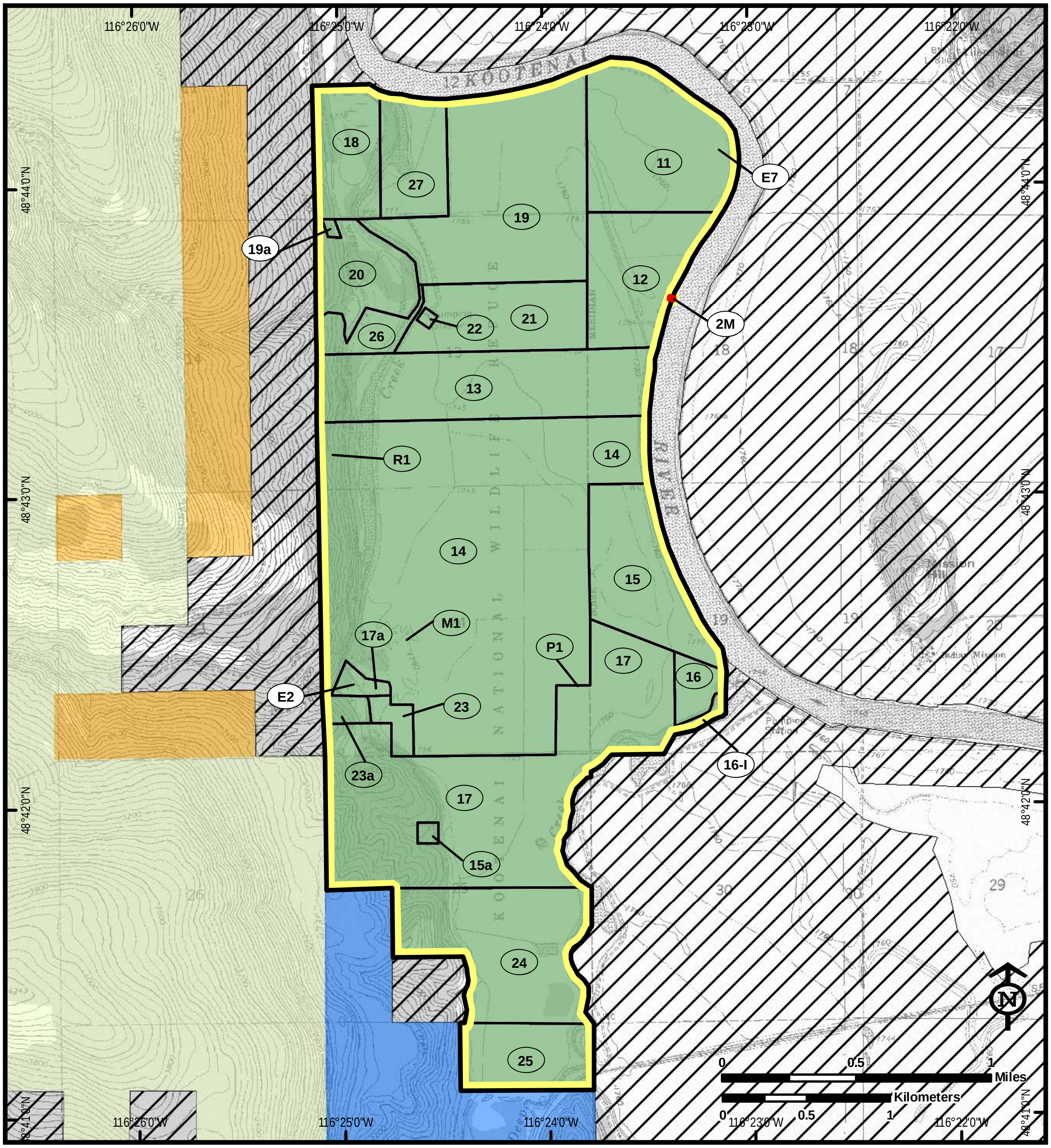
The Migratory Bird Conservation Commission (MBCC) authorized the Kootenai NWR on June 24, 1964 (MBCC Memorandum #6). In the presentation before the MBCC, the justification for establishing Kootenai NWR was "… *a pressing need for the restoration of waterfowl habitat in this part of the Pacific Flyway to increase nesting habitat*, *provide feeding and resting areas during migration*, and to *facilitate waterfowl management techniques in crop protection*."

Management and development proposed in the MBCC memo also gives some insight into the intent of the MBCC, in terms of management for particular species. Managed pastures were specifically to benefit Canada geese and "some ducks" (not specified). Management for specific plants typical of shallow, seasonal wetlands and cereal grains indicates a strong emphasis on providing migration habitat for dabbling ducks and Canada geese, as well reducing depredation on neighboring farms. It is also clear from the memo that the MBCC envisioned providing habitat for duck and goose production. This is consistent with a letter from Noble E. Buell, Chairman, Land Acquisition Advisory Committee, to Director of Bureau of Sport Fisheries and Wildlife, April 1, 1964, which stated that the Kootenai NWR "will be used primarily for waterfowl breeding with the development of 900 acres of marsh and open potholes." (However, in the final justification, which appeared in the MBCC memo, there was a more balanced emphasis between providing migration and breeding habitat.) It also appears that there was an intention to provide increased hunting opportunities since it was noted that currently such opportunities were limited in the area.

A management plan published shortly after Refuge establishment states that the Refuge would primarily be managed for mallards, pintail, green-winged teal, American wigeon, wood ducks, Canada geese (Western Canada geese would use the Refuge for nesting), with "lesser use by white-fronted and snow geese." A number of waterbirds, shorebirds, landbirds, upland game birds, big game species and fish were expected to receive "incidental benefits" from waterfowl management.

The first 117.19 acres of the Refuge were purchased from Arthur W. Hart in accordance with the Migratory Bird Conservation Act (Warranty Deed, August 31, 1964). The remaining Refuge tracts were authorized by the same act and purchased from 1965 to1985 with funds authorized by the Migratory Bird Conservation Act (see Table 1.1).

Map 3 ***Land Status and Refuge Tract Numbers***



Land Ownership

- USFWS Approved Acquisition Boundary
- USFWS Owned Tracts
- USFWS Easement
- Bureau of Land Management
- U.S. Forest Service
- State
- Private

Map Date: 7/6/2011 File: 11-071-9.mxd
Data Source: BLM Ownership, USDA National Agriculture Imagery Program 2009

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Table 1.1. Kootenai NWR Acquisition History and Land Status Summary.

Tract No	Date acquired	Acres	Interest	Acquisition authority	Funding authority	Additional Information
12	8/31/64	117.19	Fee	MBCA	MBCF	Warranty deed executed and filed August 31, 1964.
14	3/12/65	764.44	Fee	MBCA	MBCF	Warranty deed executed Feb 23, 1965 and filed March 12, 1965.
23	3/18/65	15.29	Fee	MBCA	MBCF	Warranty deed executed March 12, 1965 and filed March 18, 1965.
13	3/22/65	201.8	Fee	MBCA	MBCF	Warranty deed executed March 1 1965 and filed March 22, 1965. Includes no water rights.
17a	3/29/65	7.39	Fee	MBCA	MBCF	Warranty deed executed and filed March 29, 1965.
17		432.7	Fee	MBCA	MBCF	
19a	3/29/65	1.89	Fee	MBCA	MBCF	Warranty deed executed and filed March 29, 1965.
19		254.12	Fee	MBCA	MBCF	
24	4/21/65	187.0	Fee	MBCA	MBCF	Warranty deed executed March 19, 1965 and filed April 21, 1965.
20	4/22/65	75.21	Fee	MBCA	MBCF	Warranty deed executed April 15, 1965 and filed April 22, 1965.
21	4/22/65	109.9	Fee	MBCA	MBCF	Warranty deed executed April 10, 1965 and filed April 22, 1965.
15a	5/25/65	3.67	Fee	MBCA	MBCF	Warranty deed executed May 5, 1965 and filed May 25, 1965.
15		126.6	Fee	MBCA	MBCF	
16-I	9/7/65	6.63	Fee	MBCA	MBCF	Warranty deed executed and filed Sept 7, 1965.
16		22.57	Fee	MBCA	MBCF	
25	9/23/65	80.0	Fee	MBCA	MBCF	Warranty deed executed Sept. 7, 1965 and filed Sept. 23, 1965.
26	9/23/65	26.94	Fee	MBCA	MBCF	Warranty deed July 27, 1965 and filed Sept. 23, 1965.
18	9/29/65	79.88	Fee	MBCA	MBCF	Warranty deed executed Jan 14, 1965 and filed August 25, 1965. Indian Land Deed to US approved by BIA August 24, 1965 and filed Sept 29, 1965. (Tract 18 was originally the Ann Temo Indian allotment #52 dated Oct 12, 1908.)_
27	9/29/65	72.06	Fee	MBCA	MBCF	Tract 27 was part of original Tract 18, which was discovered to have 2 ownerships after MBCC approval. (Tract 27 was the original Moshell Temo Indian allotment #53 dated Oct 12, 1908.) Tract 27 assigned to 2nd ownership. Indian Land Deed to US approved by BIA August 24, 1965 and filed Sept 29, 1965. Warranty deed executed Dec 23, 1964 and filed Sept 29, 1965.

Tract No	Date acquired	Acres	Interest	Acquisition authority	Funding authority	Additional Information
11	5/25/66	176.69	Fee	MBCA	MBCF	Acquired through condemnation. Judgment on Declaration of Taking filed 5/25/66. Purpose: "to preserve the waterfowl resource and more effectively carry out the purpose of the Act of February 18, 1929, and for such other uses as may be authorized by Congress or Executive Order."
22	6/4/71	2.0	Fee	MBCA	MBCF	"for use in the conservation of migratory birds" Court decree dated June 4, 1971 (District Court, First Judicial District of the State of Idaho) decreed that "Drainage District No. 7 of the County of Boundary, State of Idaho, having been duly declared organized by decree of this Court dated the 14th day of September, 1925, is hereby dissolved pursuant to laws of the State of Idaho, Section 42-2910, and that title to all property, rights or interest that may have been owned by said District is hereby vested in the United States of America, acting by and through the Bureau of Sport Fisheries and Wildlife, Department of the Interior."
2M	5/27/81	0.14	Conser-vation easement	Fish and Wildlife Act of 1956		Easement granted by State of Idaho for the construction, use, and maintenance of a water pump and intake line. State of ID Easement No. 4973.
23a	3/08/85	10.18	Fee	MBCA	MBCF	Price reapproval for 10 acres, 2/5/85. Warranty deed executed March 4, 1985 and filed March 8, 1985.

Sources: Land Record System tract report, Division of Realty and Refuge Information, USFWS Region 1.

Current Flyway Technical Committee management priorities for the upper Kootenai River Valley place emphasis on spring and fall migration habitat for migratory waterfowl. In addition, the Refuge provides important stop-over habitat for migratory swans that overwinter in southeastern Oregon (e.g., Malheur NWR) and nest in northeastern British Columbia and northwestern Alberta. Because of the importance of upper Kootenai River for migrating waterfowl and waterbirds, greater emphasis is now placed upon management for seasonal wetlands and crops for fall and spring migration. The general "migratory birds" purpose of the Refuge allows for such flexibility in management emphasis (particular species, habitats, or life history stages) in response to overall Flyway needs, changes in species abundance and distribution, regional habitat losses, and other factors.

Land Status

Kootenai NWR lies within Boundary County, Idaho and is bordered by the Selkirk Mountains to the west, and the Kootenai River to the north, and the Kootenai River and Deep Creek to the east. On June 24, 1964 the Migratory Bird Conservation Commission approved 2,767.21 acres for acquisition (MBCC Memorandum #6). The Refuge establishment date is reported as August 31, 1964, concurrent with the purchase by the Service of the first 117.19 acres from Arthur W. Hart. There are 2,774.29 acres of fee title lands within Kootenai NWR (see Table 1.1 below). As of March 8, 1985 all lands identified as within the Kootenai NWR acquisition boundary have been acquired. Federal ownership of the tracts adjoining the Kootenai River and Deep Creek begins at the mean high water line.

A number of people with interest in tracts of land prior to establishment of Kootenai NWR were given extended use of the tracts and access under a variety of terms, which have now expired. Several rights of way pertained to Drainage District 7 which was dissolved on June 4, 1971 by Court Decree. At that time all rights of way and reservations for the drainage district reverted to the United States. The sale of several tracts was subject to rights of way or easements for public roads, power and water lines, and other facilities. In addition, mineral rights are outstanding on Tracts 17, 17a, 19, 19a, 20, 21, 25 and 26 (total: 988.15 acres).

1.6.3 Summary of Purposes and Management Direction for the Refuge

The purposes for Kootenai NWR have been identified in legal documentation establishing and adding refuge lands. Because the Refuge was originally established "for use as an inviolate sanctuary, or for any other management purpose, for migratory birds," this represents the priority for Refuge management. In accordance with Director's Order No.132, all lands acquired since the original establishment of the Refuge retain this purpose. The current management priority of the Refuge is to provide spring and fall migration habitat for migratory waterfowl, and to provide breeding habitat for waterfowl and other waterbirds. Habitat management would also benefit raptors, migratory landbirds, and shorebirds. In line with Refuge System policy on biological integrity, diversity, and environmental health (601 FW 3) refuge habitats may also be managed to benefit other species (e.g., native fish, amphibians, and mammals) where feasible and appropriate. However, management for these species should not conflict with or detract from the purpose for which the refuge was originally established (migratory birds).

1.7 Relationship to Ecosystem Management Goals

1.7.1 Regional Setting and Other Protected Areas

Kootenai NWR is located in the ecoregion known as the Canadian Rocky Mountains, in the Okanogan Highlands section (IDFG 2005). The lower Kootenai River—also known as the "meander reach"—lies within the Purcell Trench, which extends roughly from Bonners Ferry, Idaho to the river's entry into Kootenay Lake in British Columbia. Within this area, the river meanders across the flat valley floor. Historically, this portion of the Kootenai River Valley was an ecologically rich and productive environment, a complex of riparian and bottomland forests, sloughs, oxbows, and wetlands that supported a wide diversity of wildlife prior to Euro-American contact.

The Kootenai River's natural floodplain was drained and levees built as farms were established in the valley in the late 1800s and early 1900s. Today the Purcell Trench contains the largest contiguous block of agricultural habitat, approximately 68,000 acres (USDA 2005) along the Kootenai River. Draining the wetlands and flood prevention from the river dikes and Libby Dam eliminated nearly all of the wetland habitat within the Idaho portion of the Kootenai River Valley (approximately 35,000-40,000 acres). Of the 50,000-acre lower Kootenai River Valley in Boundary County, 22,000 acres have been converted to farmland. By 1960, less than 1,000 acres of wetlands remained in the Idaho portion of the valley. Relatively recent establishment of four wildlife management areas (McArthur WMA, Kootenai National Wildlife Refuge, Boundary Creek WMA, and the Ball Creek Ranch) has resulted in the restoration of approximately 3,100 acres of wetlands, riparian areas, and associated upland habitat in Idaho's portion of the Kootenai River Valley (Boundary County Comprehensive Plan 2008). The National Wetlands Inventory identified 3,834.1 acres of low-elevation (0-2,500 feet elevation) palustrine and lacstrine wetlands in the Idaho portion of the Kootenai River Valley (KVRI 2004). Currently, 3,086 acres (80 percent) of low elevation wetlands lie within five protected areas; of this, 1,202 acres (31 percent) occur on the Refuge (see Table 1.2 below). The Refuge manages the largest wetland complex on the Idaho portion of the Kootenai River Valley.

Approximately 25,000 acres of bottomland habitat of the valley are natural areas under Federal (US and Canada), state or provincial, or local ownership (see Table 1.2). Of this, more than two-thirds is part of the Creston Valley Wildlife Management Area (WMA) in British Columbia. The Creston Valley WMA is the largest area of protected bottomland habitat in the lower Kootenai River Valley. It includes 17,000 acres of Provincial Crownland set aside for wildlife conservation and protection, of which approximately 9,500 acres are wetlands. Located on a wide river delta entering the deep waters of Kootenay Lake, the site was designated as a Wetland of International Importance in 1994. The Creston Valley area plays a significant role in support of food chains in this part of the South Columbia Mountains ecosection, as well as supporting migrating species using this flyway. The Creston area regularly supports over 100,000 waterfowl during migration periods; single day concentrations may exceed 40,000 on occasion. The WMA provides some of the most important waterbird habitat in British Columbia including the second largest breeding colony of western grebes in the province, the only breeding colony of Forster's terns, the largest breeding colony of black terns, and the largest breeding population of wood ducks in British Columbia. Most of the WMA's wetlands are under some form of water control regime, and are maintained by a system of dikes, control structures, and pumps that have created a series of managed wetland impoundments that control flood and drought cycles for wildlife production. Some agricultural activity takes place as a management tool (Ramsar Convention on Wetlands 2001).

The 1,425-acre Boundary Creek WMA were acquired in 1999 using funds provided by the sale of hunting licenses, tags and state waterfowl stamps and the Bonneville Power Administration (BPA). The WMA is managed by the Idaho Department of Fish and Game (IDFG) to develop wildlife and fish habitat and to provide public access for hunting, fishing and other recreational pursuits. Development activities focus on restoring historic wetlands, promoting native vegetative communities and promoting compatible public recreation. About 525 acres of the WMA is wetlands, most of which are acres restored after 1999.

McArthur Lake WMA was one of Idaho's first land purchases using Pittman-Robertson funding, in 1942. About 600 acres of the 1,207-acre WMA is McArthur Lake Reservoir created by damming Deep Creek. The WMA was acquired to provide waterfowl breeding, nesting, and summer-fall use areas to replace marshlands converted to farmland in the nearby Kootenai River Valley, and to provide the public with opportunities for waterfowl and big game hunting, fishing and wildlife viewing.

The Nature Conservancy's (TNC's) Ball Creek Ranch, a preserve located 12 miles northwest of Bonners Ferry, was acquired in August 2000. The 2,600 acre preserve includes four miles of Kootenai River frontage, two tributaries to the river (Ball Creek and Trout Creek). TNC has restored approximately 550 acres of wetlands and associated habitat in partnership with the Natural Resources Conservation Service (NRCS) and Ducks Unlimited. The Conservancy has been managing the property for a variety of uses including wildlife habitat, public recreation, farming, and cattle ranching. A working farm and ranch operates on two-thirds of the preserve.

In the fall of 2003 Ducks Unlimited (DU) acquired the 756-acre Smith Creek tract in the floodplain of the Kootenai River using funding from a North American Wetlands Conservation (NAWCA) grant. The owner of this tract had previously enrolled the land in a perpetual wetland protection easement under the Federal Wetlands Reserve Program (WRP). Management of the Smith Creek tract, under agreement with DU, was assumed by the Idaho Department of Fish and Game, who already managed the Boundary Creek WMA immediately to the north of the Smith Creek tract (Ducks Unlimited 2010).

Hideaway Islands was designated by the BLM as an area of critical environmental concern (ACEC) in 1985 to preserve riparian plant communities in an unmodified condition for the primary purpose of research and education. It was designated as a Research Natural Area (RNA) in 2007. The RNA consists of two islands along the Kootenai River, located approximately five air miles east of Bonners Ferry, Idaho. The islands contain a good example of a black cottonwood/red-osier dogwood riparian plant community in various stages of ecological succession. This community type is considered very rare in Idaho, with five or fewer occurrences known statewide. A western choke cherry and a Suksdorf hawthorn at this site have been measured as the largest in Idaho (Bureau of Land Management 2007).

Table 1.2. Protected Bottomland Habitat in the Lower Kootenai River Valley (Idaho, British Columbia).

Area	Total Acres	Wetland Acres*	Ownership
Kootenai National Wildlife Refuge (ID)	2,774	1,202	U.S. Fish and Wildlife Service
Boundary Creek WMA	1,425	525	Idaho Dept. of Fish and Game
McArthur Lake WMA	1,207	600	Idaho Dept. of Fish and Game
Ball Creek Ranch Preserve	2,600	550	The Nature Conservancy
Smith Creek	756	209	Idaho Dept. of Fish and Game
Hideaway Islands ACEC/RNA	76	0	Bureau of Land Management
Totals, Lower Kootenai River Valley, Idaho	**8,838**	**3,086**	
Creston Valley Wildlife Management Area (British Columbia)	17,000	9,500	Government of the Province of British Columbia (British Columbia Department of Environment, Parks and Wildlife), Government of Canada
Totals, Lower Kootenai River Valley (Idaho and British Columbia)	**25,838**	**12,586**	

Wetland Acres: Lacustrine, Palustrine

Important Bird Areas (IBAs)

The Important Bird Areas (IBA) program is a global effort to identify the most important areas for maintaining bird populations and focusing conservation efforts on protecting these sites. Within the United States, the program has been promoted and maintained by the American Bird Conservancy (ABC) and the National Audubon Society (NAS). The ABC is coordinating the identification of nationally significant IBAs while NAS is working to identify sites in individual states. The NAS is working within each state to identify a network of sites across the U.S. that provide critical habitat for birds. This effort recognizes that habitat loss and fragmentation are the most serious threats facing populations of birds across North America and around the world. By working through partnerships, principally the North American Bird Conservation Initiative, to identify those places that are critical to birds during some part of their life cycle (breeding, wintering, feeding, migrating), the intent is to mitigate the effects that habitat loss and degradation have on bird populations. The IBA program has become a key component of many bird conservation efforts. More information is available at http://www.audubon.org/bird/iba/index.html.

In Idaho, the goals of the IBA program are to identify the sites that are the most essential for long-term conservation of birds, and to take action to ensure the conservation of these sites. An IBA is a site that provides essential habitat for one or more species of birds. The IBA selection process examines sites based on:

- The presence and abundance of birds, and/or
- The condition and quality of habitat.

The IBAs are chosen using standard biological criteria and expert ornithologists' review. All sites nominated as potential IBAs are rigorously evaluated to determine whether they meet the necessary qualifications. The IBAs represent discrete sites, both aquatic and terrestrial, that are critically important to birds during their annual life cycle (e.g., breeding, migration, and/or wintering periods). Idaho's Important Bird Areas (IBA) program was launched in 1996 as a partnership between Idaho Partners in Flight and the Idaho Audubon Council. An IBA Technical Committee encouraged nominations and reviewed materials for candidate IBAs. From 1997 through 2000, the committee reviewed and voted on nominations. To date, 52 sites have been identified as IBAs in Idaho. Thirty-seven are wetland sites and 15 are upland sites; 11 are globally recognized, such as American Falls Reservoir, Oxford Slough, and Minidoka National Wildlife Refuge (IDFG 2010).

The Kootenai NWR is listed as an Idaho State-level IBA based on large concentrations of migrating waterfowl (up to 40,000 ducks, 4,000 geese, and 500 tundra swans). The Idaho State IBA criteria applicable to the Refuge include:

- <u>D4ii, Waterfowl</u>: Regularly support more than **2,000 waterfowl** over a short period of time during and portion of the year, not including sedentary Canada geese.
- <u>D4iv, Seabirds and colonial waterbirds</u>: Regularly support more than **50 pairs of colonial nesting birds** (grebes, pelicans, cormorants, herons, egrets, ibis) over the course of the breeding season, or regularly supports more than **25 pairs of nesting terns** over the course of the breeding season; or regularly supports more than **2,500 pairs of nesting gulls** over the course of the breeding season, or more than **500 wintering gulls** over a short period of time.
- <u>D4v: Shorebirds</u>: Regularly support at least **100 shorebirds** over a short period of time during any part of the year.

The IBA website notes that "Species diversity is one of Kootenai NWR's greatest assets. A total of 310 vertebrate species have been recorded on the Refuge, including over 220 bird species of which 80 species commonly use the Refuge for nesting and feeding. Although over 100 species of birds have been recorded nesting on the Refuge, including the threatened Bald Eagle, the Refuge is better known for providing habitat for migrating waterfowl. The Refuge is an important migration stop for migratory waterfowl as it is strategically located along a major migration corridor of the Pacific Flyway. Peaks of 25,000-40,000 ducks usually occur on the Refuge in the fall, with approximately 80-85 percent being Mallards. Canada Geese also reach their peak numbers in the fall to about 3,500-4,000. Tundra Swans usually peak at 300-500 in the spring, but 200-300 are common in the fall."

Table 1.3. Significant Concentrations of Birds Noted to Identify the Kootenai NWR as an Idaho State Important Bird Area.

Species or Group	Season	Average	Maximum
Ducks	FM	14,000	30,000
Canada Goose	FM		4,000
Tundra Swan	SM, FM	40 F	500 SM, 300 FM
Bald Eagle	B, W	1 pair breeding, 0-7 wintering (mean = 3)	7
Black Tern	B		50 pairs
Shorebirds	FM (August-Sept)	n.d. "Moderate use during migration"	

Key: FM= Fall migration, SM=Spring migration, F=Fall, B=Breeding, W=Wintering
Source: USFWS Waterfowl Survey Data, Kootenai NWR; Steenhof, Bond and Dunn 2008 (Midwinter Bald Eagle Count)

1.7.2 Regional Conservation Plans

A brief summary of the major regional conservation plans we considered in the development of this CCP follows.

Idaho Comprehensive Wildlife Conservation Strategy (2005). In 2001, the U. S. Congress began to appropriate Federal funds through the State Wildlife Grants program (SWG) to help meet the need for conservation of all fish and wildlife. Along with this new funding came the responsibility of each state to develop a Comprehensive Wildlife Conservation Strategy (CWCS). The Idaho Department of Fish and Game prepared its Comprehensive Wildlife Conservation Strategy (CWCS) in 2005 to coordinate the efforts of all partners working toward conservation of wildlife and wildlife habitats across the state. The aim of Idaho's CWCS is to provide a common framework that will enable conservation partners to jointly implement a long–term approach for the benefit of Species of Greatest Conservation Need (SGCN). The Strategy identifies 229 SGCN (103 invertebrates, 126 vertebrates) and associated habitats; provides an ecological, habitat–based framework to aid in the conservation and management of SGCN; recommends actions to improve the population status and habitat conditions of SGCN; and describes an approach for long–term monitoring to assess the success of conservation efforts and to integrate new information as it becomes available. The CWCS "promotes proactive conservation to ensure cost–effective solutions instead of reactive measures enacted in the face of imminent losses" (IDFG 2005).

Kootenai NWR lies within the Okanogan Highlands ecological section described in the CWCS. Species of greatest conservation need (SGCNs) that are considered imperiled or vulnerable in Idaho under this plan, and which occur on the Refuge include: kokanee (reintroduced via egg planting in the fall of 2003), bull trout, northern alligator lizard, lesser scaup, red-necked and western grebe (breed on the Refuge in small numbers); and black tern (breeds on Refuge). The northern leopard frog has been observed on the Refuge some years ago but whether it still occurs on the Refuge is not known at this time. Several species with current secure status, but are considered SCGN due to the need to monitor trends, also occur on the Refuge (e.g., northern pintail).

Canadian Rocky Mountains Ecoregional Assessment (2004). This ecoregional assessment, produced by The Nature Conservancy in 2003, includes a portfolio of sites that collectively conserve biological diversity in the Canadian Rocky Mountains ecoregion. It also includes an assessment of multi-site threats and priorities for conservation action. Conservation targets identified in the ecoregional assessment that occur on the Refuge include bull trout, northern leopard frog (current presence on Refuge is not confirmed), bald eagle (the TNC identifies nesting and wintering sites as conservation targets), short-eared owl, Townsend's big-eared bat (point location near Refuge; predicted occurrence on slopes of Selkirks), permanent wetlands (aquatic beds), seasonal (spring flooded) wetlands (sedge meadows), and seasonal (fall flooded) wetlands (Rumsey et al. 2003).

Kootenai River Subbasin Plan (2004). The Northwest Power and Conservation Council (NPCC) was formed by the States of Idaho, Oregon, Washington, and Montana to protect and mitigate fish and wildlife that are affected by development and operation of hydropower systems on the Columbia, Snake, and Kootenai Rivers while assuring an adequate power supply. The council established the Columbia Basin Fish and Wildlife Program to guide efforts to protect, mitigate, and enhance fish and wildlife resources. Through the Fish and Wildlife Program, the Columbia Basin was divided into 62 subbasins for planning purposes. A plan was then developed for each subbasin. These plans contain the strategies that drive the implementation of the Council's Fish and Wildlife Program, direct Northwest Power and Conservation Council funding of projects that respond to impacts from the development and operation of the Columbia River hydropower system. The subbasin plan that applies to the Refuge is the Kootenai River Subbasin Plan (Northwest Power and Conservation Council 2004).

The Kootenai River Subbasin Plan identifies bull trout, westslope cutthroat trout, Columbia River redband trout, kokanee, burbot, and white sturgeon as focal species. Conditions of habitats used by terrestrial target species was also assessed (wetland, riparian, grassland/shrub, xeric (ponderosa pine) forest, and mesic forest. Class 1 and Class 2 waters for bull trout and westslope cutthroat trout and Class 1 and Class 2 terrestrial subunits were considered near-term opportunities for protection (Class 1) and restoration (Class 2). The focal fish species primarily use waters adjacent to the Refuge, although Myrtle Creek, part of which lies within the Refuge's boundaries, provides some habitat for native salmonids. Deep Creek and Myrtle Creek are considered Class 2 waters in the Plan.

Conservation Strategy for Northern Idaho Wetlands (1997). This plan identified wetland types, acreages, and status in North Idaho; divides wetlands into four management categories (based on the following criteria: richness, rarity, condition, and viability), and identifies wetlands that are irreplaceable or where sensitivity to disturbance is high (Jankovsky-Jones 1997).

Class I sites represent examples of plant communities in near pristine condition and often provide habitat for high concentrations of state rare plant or animal species. The high quality condition of the plant community is an indicator of intact site features such as hydrology and water quality. Impacts to Class I sites should be avoided as these sites cannot be mitigated for if lost, and alteration (and in some cases enhancement) of these sites will result in significant degradation. There are no lowland Class I sites in the Kootenai River Valley.

Class II sites may provide habitat for state rare plant or animal species. However, human influences are apparent (i.e., portions of wetland in excellent condition; however drier, accessible sites are impacted). Good to excellent assemblages of common plant community types or the occurrence of rare community types qualifies a site as Class II. Wetlands with unique biological, geological, or other features may be included here. In the lower Kootenai River Valley, MacArthur Lake is considered a Class II site.

Reference sites represent high quality assemblages of common community types in the survey area or areas where changes in management practices can be documented. The use of a reference area as a model for restoration or enhancement projects is the best way to replicate wetland functions and the distribution and composition of native plant communities. Reference areas may also serve as donor sites for plant material. The Plan identified Hideaway Islands and Shorty's Island as having some of the last remnant stands of riparian shrublands and forest on the Kootenai River. Hideaway Islands is currently designated as a Bureau of Land Management Area of Critical Environmental Concern (ACEC) and Research Natural Area (RNA). Shorty's Island is privately owned and currently has no protections.

Habitat sites have moderate to outstanding wildlife values, such as food chain support or maintenance of water quality, and may have high potential for designation as or expansion of existing wildlife refuges or managed areas. Human influences are often present and management may be necessary to maintain natural communities. Kootenai NWR is classified as a habitat site under this plan since habitat was highly altered from pre-settlement conditions, and is intensively managed.

North American Waterfowl Management Plan - Intermountain West Joint Venture. The North American Waterfowl Management Plan is an international action plan, signed by the United States, Canada, and Mexico, to conserve migratory birds throughout the continent. The goal of the plan is to return waterfowl populations to their 1970s levels by conserving wetland and upland habitats. Transforming the goals into on-the-ground actions is accomplished through partnerships called joint ventures. Joint ventures are comprised of individuals, corporations, conservation organizations, and local, state, provincial, and Federal agencies. Habitat joint ventures restore and enhance wetlands and associated upland habitats.

The Refuge falls under a focus area plan for Idaho developed by the Intermountain West Habitat Joint Venture, which includes Washington, Oregon and California east of the Cascades and the Sierra Nevada; all of Idaho and Utah and most of Nevada; western Montana, Wyoming, and Colorado; and northern Arizona and New Mexico. The *Coordinated Implementation Plan for Bird Conservation in Idaho* (IWJV 2005) one of a series of "focus area" plans developed from the 1990s on to provide a broad overview of wetland and wildlife resources, and describe conservation needs and opportunities in general areas identified as "target areas" for Joint Venture action. The Plan identified 36 priority Bird Habitat Conservation Areas (BHCAs) in Idaho which should be considered by the IWJV for all bird conservation projects. BHCAs display areas where bird habitat conservation projects may take place, where state partners believe the best opportunity exists for effective conservation activities. However, the BHCAs have no official status. BHCA designation simply notes where conservation activities could occur. Kootenai NWR lies within BHCA 20 (Kootenai River and Watershed). Priority habitat areas identified in the Plan include:

- Riparian (priority species: bald eagle; calliope hummingbird; blue grouse; willow flycatcher; yellow-billed cuckoo);

- Non-riverine wetlands (priority species: Wilson's phalarope; trumpeter swan; black tern; white-faced ibis; American white pelican; common loon);
- Cedar-hemlock forest (priority species: Vaux's swift; brown creeper; varied thrush; winter wren; golden-crowned kinglet; Townsend's warbler);
- Ponderosa pine forest (priority species: white-headed woodpecker; pygmy nuthatch; Lewis's woodpecker; flammulated owl); and
- Low elevation mixed conifer forest (priority species: Lewis's woodpecker; Williamson's sapsucker; dusky flycatcher; varied thrush; brown creeper)

Riparian, non-riverine wetlands, and ponderosa pine forest and are considered Priority A (high to medium value to birds, high to medium threat, high to medium opportunity for protection, restoration, and or enhancement of habitat) while low elevation mixed conifer forest and cedar-hemlock forest are considered Priority B (Medium overall rating: one criterion may be high—e.g., habitat value, threat, opportunity—but generally of medium importance to birds statewide). The Kootenai River and watershed is a priority BHCA for riparian, containing 12,472 ac of this habitat; cedar-hemlock forest (54,279 ac); low elevation mixed conifer forest (160,356 ac).

Intermountain West Regional Shorebird Plan (2000). The United States Shorebird Conservation Plan (Brown et al. 2001) includes 11 regional plans reflecting major shorebird flyways and habitats within the United States. The Intermountain West Regional Working Group was formed under the auspices of the national plan to formulate shorebird management goals for the Intermountain West (IM). The purpose of this management plan is to address shorebird management needs on a regional basis while considering Pacific Flyway and national levels of need.

The Intermountain West Regional Shorebird Plan (Oring et al. 2000) notes that perhaps a million shorebirds breed in the Intermountain West and millions more migrate through the area each year. The plan recognizes that finding ample high quality fresh water will be the greatest challenge faced by shorebirds in the Intermountain West. The regional plan articulates seven goals, plus associated objectives and strategies related to habitat management, monitoring and assessment, research, outreach and planning. The planning goal includes objectives to coordinate shorebird planning and projects with other migratory bird initiatives and specifically with the IWJV. The

IWRSP identifies 11 species of shorebirds that regularly breed in the region, as well as 23 additional species that are annual migrants.

The Refuge does not support large numbers of breeding or migrating shorebirds. Traditionally, killdeer have been the only species of shorebird using the Refuge in any significant numbers; small numbers of other shorebirds passing through in the fall. In 2003, Kootenai NWR completed a 175-acre wetland restoration project on the north end of the Refuge. One of the units restored was set aside for experimental shorebird habitat management, a habitat type not managed for in the past. The West River's Bend Unit was plowed/disked, planted to wheat, and then flooded during spring, 2004. The unit itself is a very shallow flooding unit, mostly sheet water. The strategy was to keep most of the unit in sparse vegetation early in the year while the wheat is still emerging, leaving a large amount of mudflat habitat for shorebirds. The unit was then flooded and drawn down repeatedly throughout the spring and summer. Once the wheat matured, the unit was tilled and replanted following a similar reflooding schedule. One week after the first flooding, 12 long-billed curlews were observed foraging in the new habitat while at full pool (50 percent sheet water and 50 percent sparse green emerging wheat). In addition to curlews, Wilson's phalarope, spotted sandpipers, and killdeer also used the new wetland (Thomas 2005). This suggests that managing for mudflat and/or shallow water habitat could increase shorebird use of the Refuge. Proposed changes in wetland management under all action alternatives will create increased shallow water conditions and moist soil which will provide foraging habitat for shorebirds.

Intermountain West Waterbird Conservation Plan (2006). This Intermountain West Waterbird Conservation Plan (IWWCP) is one of several regional step-down plans designed to implement the North American Waterbird Conservation Plan (NAWCP, Kushlan et al. 2002). Waterbirds are wetland-dependent species including both colonial breeders (e.g., gulls, terns, most grebes, cormorants, herons, egrets, ibis and pelicans), and solitary nesting marshbirds (e.g., cranes, rails, coots, bitterns and loons). Shorebirds and waterfowl are covered by other bird conservation initiatives and, thus, are excluded from this plan. The goal of the IWWCP is to maintain healthy populations, distributions, and habitats of waterbirds throughout the Intermountain West region. It includes four Bird Conservation Regions (BCRs 9, 10, 15, and 16).

Included are a description of waterbird populations and habitats; a review of threats and management issues; population and habitat objectives for priority species and habitats; monitoring and research recommendations; and conservation strategies for management, monitoring, and outreach. The plan is intended to facilitate waterbird conservation through on-the-ground projects and the incorporation of waterbird population and habitat objectives into joint venture projects, land use planning documents, and the conservation efforts of a diverse array of partners found throughout the Intermountain West region.

Breeding and migrant waterbird species are ranked and prioritized for the Intermountain West region based on modified national NAWCP rankings (colonial species) and national, state, and Partners In Flight (PIF) listings (marshbirds) in each of the four Bird Conservation Regions (BCRs) within the planning area. Three waterbirds are identified as species of high concern in BCR 10, which includes the Refuge: Franklin’s gull, American white pelican, and common loon. An additional 14 species were identified as species of moderate conservation concern in BCR 10 (black tern, greater sandhill crane (RMP), Virginia rail, sora, California gull, Forster’s tern, western grebe, Clark’s grebe, pied-billed grebe, snowy egret, great blue heron, black-crowned night-heron, American bittern, and white-faced ibis. Waterbirds ranked as high or moderate conservation concern are considered priorities for conservation action in the Intermountain West region. The Plan identifies key actions for the conservation of these species.

Kootenai River Valley Wetlands and Riparian Conservation Strategy (2004). The goal of this strategy is to develop a comprehensive and geographically specific process to identify local watershed objectives, priorities, community issues, and historic land use effects on the lower Kootenai River watershed. The Strategy builds on baseline information gathered through previous wetland conservation activities performed by the Kootenai Tribe of Idaho (KVRI 2004).

1.7.3 Pacific Flyway Management Plans

The Pacific Flyway Council (Council) is an administrative body that forges cooperation among public wildlife agencies for the purpose of protecting and conserving migratory game birds in western North America. The Council has prepared numerous management plans to date for most populations of swans, geese, and sandhill cranes in the Pacific Flyway (www.pacificflyway.gov). These plans typically focus on populations, which are the primary unit of management, but may be specific to a species or subspecies. Management plans serve to:

- Identify common goals;
- Coordinate collection and analysis of biological data;
- Establish the priority of management actions and responsibility for them; and
- Emphasize research needed to improve management.

The Council creates flyway management plans to help state and Federal agencies cooperatively manage migratory game birds under common goals. Management strategies are recommendations, but do not commit agencies to specific actions or schedules. Fiscal, legislative, and priority constraints influence the level and timing of implementation. Pacific Flyway plans generally guide management and research for a 5-year planning horizon. Several of these plans pertain to species found on the Refuge. A brief summary of the flyway management plans we considered in the development of this CCP follows.

Pacific Flyway Management Plan for the Pacific Population of Western Canada Geese (2000). The Pacific population of western Canada geese (*Branta canadensis moffitti*) nest in central and southern British Columbia, northwestern Alberta, northern and southwestern Idaho, western Montana, northwestern Nevada, northern California, and throughout Idaho and Oregon. A large segment of this population is nonmigratory and resident throughout the year. In response to human activities, such as transplants and artificial nesting structures, the population has expanded its historic distribution. Agricultural practices, residential expansion, and park development have further expanded this population. In some urbanized areas, the geese have become acclimated to human interaction and reside in parks.

The goals for the Pacific population of western Canada geese are to maintain a level and distribution that will optimize recreation opportunities and minimize depredation and/or nuisance problems in agricultural and urban areas.

Pacific Flyway Management Plan for the Western Population of Tundra Swans (2001). The goal of the tundra swan plan is to "ensure the maintenance of the western population of tundra swans, at a size and distribution that will provide for all their benefits to society" (Pacific Flyway Council 2001). Objectives of the plan include maintaining a population of at least 60,000 swans in their current geographic distribution to provide suitable public benefits. For the most part, swans use lands which will continue to be managed for waterfowl in general with consideration being given to swans and other waterfowl species that are more dependent upon natural and managed wetlands than agricultural areas. Refuge wetlands provide migration habitat for up to 500 tundra swans. The management practices in the CCP will ensure the continuation of that habitat.

1.7.4 Partners in Flight Landbird Conservation Plans

Partners in Flight (PIF) is an international coalition of government agencies, conservation groups, academic institutions, private organizations, and citizens dedicated to the long-term maintenance of healthy populations of native landbirds. Partners in Flight focuses their resources toward goals of improving monitoring and inventory, research, management, and education programs involving birds and their habitats. The PIF strategy is to stimulate cooperative public and private sector efforts in North America and the Neotropics to meet these goals. Specific strategies for accomplishing the goals are contained in regional landbird conservation plans. These plans describe priority habitats and species, and provide recommended management actions to conserve priority habitats and species.

Idaho Bird Conservation Plan (2000). This plan focuses on restoring healthy ecosystems that will maintain productive and complete bird communities. The plan identifies priority bird species, and then uses those species and other information on habitat trends to focus on the highest priority habitats. Thus, this plan takes a habitat-based approach, rather than a species-based approach, to conserving bird populations. The Plan identifies four high priority habitats for birds in Idaho: Riparian; Non-riverine Wetlands; Sagebrush Shrublands; and Dry Ponderosa Pine/Douglas-fir/Grand Fir Forests. For each of these habitats, their importance to birds, habitat descriptions, State objectives and issues, and strategies and tasks for meeting those objectives are described (Ritter 2000). Three of the priority habitats identified in the plan (riparian, non-riverine wetlands, and dry ponderosa pine/Douglas-fir forest) occur on the Refuge. Priority 1 breeding bird species known to breed on KNWR include bald eagle, calliope hummingbird, red-naped sapsucker, and Hammond's flycatcher. Another Priority 1 species, Lewis's woodpecker, occurs on the Refuge but breeding has not been confirmed.

1.7.5 Recovery Plans

Three species of plant and animals that currently or historically occurred on or near the Kootenai National Wildlife Refuge are listed as threatened (T) or endangered (E) under the Endangered Species Act: bull trout (T), Kootenai River white sturgeon (E), grizzly bear (T), and Canada lynx (T). (The gray wolf was recently removed from the endangered species list by Congressional action; see below.) Bull trout have been documented to occur in Myrtle Creek (USFWS 2010). The Refuge lies within the historic range of grizzly bear, Canada lynx, and white sturgeon. Grizzly bears occur in the Selkirk Range and have been sighted within 3 to 4 miles of the Refuge. The amount of human intrusion typically keeps them from entering the Refuge. Woodland caribou, which are listed as endangered, occur in low numbers in the Selkirk Range but typically use habitat above 4,000 feet elevation and would be unlikely to descend the lower slopes of the Selkirks near the Refuge.

The peregrine falcon was formerly listed as endangered but was delisted in 1999. The bald eagle was delisted in 2007, and the Service published National Bald Eagle Management Guidelines to give landowners and others guidance on how to ensure that actions they take on their property are consistent with the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

Recovery plans are prepared by the Service for most endangered species. These plans specify actions that are believed to be necessary to protect and recover the species. A brief description of Federal recovery plans follows.

Bull Trout Draft Recovery Plan (2002). The U.S. Fish and Wildlife Service issued a final rule listing the Columbia River population of bull trout as a threatened species on June 10, 1998 (63 FR 31647). Critical habitat was designated in 2005 and revised in 2010. The Kootenai River is one of 32 critical habitat units on 3,500 water body segments across the five states. These areas are clustered into six recovery units where recovery efforts will be focused. The Kootenai River Recovery Unit includes streams and rivers in Montana, Idaho, and British Columbia. Within the Unit, the historic distribution of bull trout is relatively intact. But abundance of bull trout in portions of the watershed has been reduced, and remaining populations are fragmented. Bull trout on the Refuge belong to the Lower Kootenai River subpopulation, downstream of Kootenai Falls through Idaho to the United States/Canada border. Adult bull trout appear to be well distributed throughout the Kootenai River in Idaho, but at very low densities (USFWS 2002). Extensive fish population sampling has found no indication of reproducing local populations of bull trout in any Idaho tributaries (PBTTAT 1998). The harvest of bull trout is no longer legal in the Kootenai River drainage in the United States.

On October 12, 2010 the Service revised the 2005 critical habitat designation for bull trout. The final rule identified 32 critical habitat units on 3,500 water body segments across the five states, including 8,772 stream miles in Idaho (more than any other state) and 170,218 acres of lakes or reservoirs (second only to Montana). Myrtle Creek was added to critical habitat as a part of the revision.

Recovery Plan for the White Sturgeon, Kootenai River Population (1999). The Kootenai River white sturgeon (KRW sturgeon) was federally listed as endangered on September 6, 1994 (59 FR 45989). The Recovery Plan for the Kootenai River white sturgeon (USFWS 1999) states that the Kootenai River population of the sturgeon may be reclassified or downlisted to threatened status if:

- Natural production of white sturgeon occurs in at least 3 different years of a 10-year period; a naturally produced year class is demonstrated when at least 20 juveniles from a year class are sampled at more than 1 year of age.
- The estimated white sturgeon population is stable or increasing and juveniles reared through a conservation aquaculture program are available to be added to the wild population each year for a 10-year period. Each of these year classes must be large enough to produce 24 to 120 sturgeon surviving to sexual maturity.
- A long-term Kootenai River Flow Strategy is developed in coordination with interested state, Federal, and Canadian agencies, and the Kootenai Tribe, at the end of the 10-year period based on recruits of ongoing conservation efforts, sturgeon habitat research, and fish productivity studies. An important element of this strategy is demonstration of the repeatability of . environmental conditions necessary to produce recruits (as described above) in future years.

Kootenai Refuge is within the historic range of Kootenai River White sturgeon and Myrtle Creek could potentially provide rearing habitat. Feasibility studies required for restoring lower Myrtle Creek are included as a strategy in the CCP (see Chapter 2).

Grizzly Bear Recovery Plan (First Revision, 1993, Original Approved 1982). The grizzly bear was listed as threatened in the lower 48 states on July 28, 1975 (40 FR 31734-31736). The Refuge is adjacent to the Selkirk Mountain recovery zone of northern Idaho, northeast Washington, and southeast British Columbia (2,200 sq mi) which has a population of approximately 40 to 50 bears (Wakkinen and Kasworm 2004). In 1999, the Fish and Wildlife Service first issued a warranted but precluded finding to uplist the Selkirk Mountains recovery zone population to endangered status. However, this uplisting action continues to be precluded by higher priority listing actions.

Canada lynx. The Canada lynx was listed as threatened in the lower 48 states on March 24, 2000. Critical habitat was designated in 2009, but a recovery plan has not yet been prepared.

Gray wolf, Northern Rocky Mountain population. The Northern Rocky Mountain (NRM) population of the gray wolf (including Idaho) was delisted on April 2, 2009. Until August 2010, wolves in Idaho were managed under a State management plan. Under this plan, Idaho would always manage for more than 15 breeding pairs and 150 wolves with a target population level of about 500 wolves. Regulatory protections for most of the NRM population of gray wolf were reinstated in order to comply with the District of Montana court order dated August 5, 2010. The court ruled that the delisting of the Northern Rocky Mountain Distinct Population Segment (DPS) of the gray wolf was not valid and returned wolves to the list of endangered species. The court order covered wolves in Idaho north of Interstate 90. South of Interstate 90, wolves were protected as an experimental population, which provided more flexibility compared to those classified as endangered north of the Interstate. Endangered wolves could only legally be taken when authorized by a permit issued by the Service or if exempted by an incidental take statement associated with a consultation with the Service which resulted in a Biological Opinion. Livestock owners were prohibited from taking wolves seen actively chasing, attacking, or killing their livestock; only authorized agents could take chronically depredating endangered wolves. In October, the governor of Idaho announced that the State of Idaho would no longer manage wolves as a designated agent under the Endangered Species Act.

The U.S. Fish and Wildlife Service published a final rule in the *Federal Register* on October 26, 2010. In order to enforce the court order, this final rule corrected the gray wolf listing for the northern half of Montana, the northern panhandle of Idaho, the eastern third of Washington and Oregon, and north-central Utah as endangered and reinstated the former special rules designating the gray wolf in the remainder of Montana and Idaho as nonessential experimental populations. Although this action was published in the *Federal Register* on October 26, 2010, the court order had legal effect immediately upon its filing on August 5, 2010. In April 2011, gray wolves were removed from the Endangered Species list by Congressional action. This action reverted management of gray wolves to the State of Idaho.

1.8 Issues, Concerns, and Opportunities

1.8.1 Major Issues to be Addressed in the CCP

The core planning team evaluated the issues and concerns raised during public scoping. Issues are defined as matters of controversy, dispute, or general concern over resource management activities, the environment, land uses, or public use activities. Issues are important to the planning process because they identify topics to be addressed in the CCP, pinpoint the types of information to gather, and help define alternatives for the CCP. Numerous issues, concerns, and opportunities were raised during the public scoping process; we addressed them all in some manner in the Draft CCP/EA. It is the Service's responsibility to focus planning and the EA analysis on the major issues. Major issues typically suggest different actions or alternative solutions, are within the Refuge's jurisdiction, and have a positive or negative effect upon the resource. Major issues will influence the decisions proposed in the Draft CCP/EA. The following issues, concerns, and opportunities are considered in the Draft CCP/EA.

Wildlife and Habitat Management

- How can the Refuge improve the productivity of its wetland habitats to meet Refuge purposes? What is the appropriate balance of cropland and moist soil units in order to meet the needs of migrating waterfowl?
- How should grasslands on the Refuge be managed? Should short grass habitat for geese be provided? What should be the Refuge's role in providing winter habitat for increasing numbers of deer and elk?
- What are the most appropriate management techniques for the Refuge's forested habitat in order to maximize its value to wildlife, protect the watershed, and reduce the potential for wildfire?

- Should the Refuge consider the proposed land exchange with Idaho Department of Lands (IDL)?
- Is restoration of riparian or stream habitat on the Refuge feasible given the limitations imposed by the existing dikes and Libby Dam operations? What should the Refuge's role be in restoring native fish populations?

Invasive Species

How will the Refuge control invasive species and prevent new invasives from becoming established? What are the most appropriate strategies for controlling invasive species on the Refuge?

Public Use and Access

- In what ways can Kootenai NWR address the increasing visitation and demand for wildlife-dependent recreation, especially waterfowl hunting, wildlife observation, and photography, while still providing undisturbed sanctuary areas for wildlife?
- How should the Refuge address increasing demands for big game and upland bird hunting and associated law enforcement and safety issues?
- Shall Kootenai NWR provide more environmental education opportunities?

1.8.2 Issues Outside the Scope of the CCP

While CCPs are very comprehensive plans, no single plan can cover all issues. A proposal for a major expansion of the Refuge's acquisition boundary is not included in this CCP. (A proposal to purchase a small parcel of IDL land on the south boundary is included in the range of alternatives.) The Service will analyze additional habitat protection needs and possible additions to the approved refuge boundary in future step-down plans (see Appendix C, Implementation).

1.9 Refuge Vision

Our vision of the future Refuge follows.

In a bend of the Kootenai River, nestled in a glacial valley flanked by Idaho's Selkirk Mountain Range to the west and the Purcells to the east, lies the Kootenai National Wildlife Refuge. For thousands of years, spring floods of the Kootenai River inundated the valley floor, creating the largest complex of wetlands and floodplain forests in the State of Idaho. Multitudes of ducks, geese, and swans passed through this natural funnel as they migrated between nesting areas in Canada and wintering grounds to the south.

During the 1920s, wetlands were drained to make way for farms, and dikes were built to hold back the floodwaters. In 1964, Kootenai NWR was established to restore a small remnant of the once-vast wetlands—a vital link between protected habitats in Canada and the U.S. Tens of thousands of ducks, geese, and swans visit Refuge wetlands, now managed to mimic the natural cycles of flooding and drying. Croplands complement the productivity of wetland habitats and sanctuary areas ensure that waterfowl can feed and rest undisturbed. When the winter snows blanket the land, deer and elk descend from the mountains to find food and shelter here. Spring brings not only waterfowl, but songbirds that nest in the Refuge's forests and grasslands.

The Refuge also provides a respite for people, where visitors of all ages and abilities can experience nature directly, and develop an appreciation for the unique natural character of the Kootenai River Valley.

1.10 Refuge Goals

1.10.1 Wildlife and Habitat Goals

Goal 1: Provide and manage a mixture of secure, diverse, productive grassland habitats for foraging and nesting migratory waterfowl and grassland-dependent wildlife.

Goal 2: Annually provide agricultural crops as forage for migratory waterfowl.

Goal 3: Provide, manage, and enhance a diverse assemblage of wetland habitats characteristic of the Kootenai River Valley.

Goal 4: Provide, manage, and enhance a diverse assemblage of forest habitats characteristic of lower elevation sites in the Selkirk Mountains.

Goal 5: Provide, manage, and enhance a diverse assemblage of riparian habitats characteristic of the Kootenai River Valley.

Goal 6: Protect, maintain, and where feasible restore . habitats on the Refuge to benefit native fishes and the species that depend on them.

Goal 7: Conduct inventory, monitoring, and research in support of adaptive management, habitat restoration, and fisheries restoration efforts.

1.10.2 Public Use Goals

Goal 1: Wildlife Observation, Photography, and Interpretation
Provide opportunities for visitors to safely observe and photograph a diversity of wildlife in a natural setting. Interpretation and education will enhance visitors' appreciation for and understanding of the Refuge's natural resources and increase their success in observing and photographing wildlife. Rewarding experiences ultimately build support for Kootenai NWR and the National Wildlife Refuge System.

Goal 2: Waterfowl Hunting
Provide waterfowl hunters of all ages and abilities the opportunity to participate in a safe, enjoyable, high-quality waterfowl hunt program that encourages a tradition of wildlife conservation and ethical sportsmanlike behavior. The waterfowl hunt program will provide opportunities to observe and hunt a variety of waterfowl species with clear and enforced regulations, easy access, minimal crowding, and minimal hunter conflicts.

Goal 3: Fishing, Big Game and Upland Game Hunting
Fishing and hunting enthusiasts will enjoy opportunities to fish and hunt big game and upland game on the Refuge. Fishing and/or hunting programs will provide a reasonable chance of success with little or no interference by others; minimize impacts to non-target species and habitats; promote compliance with laws and regulations; and promote ethical behavior.

Goal 4: Environmental Education
Students from area schools will participate in quality environmental education and interpretation programs that provide memorable experiences, fosters an appreciation for the natural world around them and a strong conservation ethic, and develops into a lifelong relationship with the Refuge.

Goal 5: Friends Group and Volunteers
An active and committed Kootenai NWR Friends Group and volunteer work force will assist Refuge staff in delivering quality visitor services programs, building and maintaining the facilities needed to conduct those programs, and supporting the Refuge's habitat restoration and monitoring efforts. The Friends Group and volunteers will increase support of the Refuge on both a local and state scale through public outreach.

1.11 Planning Process

A core planning team, consisting of a Project Leader, Refuge Manager, Complex Biologists, Complex Visitor Service Manager, and a Regional Planner, began developing the CCP in 2007. An extended team assisted in wildlife and habitat and public use reviews, and developing and reviewing preliminary goals, objectives, strategies, and alternatives. The extended team consisted of various professionals from other agencies and divisions within the Service. A list of core and extended team members is located in Appendix J.

Early in the planning process, the core team identified 20 priority wildlife species (resources of concern) for the Refuge, their associated habitats, and other species that would benefit from managing the resources of concern. These resources of concern are listed in Chapter 4 and Appendix E. Wildlife and habitat goals and objectives were designed directly around the habitat requirements of species designated as priority resources of concern. The analytical framework for analyzing the resources of concern and for devising appropriate conservation objectives and strategies was based on the Service's Draft *Identifying Resources of Concern and Management Priorities for a Refuge: A Handbook* (USFWS 2008).

Public use planning centered on developing goals, objectives and strategies around the "Big Six" wildlife-dependent public uses—hunting, fishing, wildlife observation and photography, and environmental education and interpretation—and the transportation and infrastructure associated with those uses.

Public scoping began in 2009. In January 2009, two scoping meetings were held in Bonners Ferry, Idaho. Public comments were solicited through distribution of planning updates to the public. In July 2010 a planning update was distributed to solicit comments on preliminary draft alternatives. A summary of public involvement to date is in Appendix K. An internal draft was distributed to Service Region 1 reviewers in May 2011. All changes requested by reviewers and extended team members and actual changes made were documented.

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Chapter 2 Management Alternatives

Canada goose and brood
©Donna Dewhurst

Chapter 2. Alternatives, Goals, Objectives, and Strategies

2.1 Consideration in Alternative Designs

During development of the alternatives for this Draft CCP/EA, the Service reviewed and considered a variety of resource, social, economic, and organizational aspects important for managing a refuge. These background conditions are described more fully in Chapters 3, 4, 5, and 6. As is appropriate for a national wildlife refuge, resource considerations were fundamental in designing alternatives. House Report 105-106 accompanying the National Wildlife Refuge Administration Act, as amended, states "… the fundamental mission of our System is wildlife conservation: wildlife and wildlife conservation must come first."

The refuge planning team reviewed available scientific 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 met with refuge users, nonprofit groups, and community organizations to ensure that their comments and ideas were considered during Draft CCP/EA development.

2.2 Actions/Alternatives Considered but Not Developed

The details of public participation can be found in Appendix K. During development of the alternatives, the planning team considered the actions detailed below. All of these actions were ultimately eliminated for the reasons provided.

Major expansion or reduction of waterfowl hunt program. Expansion of the waterfowl hunt area was suggested during scoping and public review of preliminary draft alternatives. This was not included in the alternatives, because of conflicts with resource protection, and the ability of the Refuge to provide adequate sanctuary area for migratory waterfowl. Closing the Refuge to hunting was suggested in public scoping. This was not included in the range of alternatives because the Refuge System Administration Act, as amended, mandates that waterfowl hunting, along with five other wildlife-dependent public uses, receive special consideration during planning for, management of, and establishment and expansion of units of the Refuge System. The Service is to make extra efforts to facilitate these priority wildlife-dependent public use opportunities (see Chapter 1).

Allow pheasant hunting. Pheasant hunting on the Refuge was proposed during public scoping. This alternative was considered but dismissed because (1) implementing a pheasant hunt program on the Refuge would cause conflicts with the Refuge's waterfowl hunt program; (2) it places additional demand on a small existing land base and infrastructure (trails, Auto Tour Route, service roads, etc.); (3) potential conflicts with non-consumptive uses; and (4) the small pheasant (non-native to North America) population is insufficient to provide a sustained hunting program; and (5) "planting" of non-native species is not allowed under refuge policy (7 RM 12).

Land exchange with Idaho Department of Lands. The planning team considered a proposed land exchange with the Idaho Department of Lands (IDL). This was not included in the range of alternatives because the forested lands desired for exchange by the IDL are developing old-growth characteristics and provide habitat for forest-dependent species. The forest lands also contribute to refuge water quality and provide a buffer between adjacent Forest Service and privately owned lands, and waterfowl sanctuary areas. However, initiation of a land protection plan study to analyze alternatives for possible refuge boundary expansion to include 120 acres of bottomland owned by the Idaho Department of Lands is included under Alternatives 2 and 3.

Dike breaching. Refuge wetlands are separated from the influence of the Kootenai River by the Refuge's levee system. Kootenai River fluctuations are associated with hydroelectric plant operations, and seasonal fluctuations related to precipitation and snowpack levels.

Restoring the historic connection of the Kootenai River to the Refuge could benefit both riparian and wetland habitat by scouring or reflooding wetland basins and by depositing mineral soils needed for black cottonwood germination. However, dike breaching was considered but dismissed as a CCP action for several reasons: (1) The River's hydrologic cycle is highly altered from historic conditions, and spring flooding no longer occurs; (2) Breaching of refuge levees would destroy wetland management infrastructure needed to control water levels in this highly altered ecosystem, leading to degradation and loss of productivity of refuge wetlands; and (3) dike breaching could threaten adjacent private lands.

2.3 Alternative Descriptions

2.3.1 Features Common to All Alternatives

All alternatives contain some common features. These are presented below to reduce the length and redundancy of the individual alternative descriptions.

Implementation subject to funding availability. After the CCP is completed, actions will be implemented over a period of 15 years as funding becomes available. Draft project priorities and projected staffing/funding needs are included in Appendix C.

The CCP sets priorities for implementation. Actions will be implemented over a period of 15 years as funding becomes available.

State coordination. Under all alternatives, the Service would continue to maintain regular discussions with the Idaho Department of Fish and Game (IDFG). Key topics of discussion would include habitat management for waterfowl and other migratory birds; updates of waterfowl management plans; wildlife monitoring; and hunting and fishing seasons and regulations.

Tribal coordination. The Service would coordinate and consult with the Kootenai Tribe of Idaho on a regular basis regarding issues of shared interest relating to traditionally shared resource interests such as fisheries restoration. The Service would also seek assistance from the Tribe, as needed, on issues related to cultural resources education and interpretation, special programs, and the National Historic Preservation Act (NHPA).

Maintain waterfowl habitat in support of Pacific Flyway planning efforts. The Pacific Flyway Council (PFC) prepares management plans for most populations of swans, geese, and sandhill cranes in the Pacific Flyway (www.pacificflyway.gov). These plans help state and Federal agencies cooperatively manage migratory game birds under common goals. Defining the role and extent of waterfowl habitat, including sanctuary areas (areas closed to hunting and significant disturbance from other public uses) is a component of Pacific Flyway waterfowl management plans. Kootenai NWR will continue to manage waterfowl habitat and will make adjustments as needed, in support of these plans (see Chapter 1).

Invasive species control. Because invasive plants and animals currently represent the greatest threat to the Refuge's wildlife and habitat, control of invasive species will be a high-priority management activity in all alternatives. State-listed noxious weeds would continue to be a primary management concern. Nonnoxious weeds such as common mullein, common teasel, horseweed, and tumble mustard also limit the Refuge's ability to provide high quality habitat for migratory birds and other trust species, and will be controlled to the degree that funding permits. Invasive species control will be initiated prior to or concurrently with habitat restoration efforts. The Refuge's Integrated Pest Management Plan is included in this CCP (Appendix F).

Integrated pest management. In accordance with Department of the Interior and Service policy (517 DM 1 and 569 FW 1), an integrated pest management (IPM) approach would be used where practicable, to eradicate, control, or contain pest and invasive species (herein collectively referred to as pests) on the Refuge. An IPM approach would involve using methods based upon effectiveness, cost, and minimal ecological disruption, which considers minimum potential effects to non-target species and the refuge environment. 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 the Refuge, the most specific (selective) chemical available for the target species would be used, unless considerations of persistence or other environmental and/or biotic hazards preclude it. In accordance with 517 DM 1, pesticide usage would be further restricted, because only pesticides registered with the US Environmental Protection Agency (USEPA), in full compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), and as provided in regulations, orders, or permits issued by USEPA, may be applied on lands and waters under refuge jurisdiction.

Environmental harm by pest species would refer to a biologically substantial decrease in environmental quality as indicated by a variety of potential factors, including declines in native species populations or communities, degraded habitat quality or long-term habitat loss, and/or altered ecological processes. Environmental harm may result from direct effects to native species from pests, including preying and feeding on native species; causing or vectoring diseases; preventing natives from reproducing or killing their young; out-competing native species for food, nutrients, light, nest sites or other vital resources; or hybridizing with natives so frequently that within a few generations few if any truly native individuals remain.

Environmental harm can also be the result of an indirect effect of pest species. For example, decreased waterfowl use may result from invasive plant infestations reducing the availability and/or abundance of native wetland plants that provide forage for native species during the winter. Environmental harm may also include detrimental changes in ecological processes. For example, reed canarygrass in wet meadows and seasonal wetlands can displace native sedges, grasses, forbs, and shrubs.

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

Participation in regional land protection planning. We will participate in area land protection planning efforts in cooperation with other refuges, agencies, and interested parties to assess and identify land conservation priorities. Land protection as part of the NWRS may include fee title acquisition, conservation easements, and cooperative agreements.

Cultural resource protection and Section 106 compliance. Actions with the potential to affect cultural resources will undergo a thorough review before being implemented, as is consistent with the requirements of cultural resource laws. All ground-disturbing projects will undergo a review under Section 106 of the National Historic Preservation Act.

Emphasis on wildlife-dependent public uses. The National Wildlife Refuge System Administration Act, as amended, mandates that NWRs provide wildlife-dependent public uses, including hunting, fishing, wildlife observation and photography, interpretation, and environmental education, when these uses are compatible with the needs of wildlife. Therefore, providing compatible wildlife-dependent public uses is a high priority in all alternatives.

Monitor effects of public use programs on wildlife. Monitoring to assess the effects of public use on wildlife would be conducted. Area, timing, and/or conduct of public uses would be modified if disturbance to wildlife or habitat degradation reaches unacceptable levels.

Maintenance and updating of existing facilities. Periodic maintenance and updating of refuge buildings and facilities will be necessary regardless of the alternative selected. Periodic updating of facilities is necessary for safety and accessibility, reducing the Refuge's carbon footprint, and to support staff and management needs; and is incorporated in the Service Asset and Maintenance Management System.

Reduce the Refuge's carbon footprint. The Service has developed a Strategic Plan for Responding to Accelerating Climate Change in the 21st Century (2009), and a 5 year Action Plan outlining specific actions needed to implement the Strategic Plan. The Action Plan calls for the Service to make its operations carbon-neutral by 2020. The Refuge will work toward this goal by replacing its current vehicles with more fuel efficient vehicles, and by building appropriately sized, energy-efficient facilities, as funding becomes available. The Refuge will also reduce the carbon footprint of land management activities by using energy-efficient techniques, where feasible and in line with management goals. The Refuge will also explore ways of offsetting any remaining carbon balance, such as carbon sequestration.

Management of minor recreational uses. Minor recreational activities are occasionally pursued on the Refuge. Such recreational activities not specifically addressed in this document may be allowed on refuge lands if the Refuge Manager finds that they are appropriate and compatible.

Participation in planning and review of regional development activities. The Service will actively participate in planning and studies pertaining to future development, transportation, recreation, contamination, and other potential concerns that may affect refuge resources. The Service will continue to cultivate working relationships with local, state, and Federal agencies to stay abreast of current and potential developments; and will use outreach and education as needed to raise awareness of refuge resources and dependence on the local environment.

Volunteer opportunities and partnerships. Volunteer opportunities and partnerships are key components of the successful management of public lands, and are vital to refuge programs, plans, and projects, especially in times of static or declining budgets. In the future, successful implementation of native habitat restoration, survey and monitoring activities, and environmental education and interpretation programs will require the use of partnerships and volunteers.

Wilderness review. The Service's CCP policy requires that a wilderness review be completed for all CCPs. If it is determined that the potential for wilderness designation is found, the process moves on to the wilderness study phase. As part of the process for this Draft CCP/EA, the planning team completed a wilderness review which can be found in Appendix D. This review concluded that the Refuge is not suitable for wilderness designation.

2.3.2 Alternative Description Summary

A brief description of each alternative follows. Maps displaying the three alternatives follow the alternatives descriptions. Maps 4-5 display habitat areas proposed under each alternative, while Maps 6-8 display public use facilities proposed under each alternative.

Alternative 1: No Action Alternative (Current Management)

Wildlife and habitat. Wetlands, croplands, and grasslands are managed for migratory waterfowl, shorebirds, deer, and elk. Approximately 200 acres of grain crops are grown annually to provide high-energy food for migrating waterfowl and reduce the threat of depredation locally. Moist-soil management has been limited. Grassland management has focused on producing forage for deer and elk. Forest habitat management has been minimal except to suppress wildfire. Existing riparian habitat is maintained and areas where riparian trees are recruiting naturally are protected.

Public use. Waterfowl hunting, both free-roam and fixed blind, is allowed on 740 acres, 4 days per week, in accordance with the State's season. There is a 91-acre non-shooting area along the Auto Tour Route to provide for public safety. Retrieval of game is allowed in this area. Big game and upland game (grouse) hunting are allowed on the 295 acres of timber on the west side of Lions Den and Westside Roads. No fees, permits, or reservations are required. Fishing is allowed only from the banks of Myrtle Creek. Wildlife observation and photography are permissible on the Auto Tour Route (ATR) and all of trails. The 4.5-mile ATR is open to vehicles, walking, bicycling, jogging, dog walking, and cross-country skiing, and snowshoeing year round as weather and road conditions permit. Five trails (5.2 miles total) are open to walking, jogging, and dog walking (on leash) year round, except for Island Pond Trail which is closed on hunt days during the waterfowl hunting season. The Environmental Education Center is available for self-serve, teacher-led, and occasionally staff-led, programs.

Alternative 2: Preferred Alternative

Wildlife and habitat. Wetland, cropland, and grassland management for migratory waterfowl, shorebirds, deer, and elk would continue. Increased restoration of native riparian and grassland habitats would occur. Crop acreage (small grains and green browse) would remain at 200 acres but may decrease to 125 acres with an increase in acreage of moist-soil wetlands which would be intensively managed to provide natural food sources for waterfowl. Repairs and improvements to the existing water management infrastructure would occur to increase the Refuge's ability to manage wetlands. Existing riparian habitat would be maintained and additional areas would be established. In forested and other upland habitats, wildfires would still be suppressed and forest would be thinned to maintain an open understory and reduce ladder fuels. The Refuge would work with partners to examine the feasibility of restoring degraded stream habitats for the benefit of native fish. The Refuge would initiate a land protection plan study to analyze alternatives for possible refuge boundary expansion to include 120 acres of Deep Creek floodplain immediately south of the Refuge that is under current ownership of Idaho Dept. of Lands (IDL).

Public use. Wildlife observation, photography, walking, jogging, and leashed-dog walking would continue on the ATR. Wildlife observation, photography, walking would be allowed on four trails (3.7 miles total). Bicycling, cross-country skiing, and snowshoeing would continue on the ATR as weather and road conditions permit. Cross-country skiing and snowshoeing would also be allowed on refuge trails as conditions permit. Island Pond Trail would be closed to reduce human disturbance to waterfowl. Interpretation and environmental education programs would increase with the assistance of temporary staff, volunteers, and the Friends Group.

Waterfowl hunting would be allowed 4 days per week, in accordance with the State's season. The waterfowl hunt area would be reduced to 605 acres due to the expansion of the non-shooting area to 225 acres, to provide for public safety. Retrieval of game would be allowed in the non-shooting area. The non-shooting area would be 200 yards wide along the west side of the ATR and the Deep Creek Trail. This should have little effect upon hunting opportunities since these areas are rarely hunted. Both free-roam and fixed blind hunting will continue to occur throughout the waterfowl hunt area unless hunt program monitoring demonstrates that user group conflicts exist. An additional ADA-accessible blind will be constructed on the north hunt unit. South Pond will be open to hunting from the ADA blind only. An adaptive management strategy, based upon hunter surveys, hunt program monitoring, and/or data on habitat quality and waterfowl use of wetlands, would determine the location of fixed blinds and free-roam hunt areas.

Big game and upland game (grouse only) hunting west of Westside Road would be discontinued due to public safety concerns, increasing law enforcement violations, and low hunt quality. Big game and grouse hunting would continue to be allowed west of Lions Den Road. Turkey hunting would also be allowed west of Lions Den Road. Special permit and/or depredation hunts would be developed, in consultation with Idaho Department of Fish and Game, for white-tailed deer and elk within the area that is currently closed to big game hunting if monitoring demonstrates a need for population control. Fishing would be allowed only from the banks of Myrtle Creek .

Alternative 3

Wildlife and habitat. This alternative is similar to Alternative 2 in terms of habitat management. However, fewer areas would be planted to crops since more acres are managed as moist-soil wetlands than in Alternative 1. The acreage in crops and moist soil would be intermediate between Alternatives 1 and 2.

Public use. Wildlife observation, photography, walking, jogging, and leashed-dog walking would continue on the ATR. Bicycling, cross-country skiing, and snowshoeing would continue on the ATR as weather and road conditions permit. Wildlife observation, photography, walking would be allowed on five trails (4.8 miles total). Cross-country skiing and snowshoeing would also be allowed on refuge trails as conditions permit. Island Pond Trail would be closed but the 1.1 mile Kootenai River Trail, closed in 2004, would be re-opened. All trails will be open year-round, weather permitting. Interpretation and environmental education programs would increase with the assistance of temporary staff, volunteers, and the Friends Group.

Waterfowl hunting, big game hunting, upland game hunting, and turkey hunting would be the same as in Alternative 2. Catch and release fishing would be offered from the banks of Myrtle Creek below the pedestrian bridge, using single, barbless, non-baited hooks only.

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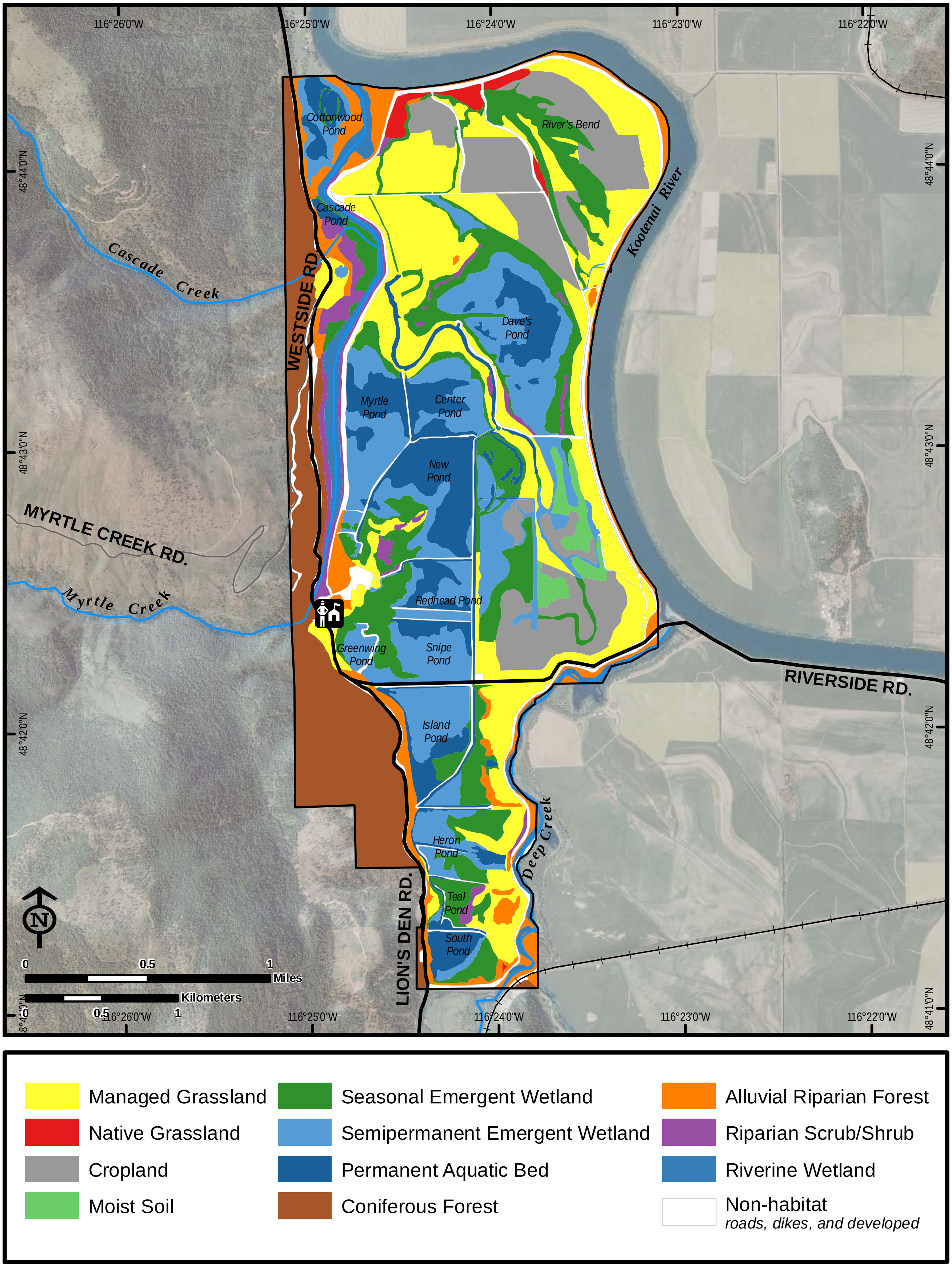
Map 4. Alternative 1 — *Current Management Habitats*



Map Date: 7/6/2011 File: 11-071-4.mxd

Data Source: USDA National Agriculture Imagery Program 2009

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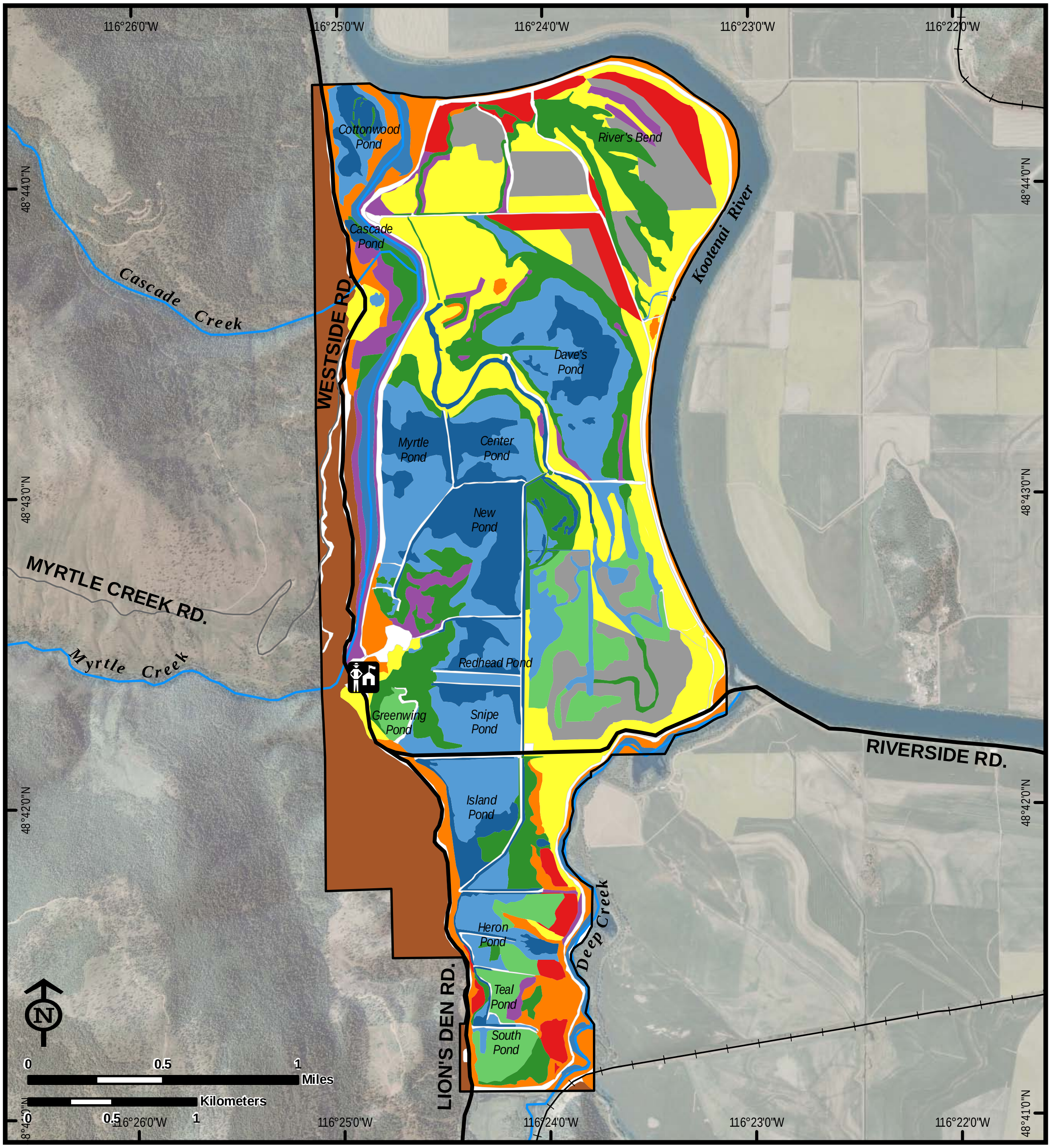
Map 5. Alternative 2 *(Preferred Alternative) Future Management Habitats*



Managed Grassland	Seasonal Emergent Wetland	Alluvial Riparian Forest
Native Grassland	Semipermanent Emergent Wetland	Riparian Scrub/Shrub
Cropland	Permanent Aquatic Bed	Riverine Wetland
Moist Soil	Coniferous Forest	Non-habitat *roads, dikes, and developed*

Map Date: 7/6/2011 File: 11-071-5.mxd
Data Source: USDA National Agriculture Imagery Program 2009

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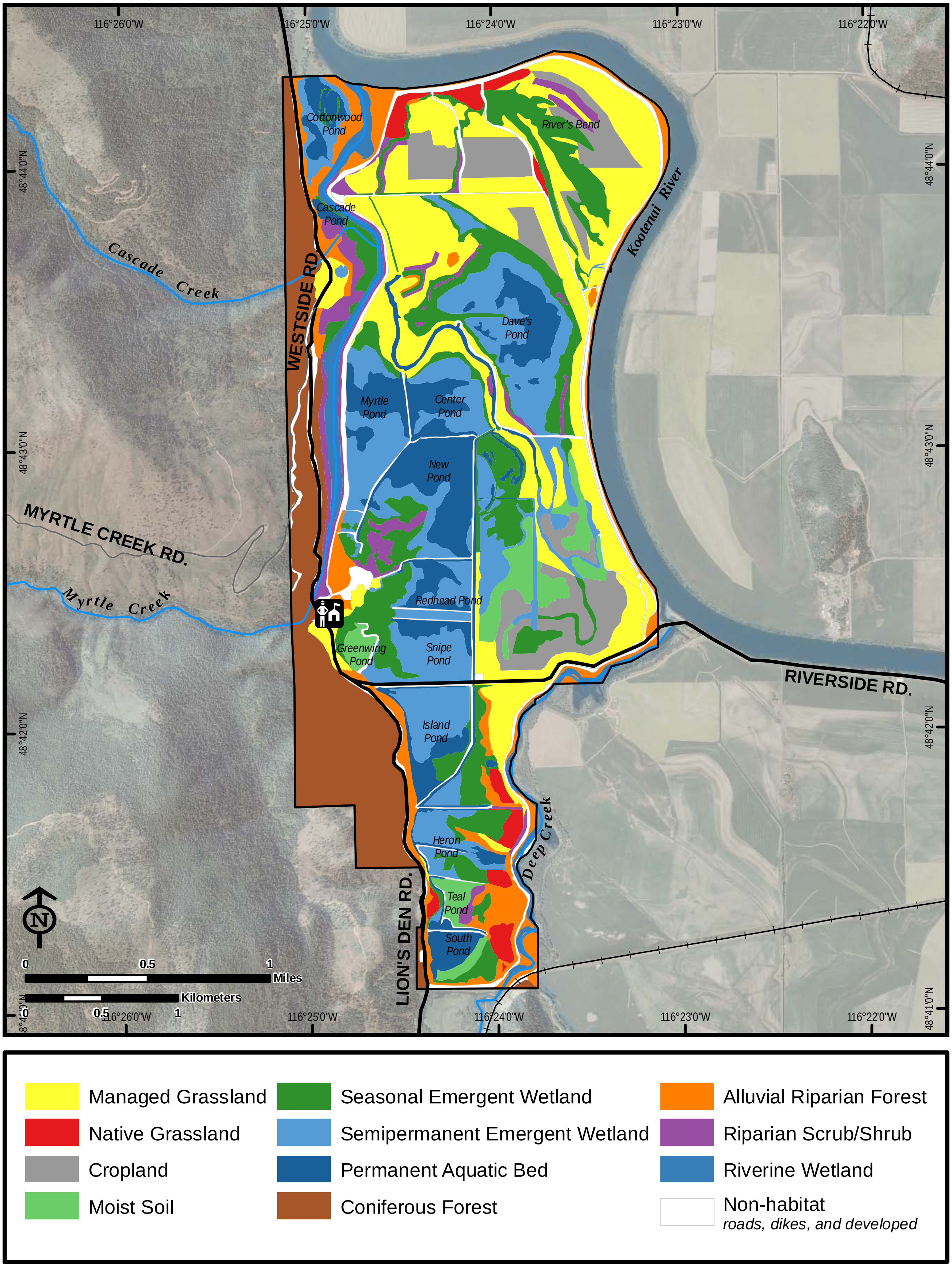
Map 6. Alternative 3 — *Future Management Habitats*



Map Date: 7/6/2011 File: 11-071-6.mxd

Data Source: USDA National Agriculture Imagery Program 2009

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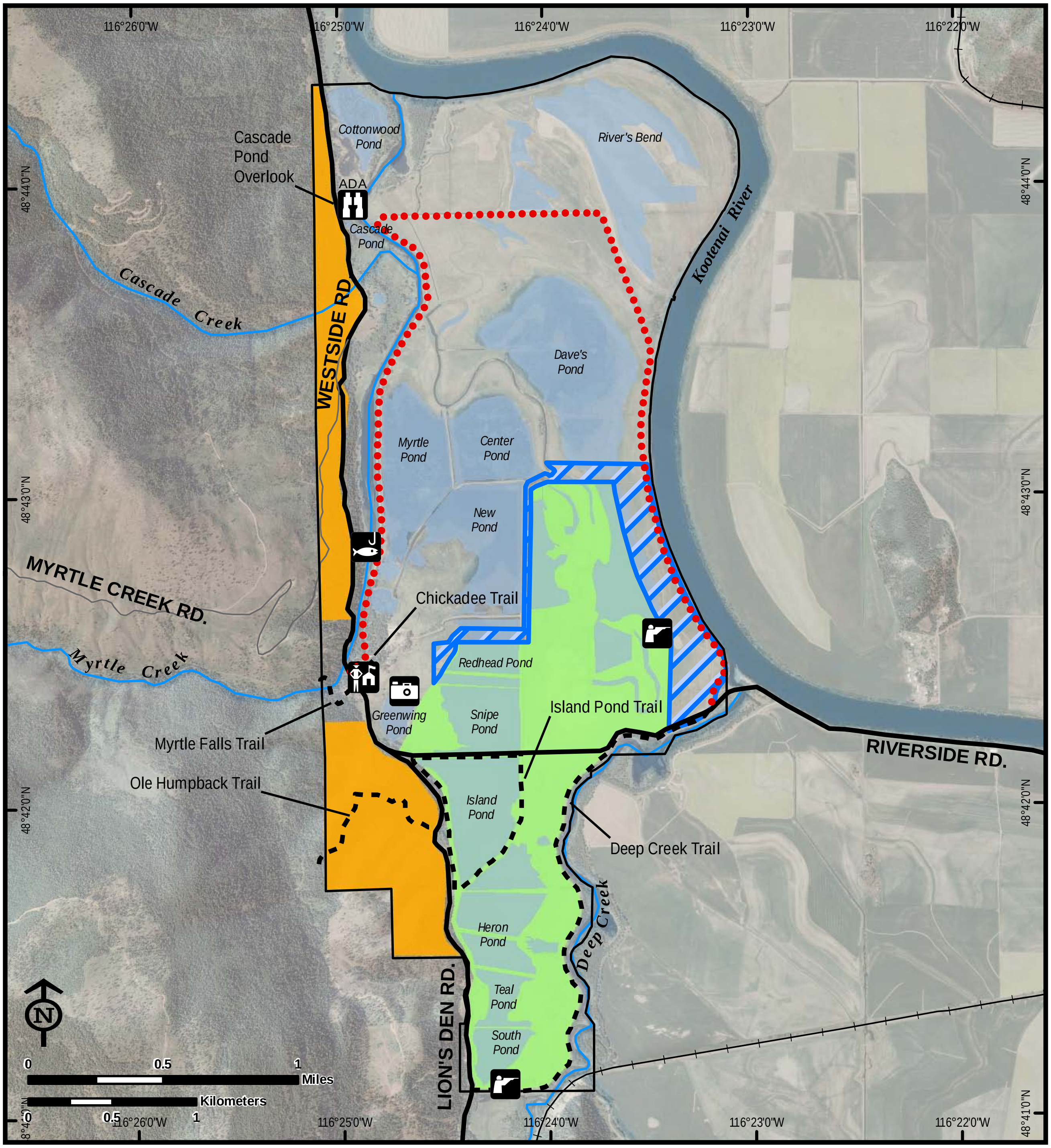
Map 7. Alternative 1 — *Current Management Public Use*



Refuge Headquarters
Refuge Boundary
Ponds
County Roads
Other Roads

Wildlife Viewing
Photo Blind
Refuge Trails
walking, x-c skiing, snowshoeing, jogging, & leashed-dog walking
Auto Tour Route
same as trails but includes bicycling

Bank Fishing Only
ADA Accessible Hunting Blind
Retrieving Zone
Grouse & Big Game Hunting
Waterfowl Hunting *(Tu, Th, Sat, Sun)*

Map Date: 7/7/2011 File: 11-071-1.mxd
Data Source: USDA National Agriculture Imagery Program 2009

ADA denotes ADA accessibile facility

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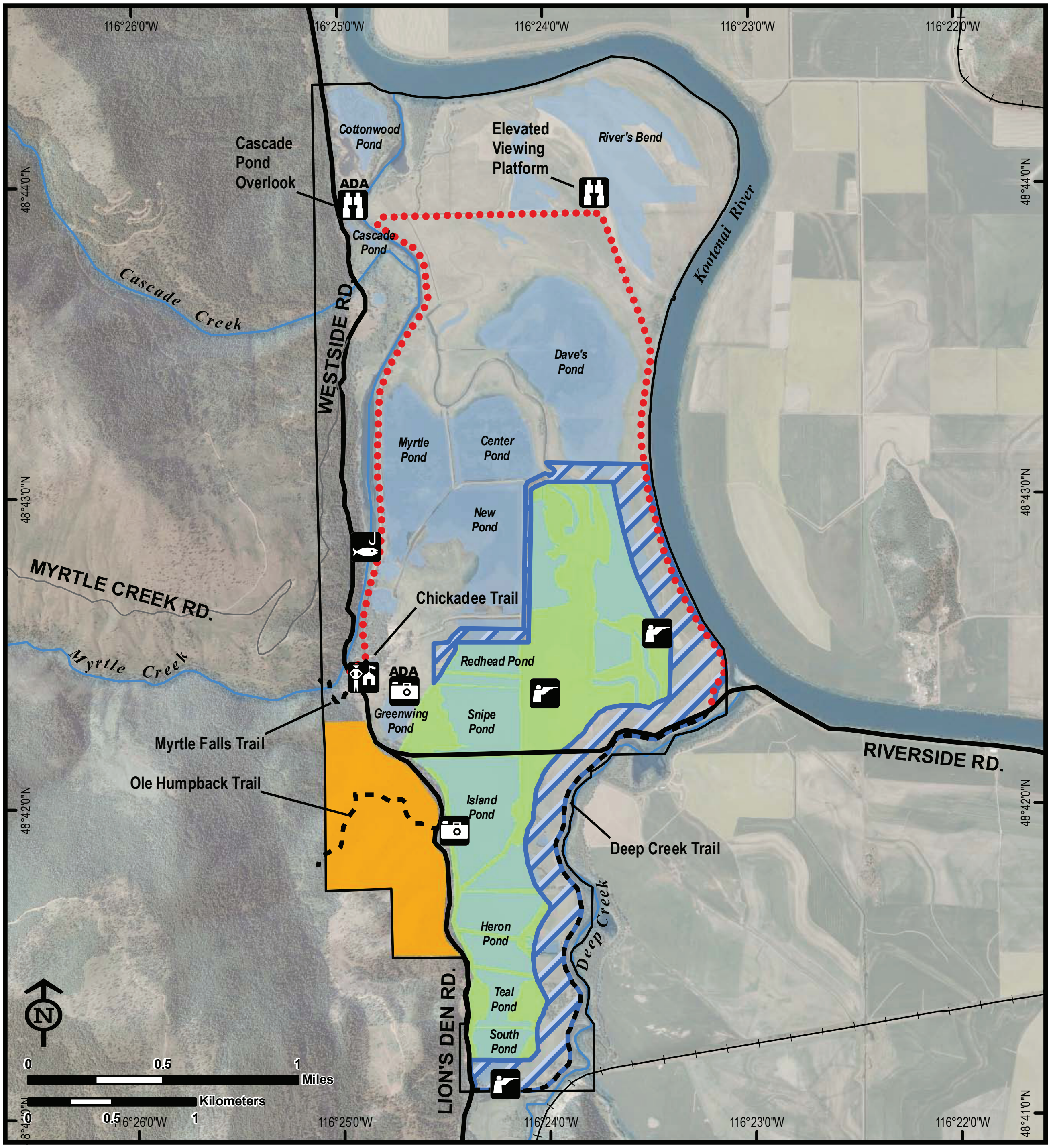
Map 8. Alternative 2 ***(Preferred Alternative) Future Management Public Use***



Refuge Headquarters
Refuge Boundary
Ponds
County Roads
Other Roads
Wildlife Viewing
Photo Blind
Refuge Trails
walking, x-c skiing, & snowshoeing
Auto Tour Route
same as trails but includes bicycling, jogging, & leashed dog walking
Bank Fishing Only
ADA Accessibile Hunting Blind
Retrieving Zone
Turkey, Grouse, & Big Game Hunting
Waterfowl Hunting *(Tu, Th, Sat, Sun)*

Map Date: 7/28/2011 File: 11-071-2.mxd
Data Source: USDA National Agriculture Imagery Program 2009

Locations of future public use facilities are approximate and may change based on future site planning.
ADA denotes ADA accessibile facility

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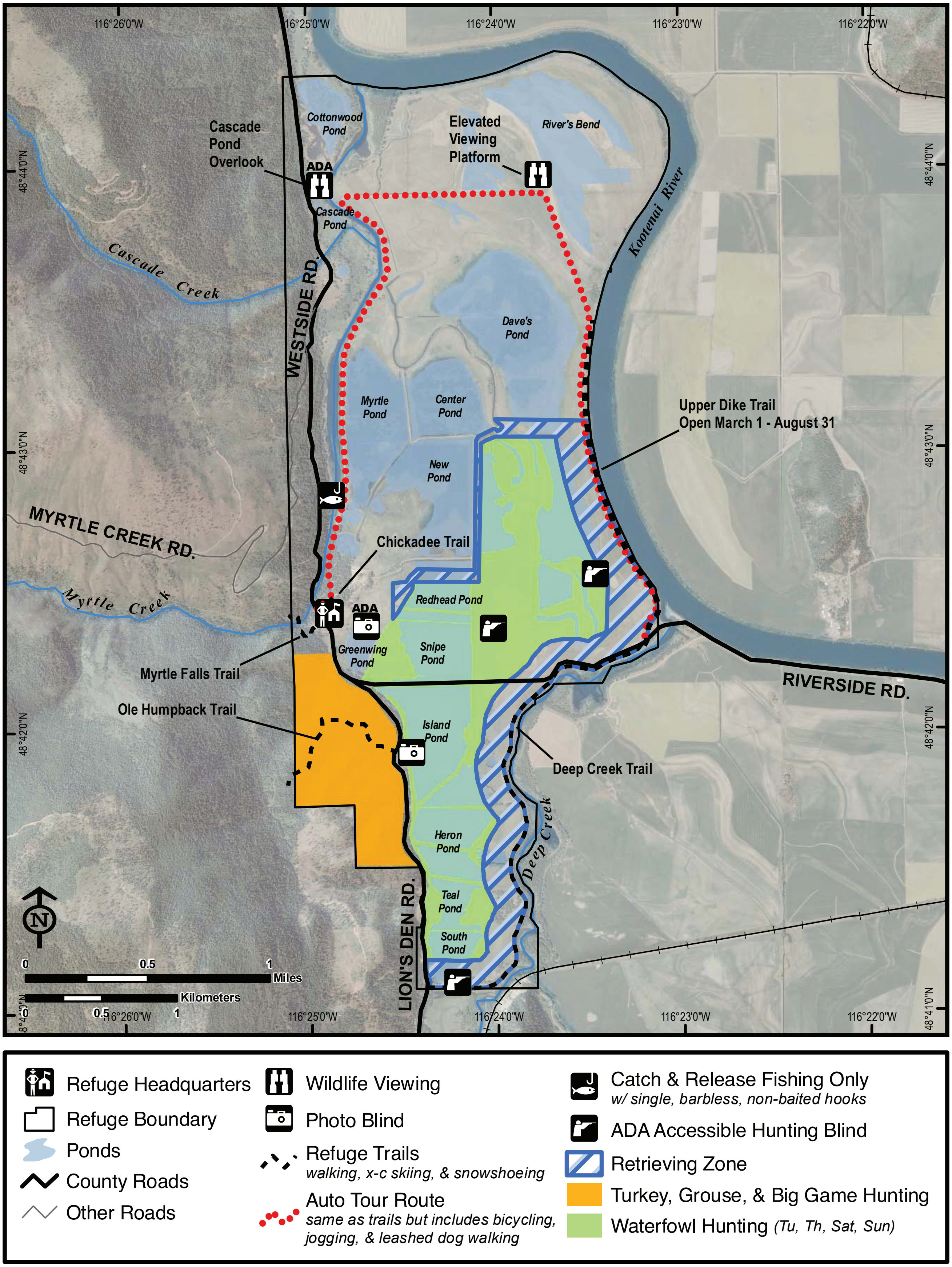
Map 9. Alternative 3 — *Future Management Public Use*



Map Date: 7/28/2011 File: 11-071-3.mxd
Data Source: USDA National Agriculture Imagery Program 2009

Locations of future public use facilities are approximate and may change based on future site planning.
ADA denotes ADA accessibile facility

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Table 2.1. Summary of CCP Actions, by Alternative.

Theme/Issue	Alternative 1 (No Action) Continue Current Management	Alternative 2 (Preferred Alternative) Healthy Wildlife Habitats; Biodiversity Gains; Maximize Natural Food Production for Waterfowl and Decrease Emphasis on Crops; Balanced Public Uses that Reduce Disturbance to Sensitive Wildlife	Alternative 3 Healthy Wildlife Habitats; Biodiversity Gains; Increased Emphasis on Natural Food Production for Waterfowl and Decreased Emphasis on Crops; Increased Public Use Opportunities
Grassland and Cropland			

Grassland	• Protect and maintain 560 acres of managed grasslands (primarily non-native grasses); management directed toward producing big game forage, controlling noxious weeds.	• a) Protect and maintain 435-460 acres of managed grasslands and restored native grasslands, including:
		  ○ 360-410 acres of managed grassland
		  ○ 50-75 acres restored native upland grassland or wet meadow
		• b) 100-125 acres of current managed grasslands converted to non-grassland habitat types
			• a) Protect and maintain 385-410 acres of managed grasslands and restored native grasslands, including:
			  ○ 310-360 acres managed grassland
			  ○ 50-75 acres restored native upland grassland or wet meadow
			• b) 150-175 acres of current managed grasslands converted to non-grassland habitat types

Crops	• Provide 200 acres of small grains and green browse annually for migratory waterfowl in upland areas. (420 acres of grassland/upland areas available as cropland; approximately ½ of acreage in crops annually).	• Provide 125-200 acres of small grains and green browse annually for migratory waterfowl in upland areas. • Restore 75-100 acres of cropland to native upland grassland or wet meadow once moist-soil habitat is established.	• Provide 150-200 acres of small grains and green browse annually for migratory waterfowl in upland areas. • Restore 25-50 acres of cropland to native upland grassland or wet meadow once moist-soil habitat is established.

Theme/Issue	Alternative 1 (No Action)	Alternative 2	Alternative 3
Freshwater Aquatic Habitats			
Wetlands—Moist-Soil Wetlands	• Provide 10-20 acres of moist-soil habitat annually.	• Provide 75-100 acres of moist-soil habitat annually.	• Provide 25-50 acres of moist-soil habitat annually.
Wetlands—Seasonal Wetlands	• Protect and maintain 417-427 acres of seasonal wetlands	• Protect and maintain 337-362 acres of seasonal wetlands	• Protect and maintain 387-412 acres of seasonal wetlands
Wetlands—Semi-permanent	• Protect and maintain 450 acres of semi-permanent wetlands.	• Protect and maintain 355-450 acres of semi-permanent wetlands.	
Wetlands—Permanent	• Protect and maintain 295 acres of permanent wetlands.	• Protect and maintain 229-283 acres of permanent wetlands.	
Water Management	• Identified need to increase pumping capacity from Kootenai River, Deep Creek, and Myrtle Creek. Replaced Deep Creek Pump with higher efficiency pump. Replace Myrtle Creek Pump	• Improve and upgrade wetland management infrastructure to meet wetland management objectives and protect native fish. • Replace Myrtle Creek Pump.	
Forest Habitat			
Moist Mixed Coniferous Forest	• Protect and maintain 267 acres of existing late-successional mixed moist coniferous forest; conduct minimal management activity (e.g., fire suppression).		
Late Seral Dry Forest	• Protect and maintain 50 acres of existing late seral dry coniferous forest; conduct minimal management activity (e.g., fire suppression).	• Protect and maintain 50 acres of existing late seral dry coniferous forest. • Hand thin to maintain open understory and remove ladder fuels (in lieu of prescribed fire).	
Mixed Moist Deciduous Forest	• Protect and maintain 10 acres of existing mixed moist deciduous forest; conduct minimal management activity (e.g., fire suppression).	• Protect and maintain 10 acres of existing mixed moist deciduous forest. • Reduce conifer encroachment, increase aspen/cottonwood recruitment.	

Theme/Issue	Alternative 1 (No Action)	Alternative 2	Alternative 3
Riparian Habitat			
Mid- to Late-Successional Alluvial Riparian Woodland	• Protect and maintain 104 acres of existing mid- to late-successional riparian woodland; allow opportunistic recruitment of bottomland hardwood trees.	• Protect, maintain, and restore 104 acres of existing mid- to late-successional riparian woodland. • Restore up to 15-20 acres of riparian habitat over lifetime of CCP. • Manage suitable areas to increase recruitment of bottomland hardwoods. • Populations of deer/elk managed by special permit hunts or depredation hunts, as appropriate, to limit damage to riparian habitat.	
Riparian Scrub-Shrub	• Protect and maintain 108 acres of existing riparian scrub-shrub habitat.	• Protect and maintain 108 acres of riparian scrub-shrub habitat. • Restore 20-30 acres of riparian shrub in managed grasslands over lifetime of CCP.	
Instream Habitat and Fisheries Restoration			
Upper Myrtle Creek, Cascade Creek	• Minimal management activity on Upper Myrtle Creek (.34 miles) Cascade Creek (.51 miles) within refuge boundary). Note: Includes only stream miles within Refuge	• Protect and maintain the upper .34 miles of Myrtle Creek, and upper Cascade Creek .19 miles to provide habitat for bull trout and native redband rainbow trout. • Work with USFS, County to reduce impacts of roads to instream habitat.	
Lower Myrtle Creek, Lower Cascade Creek	• Minimal management activity on lower Myrtle Creek (2.17 miles); major constraints to restoration exist; backwaters of Kootenai River prevent riparian restoration. • Minimal management activity on lower Cascade Creek (approx .32 miles)	• Work with partners to examine feasibility of, and develop strategies for restoration; conduct restoration activities where feasible. • Conduct feasibility study for restoring sinuousity to lower Myrtle Creek. • Conduct feasibility study to restore the lower reach (.32 miles) of Cascade Creek	
Deep Creek	• Minimal management activity; major constraints to restoration exist (dikes, Kootenai River backwaters, upstream activities). • Work with partners and neighboring landowners to improve water quality. Note: Most of Deep Creek (20.8 miles) lies outside refuge boundary; Refuge owns only west bank of the lower 2.1 miles, and both banks of 0.3 miles.		
Native Fish (bull trout, kokanee, Kootenai River white sturgeon, burbot)	• Support fisheries restoration projects for kokanee (egg planting), Kootenai River white sturgeon (spawning habitat), and	*As in Current Management, but also:* • Collaborate with USFWS Fisheries Office on aquatic resource inventory and habitat surveys.	

Theme/Issue	Alternative 1 (No Action)	Alternative 2	Alternative 3
	burbot (USFWS, IDFG, KTOI).		
Public Use			
Auto Tour Route	• Maintain 4.5-mile Auto Tour Route in its current configuration. Open to vehicles, walking, jogging, leashed-dog walking, and bicycling when weather/road conditions permit, including hunt days. Route not plowed; passable to passenger vehicles from March to early December. Open to cross-country skiing and snowshoeing in winter.	*As in Current Management, but also:* • Provide alternate methods of interpretation on tour route, e.g., radio announcing system, CD, and/or interpretive brochure. • Monitor disturbance to breeding waterfowl and waterbirds caused by bicycle and foot traffic, limit these uses (e.g., by permit or time of day) if disturbance issues warrant. • Provide up to 2 additional pullouts/passing areas. • Develop elevated viewing platform and provide interpretive signs. • 6-foot maximum leash length for dogs.	
Waterfowl Hunting	• 740 acres (28% of Refuge and 46% of waterfowl habitat) open to waterfowl hunting in accordance with State seasons and regulations, on Tues, Thurs, Sat, and Sun, all day (dawn to dusk). Both free-roam and spaced blinds occur in the same area. No fees, permits, reservations required; first-come, first-serve. • 91-acre non-shooting area/retrieval zone along east side of Auto Tour Route.	*As in Current Management, except:* • 605 acres open to waterfowl hunting in accordance with State seasons and regulations, on Tuesday, Thursday, Saturday, and Sunday, all day (dawn to dusk). • 225 acre (200 yard) non-shooting area/retrieval zone along Auto Tour Route and Deep Creek Trail. • Both free-roam and spaced blinds occur in the same area unless hunt program monitoring demonstrates that conflicts exist. Adjust blind types and locations based on habitat use by waterfowl and hunter survey data. • Establish one additional ADA blind on north hunt unit. • South Pond open to hunting from blind only (ADA blind). • Develop a Hunter Hotline for updated waterfowl hunter information. • Increase FWS/law enforcement presence during hunt season. • Provide annual hunting clinics.	
Wildlife Observation and Photography	• Provide opportunities for self-guided wildlife observation and photography on Auto Tour Route, trails, Cascade Pond Overlook, orientation kiosk at HQ, and pullouts on county road.	*As in Current Management, but also:* • Provide up to 2 photography blinds. • Develop photography programs and contests.	

Theme/Issue	Alternative 1 (No Action)	Alternative 2	Alternative 3
	• Provide one photography blind.		
Trails* *Auto Tour Route not included in trail mileage	• Provide 5.2 miles of trails (Deep Creek, Island Pond, Ole Humpback, Myrtle Falls, Chickadee). • Trails open year-round except Island Pond Trail (closed to non-consumptive users on hunt days during hunt season).	• Provide 3.7 miles of trails (Deep Creek, Ole Humpback, Myrtle Falls, Chickadee). • Close Island Pond Trail to reduce impacts to waterfowl. • MOU with USFS to maintain/sign Myrtle Falls Trail, provide safety improvements at Myrtle Falls overlook (on USFS property). • Trails open year-round.	*As in Alt 2, except:* • Provide 4.8 miles of trails (Deep Creek, Kootenai River, Ole Humpback, Myrtle Falls, Chickadee). • Repair, sign, and re-open 1.1-mile Kootenai River (Upper Dike) Trail.
	• Walking, jogging, and leashed-dog walking allowed on all trails.	• Walking, snowshoeing, and cross-country skiing only on trails.	
Big Game Hunting And Upland Game Hunting	• 295 acres of Refuge open to big game (mule and white-tailed deer, elk, moose, black bear, mountain lion) and upland game (grouse) hunting; hunt area is west of Westside Road and Lions Den Road; does not overlap with waterfowl hunt area. • No big game hunting allowed on refuge flats (area east of Westside and Lions Den Roads)	• Discontinue big game and upland game (grouse) hunting west of Westside Road. • Continue to allow big game (mule and white-tailed deer, elk, moose, black bear, mountain lion) and upland game (grouse) hunting west of Lions Den Road (173 acres). • Allow turkey hunting west of Lions Den Road. • In consultation with IDFG, develop special permit and/or depredation hunts for white-tailed deer and elk on refuge flats if monitoring demonstrates the need for population control.	
Fishing	• Fishing allowed only in Myrtle Creek; bank fishing only during daylight hours only (sunrise to sunset).	*As in Current Management*	• Catch and release fishing allowed from banks of Myrtle Creek below the pedestrian bridge, using single, barbless, non baited hooks only.
Environmental Education and Interpretation	• Provide occasional staff-led interpretive programs. • Continue self-serve use of EE facility by local school groups;	• Hire seasonal/term/temp staff to conduct public outreach; develop interp. program, deliver volunteer training (interpretive programs conducted by trained volunteers). • Hire term or temp staff to develop refuge-specific EE curriculum, deliver	

Theme/Issue	Alternative 1 (No Action)	Alternative 2	Alternative 3
	EE programs teacher-led; no teacher training or refuge-specific curriculum. • Provide interpretive exhibits at headquarters.	teacher training (EE programs conducted by teachers who have received training and use refuge-specific curricula). • Develop self-serve I and E modules/activities for refuge visitors.	
Welcome and Orient Visitors	• Provide information kiosks and refuge brochures at refuge entrance and headquarters. • Receptionist available weekdays only.	*As in Current Management, but also:* • Recruit/train volunteers to provide visitor information during times of peak demand (hunt season, spring). • Develop website with "virtual tour" of Refuge.	
Friends Group/Volunteers	• Hire seasonal AmeriCorps staff to build Friends Group and volunteer workforce.	• Hire term, seasonal park ranger, or use long-term volunteer to build volunteer workforce. • Conduct member drive to recruit Friends Group members. • Develop needs list to guide Friends Group efforts.	
Other Refuge Management Actions			
Monitoring of Wildlife Disturbance	• No monitoring conducted except for anecdotal observations of disturbance to wildlife caused by public use.	• Monitor disturbance to wildlife caused by public uses on the Auto Tour Route and trails, and waterfowl hunting. • Monitor angling activities/use on Myrtle Creek and potential impacts to bull trout.	
Land Protection	• No land protection efforts outside of current refuge boundary.	• Initiate a land protection plan study to analyze alternatives for possible refuge boundary expansion to include 120 acres of Deep Creek floodplain immediately south of the Refuge that is under current ownership of Idaho Dept. of Lands (IDL).	

2.4 Goals, Objectives, and Strategies

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

A CCP describes management actions that help bring a refuge closer to its vision. A vision broadly reflects the refuge purposes, the Refuge System mission and goals, other statutory requirements, and larger-scale plans as appropriate. Goals then define general targets in support of the vision, followed by objectives that direct effort into incremental and measurable steps toward achieving those goals. Strategies identify specific tools and actions to accomplish objectives (USDI 2002).

In the development of this Draft CCP, the Service prepared an environmental assessment. The environmental assessment evaluates alternative sets of management actions derived from a variety of management goals, objectives, and implementation strategies.

The draft goals for Kootenai National Wildlife Refuge for the next 15 years, following completion of the CCP, are presented in the following tables. 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 goal order does **not** imply any priority in this CCP. Priority actions are identified in the staffing and funding analysis (Implementation, Appendix C).

Readers, please note the following:

- The objective statements as written apply to the Service's Preferred Alternative, Alternative 2.
- ***Text underlined and italicized*** in the objective statement indicates specific items (i.e., acreages) that vary in the other alternatives. How those items vary is displayed in the short table under each objective statement; as applicable, each other alternative shows substitute text for the item or items in italics.
- If an objective is not in a particular alternative, a blank is used to indicate that this objective is not addressed in that alternative.

Below each objective statement are the strategies that could be employed in order to accomplish the objectives. Note the following:

- Check marks (✓) alongside each strategy show which alternatives include that strategy.
- If a column for a particular alternative does not include a check mark for a listed strategy, it means that strategy will not be used in that alternative.

Other symbols used in the following tables include:

% percent sign
> greater than
< less than
$\geq$ greater than or equal to
$\leq$ less than or equal to

2.4.1 GOAL 1: Provide and manage a mixture of secure, diverse, productive grassland habitats for foraging and nesting migratory waterfowl and grassland-dependent wildlife.

Objective 1.1. Managed grassland/shrublands

Annually maintain *435-460 acres* of managed grasslands with the following attributes to provide habitat for migratory landbirds (e.g., western meadowlark, savannah sparrow), small (e.g., vole spp.) and large mammals (e.g., white-tailed deer, elk), native amphibians, reptiles and invertebrates:

- A diverse mix of desirable sedges, bunch- and sod-forming grasses, and forbs (native species are preferred but desirable non-natives may be necessary).
- Mosaic of vegetation heights ranging from 6-36 inches.
- <5% cover of invasive plants (e.g., Canada thistle, yellow toadflax, spotted knapweed, common mullein, houndstongue)
- No hawkweed, teasel, poison hemlock

References
Tall upland grasslands: Robel et al. 1970, Kirsch et al. 1978, Greenwood et al. 1995, Sugden and Beyersbergen 1986, Higgins et al. 1992, Larivière and Messier 1998, Clark and Nudds 1991, Jiminez et.al 2007.
Short upland grasslands: Wiens 1973, Sample and Mossman 1997, Wiens 1969, Maher 1973, Owens and Myres 1973, Karuziak et al. 1977.

Alternatives	**Alt 1 (No Action)**	**Alt 2**	**Alt 3**
Objective as written above is modified by replacing acres in italics above with the text in this row.	560 acres	435-460 acres	385-410 acres
Strategies Applied to Achieve Objective	**Alt 1 (No Action)**	**Action Alts (2,3)**	
Management activities directed primarily toward noxious plant control and big game forage palatability (primarily monotypic stands of non-native grasses.)	✓		
Where possible, convert 50-75 acres existing monotypic stands of non-native grasses to native grasses and forbs on appropriate sites within the lifetime of the CCP (see Obj. 1.2). Management activities directed toward increasing desirable forbs, bunch- and sod-forming grasses, and the establishment of native grasses, sedges and forbs where possible, to increase use by a diversity of wildlife species.		✓	
Mow or hay at least once annually to control invasive plants, improve vigor of grass, maintain grass palatability, and minimize thatch.	✓		
Use prescribed fire or mowing as needed to manage thatch, invasive plants, and rank grasses. Treat less than 30% of individual fields annually to provide areas of tall grass/forbs for grassland bird nesting.		✓	
Delay mowing and haying until after August 1 to protect nesting habitat for grassland-dependent birds.	✓	✓	

Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive plants (see Appendix F, IPM Program)	✓	✓
Use agricultural practices (e.g., seeding, disking, fertilizing, soil amendments, herbicides) to rehabilitate grasslands that do not meet the habitat objective.	✓	✓
Maintain a 200-foot wide strip of less palatable grasses along both sides of Center Road to reduce deer use and deer/auto collisions (approx. 25 acres).	✓	

Rationale: The Refuge's managed grasslands have the potential to provide food and cover for a wide array of birds, mammals, amphibians, reptiles and invertebrates. Current management emphasizes noxious weed control and big game forage palatability by maintaining monotypic stands of non-native grasses. Lack of structural and floristic diversity limits the diversity of wildlife species using these areas. This objective encourages conversion of monotypic stands of non-native grasses to heterogeneous stands of mixed native and desirable non-native grasses and forbs of varying heights. Vertical diversity will increase grassland bird use, whereas an increased forb component will improve opportunities for insects, particularly pollinators. However, diking, altered river flow regimens and other human modifications hamper the ability of some native plant species to exist or compete on the Refuge. This objective recognizes some non-native species may be required to provide the best possible habitat characteristics for the widest range of desirable wildlife species, or for other management reasons (e.g., the strip of non-palatable grasses along Center Road, used to discourage deer use of this area).

Objective 1.2. Restore native upland grassland and wet meadow

Within the lifetime of the CCP, and where appropriate and feasible, restore *125-175 acres* of native upland grasslands and wet meadow to provide habitat for migratory landbirds (e.g., western meadowlark, savannah sparrow), small (e.g., vole spp.) and large mammals (e.g., white-tailed deer, elk), native amphibians, reptiles and invertebrates:

- A diverse mix of native bunch- and sod-forming grasses, sedges, and forbs (e.g., redtop in moist areas)
- Mosaic of vegetation heights ranging from 6-36 inches.
- <5% cover of invasive plants (e.g., Canada thistle, yellow toadflax, spotted knapweed, common mullein, houndstongue)
- No hawkweed, teasel, poison hemlock

References
Tall upland grasslands: Robel et al. 1970, Kirsch et al. 1978, Greenwood et al. 1995, Sugden and Beyersbergen 1986, Higgins et al. 1992, Larivière and Messier 1998, Clark and Nudds 1991, Jiminez et.al 2007.
Short upland grasslands: Wiens 1973, Sample and Mossman 1997, Wiens 1969, Maher 1973, Owens and Myres 1973, Karuziak et al. 1977.

Alternatives	Alt 1 (No Action)	Alt 2	Alt 3
Objective as written above is modified by replacing acres in italics above with the text in this row.	0 acres	125-175 acres	75-125 acres
Strategies Applied to Achieve Objective	**Alt 1 (No Action)**	**Alt 2**	**Alt 3**
Restore *50-75 acres* of non-native pasture to native upland grassland or wet meadow	0 acres	50-75 acres	50-75 acres

Restore *25-100 acres* of fallow cropland to native upland grassland or wet meadow	0 acres	75-100 acres	25-50 acres
Establish native grasses, sedges, and forbs in existing managed grassland and/or fallowed croplands. Prepare sites for planting using normal agricultural practices and equipment (e.g., herbicide applications).		✓	✓
Use prescribed fire, mowing, or haying as needed to manage thatch, invasive plants, and rank grasses. Treat less than 30% of acres annually to provide areas of tall grass/forbs for grassland bird nesting.		✓	✓
Delay mowing and haying until after August 1 to protect nesting habitat for grassland-dependent birds.		✓	✓
Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive plants (see Appendix F, IPM Program)		✓	✓
Rationale: With their high structural and floristic diversity, native upland grasslands and wet meadows provide food and cover for a wide array of birds, mammals, amphibians, reptiles and invertebrates. This objective encourages conversion of a portion of the Refuge's managed grassland and/or fallow croplands to native upland grassland or wet meadow, where site conditions permit. Restoration of native upland grassland or wet meadow will only be feasible in certain sites, due to soil type, diking, altered river flow regimes, and other human modifications. Species used in restoration will be selected based on site conditions (e.g., redtop would be an appropriate species for wetter areas.) Vertical diversity will increase grassland bird use, whereas an increased forb component will improve opportunities for insects, particularly pollinators.			

2.4.2 GOAL 2: Annually provide agricultural crops as forage for migratory waterfowl.

Objective 2.1: Provide Crops for Migratory Waterfowl

Annually provide *125-200 acres* of small grains, e.g., winter wheat, spring barley, millet as forage for migratory waterfowl and other wildlife.

- Minimal human disturbance in areas closed to public use and limited to necessary management activities (Oct 1 to April 1)
- Minimum buffer width of 328 feet (100 m) in non-hunt area to minimize human disturbance (<5% cover of invasive species (e.g., Canada thistle, wild oat, yellow toadflax, spotted knapweed)

Alternatives	**Alt 1 (No Action)**	**Alt 2**	**Alt 3**
Objective is modified by replacing acres in italics above with the text in this row.	Total: 200 acres	Total: 125-200 acres	Total: 150-200 acres
Strategies Applied to Achieve Objective	**Alt 1 (No Action)**	**Alt 2**	**Alt 3**
Use agricultural practices (e.g., seeding, crop rotation using legumes, disking, fertilizing, soil amendments, herbicides, plant cover crop).	✓	✓	✓
Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive plants (see Appendix F, IPM Program)	✓	✓	✓

Rotate cropping patterns with planned rehabilitations of managed grasslands where appropriate (see Objective 1.1).	✓	✓	✓
Use refuge staff (force account) to manage croplands.	✓	✓	✓
Rationale: Approximately 420 acres of cropland have recently been managed by the Refuge for waterfowl (mallard, American wigeon, and northern pintail, green-winged teal, and Canada geese). Of this, 200 acres is plowed and seeded to small grain crops (winter wheat, barley, and millet) every year on a rotational basis. Grain from standing refuge crops continues to be an important food source for migrating waterfowl in the fall and early spring. Rotational farming is used to break weed cycles and to allow volunteer crops to offset the cost of annual planting. However, these volunteer crops are prone to invasive plant infestations, which require resources to control. Although the agricultural footprint on the Refuge has been reduced by approximately 75% since 1973, waterfowl population trends in the Kootenai River Valley appear to have remained relatively constant. Croplands on refuge and state land promote sustained use of these areas by migrating waterfowl by providing an accessible, high-energy food source during late fall and early winter as wetlands freeze up. This reduces waterfowl depredation on adjacent croplands. The minimum recommended buffer width between crops and potential human disturbance (e.g., auto tour) is based on studies related to flushing distances. In their wintering waterfowl study Pease et al. (2005) noted that individual species responded differently to vehicle and pedestrian disturbance, noting that flushing rates dropped off beyond 328 feet. Others also recommend a buffer of 100 meters (328 feet) to minimize disturbance to most waterfowl and wetland birds (DeLong, 2002; and Rodgers and Smith, 1997). The use of moist-soil management in seasonal wetlands has the potential to provide important food resources for migrating waterfowl. Currently, moist-soil habitat on the Refuge is limited and productivity is low. As the Refuge develops and refines its moist-soil management capability, the number of cropland acres can be reduced and previously farmed areas can be restored to native habitats (e.g., seasonal wetlands, wet meadows, and upland grassland).			

2.4.3 GOAL 3: Provide, manage, and enhance a diverse assemblage of wetland habitats characteristic of the Kootenai River Valley.

Objective 3.1: Provide Moist-Soil Habitat

Enhance and annually maintain a minimum of *75-100 acres* of managed, moist-soil habitat for migratory waterfowl, wading birds, shorebirds, and other wetland-dependent wildlife species. Moist-soil wetlands are characterized by the following:

- >60% cover of desirable and/or native wetland plants including moist-soil annuals (e.g., smartweeds, wild millet, water plantain)
- <20% cover of native emergent species (e.g., cattail, hardstem bulrush) that are >5 feet tall
- <30% cover of undesirable/invasive plants including reed canarygrass
- <20% cover of reed canarygrass and <5% cover of other undesirable/invasive plants
- No purple loosestrife, poison hemlock, Eurasian milfoil
- During initial flood-up (September), water level depths 4-9 inches
- Maintain maximum water levels 3 feet to control reed canarygrass from late January to May
- Achieve drawdown by June 15
- Mudflats available for migratory shorebirds from May 15-June 15 (spring migrants) and Aug 15-Sept15 (fall migrants).
- Minimal damage to wetland infrastructure by muskrat and beaver

***Definition:** **Managed seasonal wetlands** are those wetlands which have existing infrastructure (pumps, culverts, water control structures) to manipulate water levels on a seasonal basis, relatively independent of water conditions in the surrounding watershed. References: Wildlife Management Handbook 13.1.1, Ringelman 1990, Frederickson in Bookout

Strategies Applied to Achieve Objective	Alt 1 (No Action)	Alt 2	Alt 3
Objective as written above applies to alternatives (✓) or the alternative is modified by replacing acres in italics above with the text in this row.			
Provide *75-100 acres* of moist-soil habitat annually. (Also see Objective 3.2, rotation of semi-perm, perm wetlands through drawdown and moist-soil mgmt)	10-20 acres	75-100 acres	25-50 acres
Use IPM strategies including mechanical, physical, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants (see Appendix F, IPM Program)	✓	✓	✓
Flood-up strategy: Slowly flood moist-soil units from mid-Sept thru Nov at a rate of 4-6 inches per week until units are near capacity (average depth of 18 inches). After each 4-6 inch increase, hold levels stable for 1 week until next increase. Water quantities for flooding include 1,400 acre feet pumped from the Kootenai River and 550 acre feet pumped from Deep Creek.	✓	✓	✓
Depth and timing of inundation for reed canarygrass control: Flood to >24 inches from late January to May	✓	✓	✓
Drawdown strategy: Begin slow drawdown in mid May; drop levels 2-4 inches/wk with goal of all units drawn down by mid-June or July 1, at the latest. Drawdown may require pumping between 670 and 1,000 acre feet from Center Ditch into lower Myrtle Creek	✓	✓	✓
Use mechanical techniques (e.g., disking, mowing) to set back succession and promote moist-soil and native plant production, control invasive/undesirable plants, and provide mudflats to promote shorebird use	✓	✓	✓
By 2027, repair approximately 8,525 linear feet of dikes between wetland cells and the Center Ditch in the North Unit to improve independent management of wetlands.		✓	✓
By 2027, isolate Center Ditch from ponds in the South Unit and extend the distribution ditch from the Deep Creek pump to include Heron Ponds to allow independent flooding and drawdown of wetland units.		✓	✓
By 2027, replace 5 cfs pump at Myrtle Creek outlet with higher capacity pump (at least 10 cfs) to dewater Center Ditch during May and June, allowing drawdown of all moist-soil units.		✓	
Use existing pump at Myrtle Creek Outlet and move Deep Creek Pump (or portable diesel pump) to assist with dewatering Center Ditch during May and June, allowing drawdown of units in the North Unit.			✓

Manage drawdown to correspond to reductions in Kootenai River flows. Allow wetlands on the east side of the North Unit and the South Unit to draw down naturally in late June for moist-soil management.		✓	✓
Use wetlands in drawdown status as sumps for water from moist-soil units to increase opportunity to drawdown without pumping		✓	✓
Use a rotational system that alternates moist-soil management and semi-permanent and permanent wetland status in Island, Snipe, Redhead, New, Center, Myrtle, and Dave's Ponds. (Also see Obj 3.3)		✓	✓
Use IPM techniques to control beaver and muskrat damage to water control structures and dike systems, in compliance with 50 CFR 3.14, Official Animal Control Operations, and 569 FW 1, Integrated Pest Management.	✓	✓	✓
Use mechanical, cultural, and chemical means, e.g., disking, herbicides, and water level management, to re-open areas that have become vegetated with persistent emergent vegetation in order to set back succession and maintain open, shallow water areas. Mechanically remove longer term mineral and organic deposits that lead to filling and wetland loss.	✓	✓	✓

Rationale: Moist-soil wetlands provide foraging habitat for fall and spring migrating waterfowl and waterbirds. These wetlands are intensively managed through soil disturbance (disking) and water manipulations (drawdowns and flood-ups) to promote moist-soil plants and macro-invertebrates for waterfowl and other wetland birds. Effective management of moist-soil habitat is currently limited by the condition and configuration of the water management system. The presence of high river elevations during the late spring and early summer prevents gravity drainage of wetlands to Myrtle Creek unless water is pumped over the dikes. Currently, pumps do not have the capability to drain wetlands for effective management. In addition, the Center Ditch is perforated along its course through most of the length of the Refuge, which makes it impossible to independently drain and fill many wetlands required for effective management for emergent or seasonal wetlands. In the southern portion of the Refuge most wetland units are not separated from the Center Ditch and wetlands are filled in series, reducing the ability to independently manage them. Water management is also hampered because the elevation of wetland bottoms and morphometry are unknown. Strategies in Alternatives 2 and 3 would improve the Refuge's water management capabilities and allow the Refuge to provide more acres of natural moist-soil vegetation for migrating waterfowl.

A new 5 cfs pump would be installed at Myrtle Creek outlet under Alternative 2 in order to drawdown all moist-soil units meeting the acreage goal of 100 acres. This wouldn't be required to meet the acreage goal of 50 acres under Alternative 3.

Beaver and muskrat may cause significant damage to dikes and other wetland management infrastructure. Beaver and muskrat burrows may compromise dike stability as well as interfere with the ability of dikes to hold water. Therefore, a range of non-lethal and/or lethal control methods for beaver and/or muskrat may be used over the lifetime of the CCP. Control of vertebrates, including beaver and muskrat, is performed in compliance with refuge policy (569 FW 1, Integrated Pest Management) and Federal regulation (50 CFR 31.14, Official Animal Control Operations). 569 FW 1, Section 1.11 requires that a pesticide use proposal (including dates and materials used) be submitted and approved by the appropriate reviewer (Project Leader, Regional IPM Coordinator, or National IPM Coordinator) before starting a control program. All compliance requirements would be met before control activities would occur.

In addition to the annual drawdown cycle of managed seasonal wetlands to grow moist-soil plant species on exposed mudflats, extended drawdowns through the fall will be required on a periodic basis to allow for chemical and mechanical treatment of moist-soil areas that have been encroached by native emergent vegetation and exotic species such as reed canarygrass and common reed.

Objective 3.2: Provide Seasonal Wetlands

Enhance and annually maintain *337-362 acres* of seasonal wetland habitat for migratory waterfowl, wading birds, shorebirds, and other wetland-dependent wildlife species. Seasonal wetlands are characterized by the following:

- >60% cover of desirable and/or native wetland plants including moist-soil annuals (e.g., smartweeds, wild millet, water plantain)
- <20% cover of native emergent species (e.g., cattail, hardstem bulrush) that are >5 feet tall
- <30% cover of undesirable/invasive plants including reed canarygrass
- <20% cover of reed canarygrass and <5% cover of other undesirable/invasive plants
- No purple loosestrife
- Water level depths from saturated soil to 12 inches
- Seasonal wetland zones are typically dry from July to September.
- Minimal damage to wetland infrastructure by muskrat and beaver

References: Wildlife Management Handbook 13.1.1, Ringelman 1990, Frederickson in Bookout

Strategies Applied to Achieve Objective	Alt 1 (No Action)	Alt 2	Alt 3
Objective as written above applies to alternatives (✓) or the alternative is modified by replacing acres in italics above with the text in this row.			
Provide *337-362 acres* of seasonal wetland habitat annually. (Also see Objective 3.3, rotation of semi-perm, perm wetlands through drawdown and moist-soil mgmt)	417-427 acres	337-362 acres	387-412 acres
Use IPM strategies including mechanical, physical, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants (see Appendix F, IPM Program)	✓	✓	✓
Flood-up strategy: Flood seasonal wetlands in spring using approximately 1100 acre feet from the Myrtle Creek diversion once freezing conditions are absent, typically in March.		✓	✓
Drawdown strategy: Allow slow drawdown in mid May using primarily evapotranspiration and wetland leakage.		✓	✓
Use mechanical techniques (e.g., disking, mowing) to set back succession and promote moist-soil and native plant production, control invasive/undesirable plants, and provide mudflats to promote shorebird use.	✓	✓	✓
By 2027, repair approximately 8,525 linear feet of dikes between wetland cells and the Center Ditch in the North Unit to improve independent management of wetlands.		✓	✓
Use a rotational system that alternates moist-soil		✓	✓

management and semi-permanent and permanent wetland status in ponds in the North Unit. (Also see Obj 3.3)			
Use IPM techniques to control beaver and muskrat damage to water control structures and dike systems, in compliance with 50 CFR 3.14, Official Animal Control Operations, and 569 FW 1, Integrated Pest Management.	✓	✓	✓
Use mechanical, cultural, and chemical means, e.g., disking, herbicides, and water level management, to re-open areas that have become vegetated with persistent emergent vegetation in order to set back succession and maintain open, shallow water areas. Mechanically remove longer term mineral and organic deposits that lead to filling and wetland loss.	✓	✓	✓
Rationale: These wetlands typically occur around the periphery of semi-permanent and permanent wetland impoundments such as Dave's, New, and Redhead Ponds or in shallow basins where water depths are rarely deeper than 12 inches and surface water is seldom present by the end of the growing season (Mallard Marsh, and River S Bend). Seasonal wetlands provide pairing and foraging habitat in the spring for migrating and breeding waterfowl and waterbirds. Wetland restoration projects in the Curlew Flats and River S Bend unit in the late 1990s have been only partially successful. Soil porosity and the higher elevation of these units make it difficult to fill and hold water in the low spots. Water retention increases in late winter (despite low river levels) in some wetlands, probably due to complete soil saturation and regular inputs of precipitation, but retention is generally short term. As a result of this long-term drying trend, some of these seasonal wetlands are being infested by reed canarygrass and/or upland-adapted invasive plants such as Canada thistle. Once established, these invasive plants can only be controlled mechanically or chemically.			

Objective 3.3: Semi-permanent wetlands, persistent emergent vegetation

Enhance and annually maintain *355-450 acres* of semi-permanent wetlands for migratory waterfowl, wading birds, shorebirds, and other wetland-dependent wildlife species. Semi-permanent wetlands are characterized by the following:

- 30-70% cover of native emergent species (e.g., cattail, hardstem bulrush, bur-reed) that are >5 feet tall
- Mosaic of open water and emergent cover
- 30-70% cover of desirable and native wetland plants including moist-soil annuals (e.g., smartweeds, wild millet, water plantain) and submergent plants (e.g., pondweeds)
- 30-50% cover of open water with submergent plants (e.g., pondweeds)
- <20% cover of reed canarygrass and <5% cover of other undesirable/invasive plants
- No purple loosestrife, poison hemlock, Eurasian milfoil
- Water level depths 24-30 inches by late January to control undesirable plants
- Water levels 24-30 inches by April 1 and not less than 18 inches through July 30
- Minimal damage to wetland infrastructure by beaver and muskrat

References: Johnson and Dinsmore 1985, Gibbs et al. 1992, Pospichal and Marshall 1954, Tacha 1975, Johnson and Dinsmore 1986, Johnson 1984, Conway 1990, Walkinshaw 1940, Melvin and Gibbs 1994, Krapu and Green 1978.

Strategies Applied to Achieve Objective	**Alt 1 (No Action)**	**Action Alts (2,3)**
Objective as written above applies to alternatives (✓) or the alternative is modified by replacing acres in italics above with the text in this row.		
Acres of semi-permanent wetlands	450	355-450
Use a rotational system that alternates moist-soil management and semi-permanent and permanent wetland status in ponds north of the county road (Snipe, Redhead, Myrtle, Center, New, Island, Dave's).*	0	17-88 acres
Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants (see Appendix F, IPM Program)	✓	✓
Divert 1,365 – 2,000 acre feet of water from Myrtle Creek and 2,017 acre feet from Cascade Creek from March through July to achieve and maintain depths of at least 18 inches in semi-permanent wetlands.	✓	✓
As needed, reconfigure water delivery system to enhance water level management. (See Objective 3.1)		✓
Use IPM techniques to control beaver and muskrat damage to water control structures and dike systems, in compliance with 50 CFR 3.14, Official Animal Control Operations, and 569 FW 1, Integrated Pest Management.	✓	✓
Following drawdown of wetland units, use mechanical, cultural, and chemical means to re-open areas that have become vegetated with persistent emergent vegetation in order to set back succession and maintain interspersion of open water.	✓	✓
Rationale: Semi-permanent wetlands are characterized by the presence of minimum water depths between 1 and 20 inches for at least 4 growing season months. This water regime favors the establishment of emergent plant species such as common cattail, hardstem bulrush and various native/desirable sedges and spike rushes. This water regime is present in at least a portion of all wetland units on the Refuge. Semi-permanent wetlands on the Refuge provide habitat for nesting waterfowl and waterbirds (e.g., redheads, ruddy ducks, Virginia rails, soras, black terns, and American bitterns). The desired habitat condition for emergent wetlands is a range from 70:30 to a 50:50 mosaic of emergent plants (e.g., cattails, bulrushes) and open water with submergent plants such as pondweeds. Currently, some semi-permanent wetlands have large, contiguous stands of emergents rather than the desired mosaic of open water and emergent cover, as a result of basin morphometry that creates large areas with similar water regimes. Periodic drawdown and disking can be used in these areas to reduce emergent cover to create an optimal interspersion of water and emergent cover, promote the growth and productivity of native submerged aquatic plants, and control of invasive species. Interfaces of emergent wetlands to uplands are infested with reed canarygrass. Historically, these wetland borders were characterized by native sedge meadows and moist-soil plants. Other invasive plants within these marshes require herbicide treatments to control them at the target level of less than 20% cover.		

Drainage of wetlands (Dave's, Myrtle, Center, New, Redhead, Snipe, and Island) to produce spring and fall shorebird habitat and for cyclical maintenance of emergent vegetation should occur on a 7 year rotation using the following 2 year scenario:

Year 1
- Water is not diverted to the targeted wetland from Myrtle Creek Diversion in spring.
- Center Ditch is drawn down when river levels are low.
- The targeted wetland is drained into Center Ditch and to Myrtle Creek as long as the elevation of river is below the surface elevation of Center Ditch and targeted wetland.
- When the river rises to an elevation above that of the surface elevation of Center Ditch and the targeted wetland, Myrtle Creek Outlet is closed and boards are replaced in outlet structure of targeted wetland to prevent increasing water levels in Center Ditch from back flowing into target pond. If further drawdown is required, then Center Ditch must be lowered by pumping through the Myrtle Creek Outlet.
- Evapotranspiration during summer further lowers the targeted pond enough to allow access to pond with heavy equipment in the fall and early winter to open up areas of dense emergent vegetation especially cattail and reed canarygrass using a 36" heavy disk.

Year 2
- Flood pond in late winter and early spring using water first from Center Ditch and then from Myrtle Creek to reach objective levels by April 1.
- For moist-soil management, begin drawdown through Center Ditch and the Myrtle Creek Outlet on May15 at a rate of 1 foot per week until the pond is at 25% of capacity. Summer evapotranspiration will draw down wetland further. During this drawdown cycle, moist-soil plants will germinate on the exposed pond bottom and shallow flooded areas will provide shorebird foraging habitat
- Begin re-flooding the targeted wetland in late summer/early fall once moist-soil plants mature and go to seed. As the moist-soil areas are re-flooded the seed and associated invertebrate resources are available to migrating dabbling ducks and shorebirds. Since Myrtle Creek flows will be low at this time, backflow from Center Ditch can be diverted to the targeted wetlands until elevations equalize (highest elevation that can be reached is 1,756 feet).

Objective 3.4: Permanent wetlands, open water with aquatic beds (Dave's Pond, New Pond, Myrtle Pond)

Enhance and annually maintain *229-283 acres* of permanent wetlands for the benefit of migrating and breeding waterfowl, wading birds, and other wetland-dependent wildlife species. Attributes of permanent wetlands include the following:
- Maximum water depths 24-36 inches with potentially increased depths in spring due to snowmelt.
- >75% cover of open water with native submergent vegetation (e.g., sago pondweed) covering wetland basins during peak water elevations
- <25% cover of desirable and native emergent (e.g., hardstem bulrush, cattails) and other wetland plants (e.g., annual moist-soil plants)
- <10% cover of invasive plants (e.g., reed canarygrass)
- No purple loosestrife, Eurasian milfoil

References: Low 1945, Lokemoen 1966, Siegfried 1976, Stoudt 1982.

Strategies Applied to Achieve Objective	**Alt 1 (No Action)**	**Action Alts (2,3)**
Objective as written above applies to alternatives (✓) or the alternative is modified by replacing acres in italics above with the text in this row.		
Acres of permanent wetlands	295	229-283
Periodic complete drawdown over summer to increase productivity of submergent plant community. Drawdown over 1 growing season every 5-7 years or as needed.		12-66 acres
Divert 1,365-2,000 acre feet from Myrtle Creek from March to July to maintain greater than 24 inches depth in open water areas from April through June.	✓	✓
During drawdown phase, use mechanical, cultural, and chemical means to re-open areas that have become vegetated with persistent emergent vegetation in order to set back succession and maintain open, shallow water areas.	✓	✓
Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants (see Appendix F, IPM Program)	✓	✓
Use IPM techniques to control beaver and muskrat damage to water control structures and dike systems, in compliance with 50 CFR 3.14, Official Animal Control Operations, and 569 FW 1, Integrated Pest Management.	✓	✓
Discourage the growth of new trees on the Kootenai River dike via IPM strategies, including mechanical, cultural, biological, and chemical means.		✓
Monitor the Kootenai River dike for uprooted trees and make appropriate repairs as recommended by the U.S. Army Corps of Engineers	✓	✓

Rationale: Permanent wetlands occur on the Refuge in units where water depths are >2 feet throughout the growing season months during most years. This water regime favors the creation of open water with aquatic bed habitat that supports submerged species such as coontail, pondweeds, and milfoils, and floating aquatic plants. This wetland type provides important pairing, foraging and brood rearing habitat for many waterfowl and water bird species. This type is also an important resting area for migrating waterfowl, especially tundra swans, if buffered from human disturbance. From a flyway perspective, refuge wetlands may be providing important stop-over habitat for spring migratory swans that winter in southeastern Oregon (e.g., Malheur NWR) and nest in northeastern British Columbia and northwestern Alberta. Tundra swans require large unobstructed wetlands with emergent and submergent plants as foraging habitat. Maintenance of long-term productivity of this wetland type requires periodic drawdown because long-term flooding can result in the accumulation of organic material that creates low-oxygen environments unfavorable to many submerged aquatic plant species. In addition, unconsolidated wetland bottoms reduce water clarity, which can reduce cover of submergent plants. These wetlands would under natural conditions dry up on an intermittent basis. The pond drawdown scenario is the same as described for semi-permanent wetlands under Objective 3.3.

Kootenai River Dike: The Refuge owns the dike along the Kootenai River and has a legal responsibility to maintain it. Breaching of the dike would destroy the Refuge’s wetland management infrastructure, flood adjacent landowner's properties, and damage County roads. Inspections have revealed problems with the earthen dike including the cottonwood trees growing on it. Trees growing on earthen dikes generate safety problems and reduce dike durability in three ways: internal erosion related to the galleries created by rotten roots in the earthfill; the mechanical action of the live roots decompacting dike materials; and external erosion related to tree uprooting (e.g., wind thrown trees). Ideally, no trees should grow on dikes and all new tree growth should be stopped. However, by killing existing trees the structure of the dike materials changes due to rotting roots, creating galleries leading to internal water erosion (Zannette et al. 2009). Therefore, the current recommendation is to retain existing trees but prevent further expansion of trees on dikes.

2.4.4 GOAL 4: Provide, manage, and enhance a diverse assemblage of forest habitats characteristic of the lower elevation sites in the Selkirk Mountains.

Objective 4.1: Moist mixed coniferous forest

Annually, maintain and protect 267 acres of late seral, structurally diverse, moist mixed coniferous forest (mature trees >20" dbh) to benefit migratory landbirds and other wildlife, with the following attributes:

- High tree canopy cover (>60%)
- Multiple tree layers with mixed species composition including >25% deciduous cover
- 9.0 snags/acre with ≥10" dbh, where approximately 40% are >20" dbh
- Recruitment snags >27" dbh and >80' tall
- 40-70% cover of native shrub species, depending upon the appropriate moist forest plant associations
- 10-30% cover of native herbaceous species, depending upon the appropriate moist forest plant associations

Reference: Altman 2000

Strategies Applied to Achieve Objective	Alt 1 (No Action)	Action Alts (2,3)
Objective as written above applies to alternatives (✓)		
Immediately suppress all wildfire ignitions.	✓	✓
If hazardous fuels reduction becomes necessary to reduce fire hazards, standard techniques including but not limited to pre-commercial thinning and reduction of ladder fuels may be used.		✓
Within the lifetime of the CCP, initiate snag creation and recruitment where necessary. Additional suitable snags (of optimal size, species, or orientation) could be created using topping, fungal inoculation, or other methods. See Objective 7.1.		✓
Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants (see Appendix F, IPM Program)	✓	✓

Rationale: Late seral moist coniferous forest is important for maintaining the biological diversity, integrity, and environmental health of the Refuge. Harvesting and other activities on surrounding private and public lands have reduced the number of older low-elevation moist forest stands in the

Kootenai Valley. Since late-successional forest of this type are becoming rarer, management of the remaining stands on the Refuge will be directed toward older forest seral stages in support of migratory landbirds and other wildlife. Bird species using this habitat include Townsend's warbler, Swainson's thrush, western tanager, red-breasted nuthatch, and brown creeper. This forest type is currently on a trajectory to develop the desired habitat attributes, requiring only time and protection to reach the objective.

Objective 4.2: Late Seral Dry forest

Annually, maintain and protect 50 acres of late seral, open understory dry forest (mature trees >21" dbh) benefitting migratory birds (e.g., Hammond's flycatcher, hairy woodpecker, brown creeper, white-breasted nuthatch, and pygmy nuthatch) with the following attributes:

- >10 trees/acre >21", where >2 trees >31" dbh, providing a range of diameters to allow for replacement
- 10-40% canopy cover of ponderosa pine
- >1.4 snags/acre with >8" dbh, including >50% >25" dbh
- Shrub canopy cover of native species, dependent upon the appropriate plant association for the Dry Forest Ponderosa Pine and Douglas-fir Series
- Herbaceous canopy cover of native species dependent upon the appropriate plant association for the Dry Forest Ponderosa Pine and Douglas-fir Series

Reference: Altman 2000

Strategies Applied to Achieve Objective	Alt 1 (No Action)	Action Alts (2,3)
Objective as written above applies to alternatives (✓)		
Immediately suppress all wildfire ignitions.	✓	✓
Maintain open understory conditions by hand thinning seedlings and saplings as necessary to remove ladder fuels, and/or use prescribed fire if site conditions allow.		✓
Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants (see Appendix F, IPM Program)	✓	✓

Rationale: Late seral dry forest is important for maintaining the biological diversity, integrity, and environmental health of the Refuge. Dry, ponderosa pine–dominated stands constitute only a small fraction of the forested habitat on the Kootenai NWR, but are important both for their use by nesting birds (31 of the 243 bird species breeding in Idaho) (Ritter 2000) and for their scarcity on the landscape due to timber harvesting and other activities. Benefiting species include Hammond's flycatcher, hairy woodpecker, brown creeper, white-breasted nuthatch, and pygmy nuthatch. Hand thinning will reduce hazardous fuels and reduce the chance of a stand-replacing fire. Time and protection will ensure this forest type will continue to develop the attributes stated in the objective.

Objective 4.3: Mixed moist deciduous forest

Annually, maintain, enhance, and protect 10 acres of mixed moist deciduous forest (cottonwood/aspen/birch at bottom of moist draws, above the Kootenai River floodplain, at the outlets of high-gradient streams) to benefit breeding landbirds and other wildlife, with the following attributes:

- Canopy closure 30-70% of overstory species including cottonwood, aspen, and birch
- Shrub cover >40%, including common snowberry and red-osier dogwood
- >10% of shrub layer young (recruiting) cottonwoods or aspens

- >4 trees/acre that are 40' tall and 10" dbh
- >1.5 snags/acre with >40' tall and >10" dbh

Reference: Altman 2000

Strategies Applied to Achieve Objective	Alt 1 (No Action)	Action Alts (2,3)
Immediately suppress all wildfire ignitions.	✓	✓
Within the lifetime of the CCP, create snags where snags are limiting and sapling recruitment is adequate to support loss of mature trees. Additional suitable snags (of optimal size, species, or orientation) could be created using topping, fungal inoculation, or other methods.		✓
Within the lifetime of the CCP, remove encroaching conifers by hand falling to minimize shading and maintain aspen stand integrity.		✓
Increase aspen or cottonwood recruitment if necessary and practical. See Objective 7.1.		✓
Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants (see Appendix F,IPM Program)	✓	✓

Rationale: Mixed moist deciduous forest is important for maintaining the biological diversity, integrity, and environmental health of the Refuge. Over 30 species of birds breed in aspen stands in Idaho (Ritter 2000). Although no bird species occur exclusively in aspen stands, many species including red-naped sapsucker, warbling vireo, orange-crowned warbler, and ruffed grouse are attracted to aspen stands at least part of the year. Aspen and cottonwoods are especially important to cavity nesters because of their susceptibility to heart rot, and cottonwoods have been the main tree species used by nesting bald eagles at Kootenai. Aspen suckers and bark provide forage for deer, elk and moose, and buds are an important ruffed grouse winter food. The diverse, often moist understory attracts insects that are important food for many insectivores.

Areas of this habitat type at Kootenai NWR are small, often <2 acres, and found at the bottom of the drainages of small perennial or ephemeral streams, above the Kootenai River floodplain. On the scale that most habitats are discussed in sources, these are such a small part of the whole area they are not specifically addressed. Several studies have shown that aspen, while a small patchy component of the landscape, harbor diverse bird communities and may be necessary for reproduction and survival of some species. The habitat attributes listed are a compilation of vegetative attributes gleaned from Washington and Idaho Partners in Flight publications (Altman 2000, Ritter 2000). Some of these addressed more riverine/riparian cottonwood habitats; only portions that were applicable to the stands at Kootenai were included. Before any of the strategies in the Preferred Alternative would be implemented, habitat assessments would need to take place (see Objective 7.1)

2.4.5 GOAL 5: Provide, manage, and enhance a diverse assemblage of riparian habitats characteristic of the Kootenai River Valley.

Objective 5.1: Mid- to late-successional alluvial riparian woodland

Annually, protect and maintain 104 acres, and by 2016 initiate restoration on, *15-20 acres* of mid- to late-successional, alluvial riparian woodland to benefit a diverse assemblage of riparian-dependent species (e.g., red-eyed vireo, veery, wood duck, red-naped sapsuckers, bald eagle) with the following attributes:

- Canopy cover 40-60% composed of native black cottonwood, aspen and residual non-native plains cottonwood.
- Canopy trees >12" dbh
- Shrub cover >40% cover including young cottonwood, red-osier dogwood, chokecherry, alder, willow, serviceberry, and elderberry
- >0.8 snags/ac with dbh >16 inches, especially cottonwoods
- Width of contiguous understory shrubs >100 feet
- Width of zone of mature trees 160 feet
- Unbroken tracts >650 feet in length
- Proximity to wood duck brood habitat 0.8 mile
- <10% cover of invasive plants (e.g., reed canarygrass)

Reference: Altman 2000

Alternatives	**Alt 1 (No Action)**	**Action Alts (2,3)**
Alternative is modified replacing acres in <u>*italics*</u> *above with the text in this row.*	Restore 0 acres	Restore 15-20 acres
Strategies Applied to Achieve Objective	**Alt 1 (No Action)**	**Action Alts (2,3)**
Allow opportunistic recruitment of alluvial riparian woodland species with no active management, except on the river dike	✓	
Fence naturally regenerating cottonwood copses to exclude ungulate browsing. Fertilize if advantageous.		✓
Create seed beds by removing vegetation and exposing mineral soils on appropriate sites to catch natural seed dispersal. Seed can also be collected and sown on these sites. These sites will require intense irrigation to help roots grow toward the alluvial water table.		✓
Plant cottonwood, aspen, birch, or other appropriate bottomland hardwood species on appropriate sites. Protect from ungulate browse with fencing. Avoid planting isolated individual trees. Use temporary irrigation (1-3 years) as needed. Years 1-5: Fence and plant restoration areas, fertilize Years 5-10: Measure survival rate, replant as necessary; maintain fence, fertilize and mow Years 10-15: Control invasive species in tree/shrub plantings, remove fence at end of 15 years		✓
Increase cottonwood recruitment within existing mature stands by top killing selected mature trees or root plowing (both increase suckering).		✓
Experiment with gravity flowing water north into Aspen Slough, Curlew Flats, and Whitetail Slough when the river is high to increase potential for growing desirable bottomland hardwoods.		✓
Through consultation or original research, investigate potential techniques to facilitate establishment of alluvial		✓

riparian woodlands along the portions of Myrtle and Deep Creeks currently affected by backwaters of the Kootenai River. Encourage natural restoration, e.g., fence areas where establishment is occurring or where irrigation is feasible		
Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive plants (see Appendix F, IPM Program)	✓	✓

Rationale: Riparian forest is important for maintaining the biological diversity, integrity, and environmental health of the Refuge. Mature deciduous woodland is important to many bird species including red-eyed vireo, western wood pewee, warbling vireo, American redstart, and orange-crowned warbler. Increasing alluvial riparian woodland will help return an important habitat component largely lost from the Kootenai River Valley due to river flow alterations and tree clearing for agricultural production.

The Refuge currently contains remnants of old cottonwood gallery forest, primarily on the Kootenai River and Deep Creek dikes. Potential cottonwood recruitment sites are limited along the Kootenai River due to steep banks created by diking. Without periodic flood scouring and suitable sites, little natural recruitment is occurring along the river. Past attempts to increase woody vegetation along the lower portions of Myrtle and Deep Creeks have been unsuccessful due the widely fluctuating water levels resulting to changes in flow in the Kootenai River controlled by Libby Dam. Limited recruitment is occurring inside the dikes; however, some natural recruitment has resulted from disturbance activity associated with the Curlew Flats wetland project. Based on soils, topography, and hydrology, the River Bend Unit could be suitable for reestablishing riparian woodland. Trees on dikes have the potential to reduce dike stability; therefore new planting sites should exclude the dikes (see Objective 3.4). Before any of the strategies in the Preferred Alternative would be implemented, habitat assessments would need to take place (see Objective 7.1).

Defined: Riparian habitat within the alluvial floodplain; mature canopy component with large trees (primarily cottonwood but also including aspen, birch and some conifers in drier sites)

Objective 5.2: Riparian scrub-shrub habitat

Annually, protect and maintain 108 acres, and by 2016 initiate restoration on *20-30 acres,* of riparian scrub-shrub habitat to benefitting landbirds (e.g., willow and dusky flycatchers, lazuli bunting, black-chinned and rufous hummingbirds) and other wildlife (e.g., white-tailed deer, elk) with the following attributes:

- Dense patches of native vegetation in shrub layer (>35' × 35') and interspersed with openings of herbaceous species
- Shrub cover 40-80% including Sitka willow, aspen, red-osier dogwood, chokecherry, alder, serviceberry, and elderberry
- Shrub layer height >3 feet
- Overstory tree cover <30%
- Width of contiguous understory shrubs >100 feet
- <10% undesirable plants, e.g., reed canarygrass, smooth brome

Reference: Altman 2000

Alternatives	**Alt 1 (No Action)**	**Action Alts (2,3)**
Objective as written above applies to alternatives (✓) or the alternative is modified replacing acres in italics above with the text in this row.	Restore 0 acres	Restore 20-30 acres
Strategies Applied to Achieve Objective	**Alt 1 (No Action)**	**Action Alts (2,3)**
Allow opportunistic recruitment of riparian shrubs with no active management	✓	
Restore riparian shrub habitat in existing managed grasslands (20-30 acres.) Prioritize new planting sites requiring short-term irrigation (2-3 years), or with sufficient soil moisture to sustain desirable shrubs without additional irrigation, e.g., natural or manmade swales (Aspen and Whitetail Sloughs). Restoration techniques include the following: • Fence new plantings with appropriate material (e.g., hog panels stacked 2 high) to exclude ungulate browsing for at least 15 years. • Plant 5 gallon container grown stock to increase survival rates. Plant in stands of at least 36' × 36' that are protected by fencing to increase individual survival rate and optimal habitat quality. • Hardware (invasive plant abatement) cloth tubes buried 6"-1' to protect individual plants from meadow voles • Prepare sites for planting using normal agricultural practices and equipment(e.g., herbicide applications, scrape off reed canarygrass to mineral soil)		✓
Prioritize suitable planting sites that will provide visitors opportunities to view songbirds at close range from the Auto Tour Route.		✓
Plant native species suitable for the site based on species thriving in similar habitats in the local area. Examples may include Sitka willow, native rose, serviceberry, and hawthorn.		✓
Through consultation or original research, investigate potential techniques to facilitate establishment of riparian shrub habitat along the portions of Myrtle and Deep Creeks currently affected by backwaters of the Kootenai River.		✓
Use IPM strategies including mechanical, physical, biological, and chemical means to eradicate, control, or contain invasive plants (see Appendix F, IPM Program)	✓	✓

Rationale: Riparian scrub-shrub habitat is important to a number of bird species, including willow and dusky flycatcher, Bullock's oriole, and rufous and black-chinned hummingbirds. Little riparian shrub habitat exists on the Refuge. The best examples are the Siberian snow pea hedges growing on old home sites; while this is a non-native plant, its structure provides excellent habitat for several species of birds, providing a model for the size and density of shrub habitat desired. Past attempts to increase woody vegetation along the lower portions of Myrtle and Deep Creeks have been unsuccessful due the widely fluctuating water levels resulting from changes in flow in the Kootenai River controlled by

Libby Dam. Before any of the strategies in the Preferred Alternative would be implemented, habitat assessments would need to take place (see Objective 7.1).

Scrub-shrub defined: Areas of dense willow and other shrubs (e.g., red-osier dogwood) with few to no large canopy trees.

2.4.6 GOAL 6: Protect, maintain, and where feasible restore instream habitats on the Refuge to benefit native fishes and the species that depend on them.

Objective 6.1: Protect/Maintain instream habitat—upper Myrtle Creek, upper Cascade Creek

Annually, protect, maintain, and enhance the upper .34 miles (600m) of Myrtle Creek on the Refuge, and the upper .51 miles (833m) of Cascade Creek, to benefit native salmonids (e.g., bull trout, redband rainbow trout) and fish-eating mammals and birds. Instream habitat has the following attributes:

- No measurable increase in maximum water temperature (7-day moving average of daily maximum temperature measured as the average of the maximum daily temperature of the warmest consecutive 7-day period)
- Maximum water temperatures <59°F (15°C) within adult holding habitat and <48°F (9°C) within spawning and rearing habitats
- >20 pieces/mi of large (>12" diameter and >35' long) woody debris in forested streams
- 80% of the banks stable in non-forested systems, with >75% of the lower banks with <90° angle
- Width/depth ratio <10" (mean wetted width divided by mean depth)
- Pool frequency of 60 pools/mi for wetted width of 10 feet, 23 pools/mi if wetted width 20 feet, and at least 23 pools/mi if wetted width is over 25 feet; also pools have good cover and cool water, and only minor reduction of pool volume by fine sediment

Reference: USFWS 2010, ID DEQ TMDL

Strategies Applied to Achieve Objective	Alt 1 (No Action)	Action Alts (2,3)
Objective as written above applies to alternatives (✓)		
Maintain streamside vegetation	✓	✓
Work with County to ensure that road maintenance does not impact instream habitat		✓
Work with Forest Service to minimize erosion and sedimentation from roads and culverts on adjoining lands		✓
Place large woody debris if needed, as identified in surveys		✓
Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants (see Appendix F-IPM Program)	✓	✓

Rationale: Myrtle Creek: Only the upper .34 miles (600 m) of Myrtle Creek on the Refuge can achieve the habitat attributes in this objective. Myrtle Creek has highest bull trout potential of streams on or adjacent to the Refuge. Other benefiting species include kokanee, redband rainbows, bald eagle, osprey, kingfisher, common merganser, American dipper, river otter, and beaver. There are two very different habitat areas on Myrtle Creek—the lower reach/slough and the upper reach. Only the upper portion on the Refuge provides good spawning habitat for bull trout; the lower section has major constraints due to Kootenai River backwaters and will be considered in a separate objective (6.2). Bull trout do occur in Myrtle Creek upstream of the Refuge.

Cascade Creek: Upper Cascade Creek is defined as the portion of the creek west of Westside Road. Approximately .51 miles (833 m) of this creek lies on refuge lands. Cascade Creek is too steep and short to support spawning habitat, however it does provide some habitat for trout. Fish surveys have been conducted to determine if these are native redband trout or introduced rainbows. The lower reach, from Westside Rd. to Myrtle Creek is affected by a diversion for Cascade Pond, and will be considered under a separate objective (Objective 6.4).

Objective 6.2: Restore instream habitat—lower Myrtle Creek

Within the life of the CCP, investigate opportunities and strategies to restore the lower 2.17 miles of Myrtle Creek for the benefit of native salmonids, burbot, Kootenai River white sturgeon, and fish-eating mammals and birds.

Alternatives	Alt 1 (No Action)	Action Alts (2,3)
Objective as written above applies to alternatives (✓)		✓
Strategies Applied to Achieve Objective	**Alt 1 (No Action)**	**Action Alts (2,3)**
Minimal management activity on lower Myrtle Creek.	✓	
Protect and encourage natural regeneration of riparian vegetation on the lower section of Myrtle Creek (see Objective 5.1)		✓
Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants (see Appendix F, IPM Program)	✓	✓
Conduct feasibility study for restoring sinuousity to lower Myrtle Creek.		✓
Work with partners to examine the feasibility of, and develop strategies for, restoration; conduct restoration activities where feasible.		✓
Explore funding opportunities (FONS, Challenge Grants, matching funds etc.) with partners (e.g., KTOI, IDFG, USFWS FRO etc.) to fund restoration activities		✓

Rationale: Approximately 2.54 miles of Myrtle Creek lies within the refuge boundary. This lower section of the creek may have been used historically as habitat for Kootenai River white sturgeon and burbot, but is now highly altered from historic conditions. Currently the Kootenai River backs up into the lower section of Myrtle Creek when water is released from Libby Dam, presenting a major obstacle to habitat restoration. This issue would need to be addressed before any habitat restoration activities could be implemented. In this objective, strategies for reducing or eliminating these backwaters would be investigated. Potential strategies include a weir or a reverse system with flap gate (like a tide gate). A reverse system installed on the Yakima River near Toppenish could serve as a model. Any engineering solutions would need to allow for fish passage.

Invasive plants have not been noted in Myrtle Creek however, a 2007 survey found Eurasian water milfoil in the Kootenai River across from the mouths of Myrtle Creek and Deep Creek. Myrtle Creek should be monitored for this invasive plant and control measures instituted if necessary.

Objective 6.3: Improve water quality in Deep Creek		
Over the life of the CCP, work with partners and neighboring landowners to improve sediment and water temperature standards in the lower 2.4 miles of Deep Creek adjoining Kootenai NWR. • Increase channel shading, where Refuge owns both banks (0.3 miles/500m) to ≥30%* • Reduce bank erosion along Deep Creek by about 80% on refuge-owned lands** (16 tons/yr to 3 tons/yr) over 30 years. * TMDL standard: For the Deep Creek bottomland (lowest 1.5 miles) an effective shade target of 30% was chosen, for the middle portion of Deep Creek the effective shade target is 60% (Idaho DEQ,: Assessment of Water Quality in Kootenai River and Moyie River Subbasins (TMDL), Sept 2006. pp 99, 106)		
Strategies Applied to Achieve Objective	**Alt 1 (No Action)**	**Action Alts (2,3)**
Work with neighboring landowners to minimize erosion and sedimentation from roads and culverts, farming and logging operations on adjoining lands.	✓	✓
Support restoration projects upstream that improve water quality through programs such as Partners for Fish and Wildlife Program, FONS, Challenge Grants, etc.		✓
Initiate a land protection plan study to analyze alternatives for possible refuge boundary expansion to include 120 acres of Deep Creek floodplain immediately south of the Refuge that is under current ownership of Idaho Dept. of Lands (IDL). This would allow for eventual acquisition through purchase or long-term lease.		✓
If IDL property is obtained, investigate various funding sources and methodologies to restore Deep Creek.		✓
Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants (see Appendix F, IPM Program)	✓	✓
Rationale: Deep Creek runs for approximately 22.8 miles from MacArthur Lake (created by damming Deep Creek) to its confluence with the Kootenai River. Approximately 2.41 miles of Deep Creek follows the Refuge's southeastern boundary before emptying into the Kootenai River. The Refuge owns only the west bank of the creek, except for a short stretch (0.3 miles/500 m) where it owns both banks. Deep Creek is a Clean Water Act 303(d) listed stream for temperature and sediment. The creek gets limited use by salmonids. There is potential bull trout spawning habitat on Deep Creek, but it is far upstream of the Refuge. Deep Creek was originally listed on the 1998 Idaho §303(d) list of impaired waters for sediment pollution. Later, when EPA made additions to the 1998 Idaho §303(d) list for temperature, Deep and Boundary creeks were added. In 2002, DEQ conducted additional assessments of streams in Idaho. Deep and Boundary Creeks were assessed at that time and found not supportive of aquatic life uses (cold water and salmonid spawning). Deep Creek had the sediment pollution listing from 1998 carried over into the 2002 assessment, and was also found to be thermally modified. It is probably not feasible to meet INFISH standards (Joe Dupont, pers. comm.); however it would be desirable to meet the TMDL standard. Riparian restoration would improve habitat for native salmonids by increasing bank stability and decreasing water temperatures. However, there are significant		

limitations to the feasibility of restoration because backwaters from Kootenai River during highwater periods reach 1,760', backing water up Deep Creek past the refuge boundary and beyond the railroad bridge. Even where the Refuge owns both banks, flood inundations coupled with the Deep Creek dike limit restoration.

Because the Refuge includes only a small portion of the Deep Creek watershed, actions taken on the Refuge cannot reduce sediment loads to desired levels. Watershed-wide cooperation by all landowners would be required to achieve the desired reduction in sediment.

Objective 6.4: Restore instream habitat—lower Cascade Creek		
Within the life of the CCP, investigate opportunities and strategies to restore the lower section of Cascade Creek, east of Westside Road to its junction with Myrtle Creek (0.32 mile/523 meters), for the benefit of native salmonids and fish-eating mammals and birds. Restored habitat condition would be based on a similar reference reach.		
Alternatives	**Alt 1 (No Action)**	**Action Alts (2,3)**
Objective as written above applies to alternatives (✓)		✓
Strategies Applied to Achieve Objective	**Alt 1 (No Action)**	**Action Alts (2,3)**
Minimal management activity on lower Cascade Creek.	✓	
Work with partners (e.g., KTOI, IDFG, USFWS FRO etc.) to examine feasibility of, and develop strategies for, restoration.		✓
If found to be feasible, restore Cascade Creek by replacing culverts with bottomless culvert or bridge, reconfiguring the diversion to allow flow between Cascade and Myrtle creeks, developing a channel in the braided section (using heavy equipment where necessary), and planting riparian vegetation (e.g., willow)		✓
Explore funding opportunities (FONS, Challenge Grants, matching funds etc.) with partners (e.g., KTOI, IDFG, USFWS FRO etc.) to fund restoration activities.		✓
Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants (see Appendix F, IPM Program)	✓	✓
Rationale: Approximately .51 miles of Cascade Creek occurs within Kootenai NWR. The Refuge has a diversion in Cascade Creek immediately east of Westside Road which diverts water into Cottonwood Pond. The lower section of the creek, east of Westside Road, is currently braided. In this objective, restoration opportunities for the lower section will be investigated, including the feasibility of reconfiguring the diversion to restore flow between Cascade and Myrtle Creeks and restoring the channel.		

2.4.7 GOAL 7: Conduct inventory, monitoring, and research in support of adaptive management, habitat restoration, and fisheries restoration efforts.

Objective 7.1: Inventory, Monitoring and Research—Wetland, Riparian, and Forest Habitat		
Description: Conduct inventory, monitoring, and research projects that support adaptive habitat management and habitat restoration efforts on the Refuge.		
Strategies Applied to Achieve Objective	**Alt 1 (No Action)**	**Action Alts (2,3)**
Inventory wetland plant communities for invasive species, e.g., Eurasian water milfoil, and annually monitor effectiveness of invasive plant control measures.	✓	✓
Conduct vegetation monitoring in emergent wetlands to determine plant response (e.g., moist-soil, sago pondweed) to water management (see Objective 3.1)		✓
Monitor plant species composition/density in managed semi-permanent and permanent wetlands: pre-drawdown, post-drawdown and yearly to determine need for drawdown and/or reduction in persistent emergent vegetation (Objectives 3.2, 3.3).		✓
Water Resources Branch or Engineering Surveyor to conduct wetland basin assessment and topographic mapping (RTK) of wetlands, set benchmarks, and staff gages to evaluate water management capabilities (Goal 3).		✓
Conduct hydrogeomorphic (HGM) study of refuge wetlands. Following HGM study, develop engineering assessment/design of water control infrastructure		✓
Monitor vegetation composition and distribution in wetlands to assess benefits to waterfowl (see Goal 3).		✓
Assess impacts on existing riparian forest and shrub stands (e.g., agricultural practices, ungulate browsing) and protect if necessary.		✓
Prior to initiating management strategies described in Objectives 4.1, 4.2, and 4.3, conduct habitat assessments of coniferous and moist mixed deciduous forest, including determining canopy closure at various tree, shrub and herbaceous layers; snag density and size; live tree size and density; and plant species composition.		✓
Prior to initiating management strategies described in Objectives 5.1 and 5.2, conduct habitat assessments of riparian scrub-shrub and alluvial riparian woodland, including determining canopy closure at various tree, shrub and herbaceous layers; snag density and size; live tree size and density; plant species composition; and size of these habitat patches.		✓
Rationale: Research, scientific collecting, and surveys on refuge lands are inherently valuable to the Service because they will expand scientific information available for resource management decisions. Use of the refuge 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.

Objective 7.2: Inventory, Monitoring and Research—Fisheries

Description: Conduct and support cooperative inventory, monitoring and research projects that support native fisheries restoration in the Kootenai River watershed.

Strategies Applied to Achieve Objective	Alt 1 (No Action)	Action Alts (2,3)
By 2016, prepare fisheries management plan.		✓
Support instream restoration projects in Deep, Cascade, and Myrtle Creeks that would benefit bull and rainbow trout.	✓	✓
Continue to support the ongoing kokanee egg planting and monitoring of adult returns in Myrtle Creek, unless studies demonstrate that bull trout spawning and superimposition of redds are occurring.	✓	✓
Support ongoing white sturgeon research in an effort to create better spawning conditions with less high stage river conditions, e.g., hydraulic modification of the Kootenai River in key locations with ecology blocks or other channelization devices.	✓	✓
Collaborate with the Fish Resource Office (FRO) in Orofino to conduct additional inventory and monitoring of fish and aquatic habitats, including detailed habitat information (e.g., temperature, depth, width ratios, # pools, riffles, woody debris info) an inventory of Cascade Creek for redband trout, a baseline spawning and rearing snorkel surveys for bull trout in upper Myrtle Creek and subsequent inventories every 3 years.		✓
Conduct baseline fisheries surveys of Myrtle Creek to determine fish abundance and distribution and the presence or absence of spawning bull trout. Conduct additional surveys every 3 years to document fish populations, the need for fishing regulations that are more protective of bull trout, and/or need for brook trout control.		✓
Fisheries survey to determine if the Refuge meets INFISH or bull trout standards and make recommendations on needed improvements (see Objective 6.1)		✓
Survey refuge portion of Deep Creek for bank stability and shading (see Objective 6.3.)		✓
Feasibility study on restoring sinuousity to lower Myrtle Creek (see Objective 6.2)		✓
Work with partners (e.g., KTOI, IDFG, USFWS FRO etc.) to examine feasibility of, and develop strategies for, stream restoration (Objectives 6.2, 6.3, 6.4)		✓
Support research projects and studies to develop methodologies and protocols for stream restoration (Objectives 6.2, 6.3, 6.4).		✓

Rationale: Research, scientific collecting, and surveys on refuge lands are inherently valuable to the Service because they will expand scientific information available for resource management decisions. Use of the refuge 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.

2.5 Kootenai NWR Public Use Goals and Objectives

2.5.1 GOAL 1: Wildlife Observation, Photography, and Interpretation

Provide opportunities for visitors to safely observe and photograph a diversity of wildlife in a natural setting. Interpretation and education will enhance visitors' appreciation for and understanding of the Refuge's natural resources and increase their success in observing and photographing wildlife. Rewarding experiences ultimately build support for Kootenai NWR and the National Wildlife Refuge System.

Objective 1.1. Improve the 4.5 mile Auto Tour Route so that it provides visitors numerous opportunities to view and photograph wildlife and supports an average of 200 vehicles per week, spring through fall.

Strategies Applied to Achieve Objective	Alt 1 (No Action)	Action Alts (2,3)
Maintain the 4.5 mile long Auto Tour Route in its current configuration.	✓	✓
Provide up to two additional pullouts/wide spots/passing areas for vehicle passage.		✓
Develop an elevated wildlife viewing platform along the northern end of the Auto Tour Route.		✓
Provide interpretation signs along the Auto Tour Route that orient visitors to the larger landscape and the NWRS mission.		✓
Develop additional interpretive and informational materials using current, innovative, and creative interpretation techniques and designs, including an interpretive brochure for the Auto Tour Route, updated refuge website, dedicated hunter hotline, Eagle Cam, and/or AM radio announcing system, or CD.		✓
Auto Tour Road is open during daylight hours, year round, and weather permitting to walking/hiking, dog walking (on leash only), jogging, snowshoeing, and cross-country skiing. Auto Tour Road is also open to licensed, street-legal vehicles and bicycles. ATR opens ½ before sunrise and closes ½ hour after sunset.	✓	✓
Allow winter use of the Auto Tour Route (when road	✓	✓

closed to vehicle traffic due to weather/road conditions) by snowshoers, cross-country skiers, and walkers/joggers.		
Dogs would be required to be on a short leash (not longer than 6 feet) and under the control of their owners at all times. Extendable or retractable leashes would be prohibited. No more than 2 dogs per walker will be allowed. Dogs would not be allowed off the gravel surface road. Dog walkers must pick up after their dogs(s) and remove the feces from the Refuge.		✓
Continue to obtain baseline data on visitation. Install new traffic and trail counters at the entrance of the Auto Tour Route; conduct counts/observations to back up/calibrate traffic and trail counter data.	✓	✓
Monitor disturbance to waterfowl and waterbirds by public use on the Auto Tour Route and limit these uses if disturbance issues warrant.		✓

Rationale: The Auto Tour Road (ATR) is a 12-15 foot wide, 4.5-mile long gravel road that offers a panoramic view of the Refuge's wetlands, grassland, and riparian habitats. The ATR is currently open to vehicle traffic (vehicles licensed for highway use only), bicycling, walking, dog walking (on leash), jogging, cross-country skiing, and snowshoeing. The ATR is open to vehicles in early spring (dependent upon presence of snow/ice) until December (first heavy snowfall). Based upon data gathered from a vehicle traffic counter installed May of 2009 on the Auto Tour Route, there was a maximum of 305 vehicles per week in June, with an average of 200 vehicles per week. Under the current vehicle usage, the Refuge has been able to keep up with maintenance of the Auto Tour Route. It should be noted however that prior to 2009, saw an even higher visitation. The low visitation in 2009 has been attributed to the economic recession and fewer travelers. The ATR has become increasingly popular with groups of bicyclists, especially in the spring and summer.

Wildlife disturbance caused by public use of the Auto Tour Route does not appear to be significant during the spring and summer, when lower numbers of wildlife are present and animals are more widely dispersed. However, visitor use of the tour route (especially the presence of walkers, joggers, and bicyclists) has the potential to cause unacceptable levels of disturbance during the fall waterfowl migration and hunt season. In part this is because larger groups of waterfowl tend to be more easily disturbed, especially if they are also hunted (DeLong 2002). On the other hand, waterfowl tend to acclimate to the presence of slow-moving vehicles (Pease et al. 2005), and the majority of the Auto Tour Route is sufficiently elevated and distant from key wildlife use areas that behavioral effects to wildlife from human activity should be negligible. Therefore, current uses of the Auto Tour Route would be continued in all alternatives; however because dogs have the potential to cause significant wildlife disturbance if they leave the road, leash length on dogs would be restricted to 6 feet or less (see Appendix B, Compatibility Determination, Dog Walking). We would address potential disturbance issues through placement of crop plantings (outside disturbance zones; approx 100 yards from public us facilities; also see Objective 2.1). Safety during the hunting season is also a concern with some visitors; however Auto Tour Route use is separated from the hunt area by 200 yards (distance waterfowl shot can travel).

Objective 1.2. Provide opportunities for wildlife observation and photography that minimize disturbance to wildlife and are sustainable with a small refuge staff.		
Strategies Applied to Achieve Objective	**Alt 1 (No Action)**	**Action Alts (2,3)**
Provide opportunities for self-guided wildlife observation and photography on the Auto Tour Route, trails, the Cascade Pond overlook, the orientation kiosk at refuge headquarters, and pullouts from the county road.	✓	✓
Develop and offer programs for the public on photographing wildlife.		✓
Offer photography contests for youth in order to connect them to the outdoors and the Refuge.		✓
Provide one photography blind on the Refuge.	✓	
Provide two photography blinds on the Refuge.		✓
Rationale: Kootenai NWR has a small staff, necessitating that the photography blind(s) are “self-serve.” Allowing the use of hunt blinds by photographers during the non-hunt season, on a reservation basis, was considered but dismissed for several reasons, including increasing disturbance in the central portion of the Refuge, and the fact that the location and lighting of the hunt blinds rendered them unsuitable for photography. Blinds developed specifically for photography, with input from photographers, located at the perimeter of the Refuge, would provide better photography conditions and result in fewer disturbances to wildlife.		

Objective 1.3. Improve visitor contact and orientation facilities, signage, website, and interpretation.		
Strategies Applied to Achieve Objective	**Alt 1 (No Action)**	**Action Alts (2,3)**
Provide visitor information (e.g., signs, brochures) at refuge entrance and headquarters.	✓	✓
Provide interpretive exhibits at refuge headquarters.	✓	✓
Recruit and train volunteer (AmeriCorps or long-term community volunteer) to answer phones and provide key information about the Refuge during times of peak demand, including weekends (hunt season, spring).		✓
Hire seasonal/term/temporary staff to develop a quality interpretation program that fosters long-term interest in the conservation of natural resources among citizens of all ages, and connects children and their families with nature. Staff would be responsible for developing program content and delivering training to volunteers, who would conduct the program.		✓
Provide occasional staff-led interpretive programs upon request.	✓	✓
Develop self-serve interpretive modules/activities for refuge visitors. Allow visitors to sign out backpacks with suggested activities that engage children and adults and deliver NWRS messages.		✓

Develop a "virtual tour" of the Refuge on the refuge website, with images of wildlife in their natural settings throughout the seasons.		✓
Design and install informational and interpretive signs for the one mile (one way) Ole Humpback Trail.		✓
Install a webcam of the bald eagle's nest and link to the Refuge's website.	✓	✓
Revise the Refuge's general brochure with improved text and photographs.	✓	✓

Rationale: In accordance with the National Wildlife Refuge System Administration Act of 1996, as amended, refuges are encouraged to provide wildlife observation and photography opportunities wherever they are compatible with refuge purposes. Outreach is crucial to distinguishing the Service's National Wildlife Refuge System from other wildlife–management agencies or parks. When the public knows and understands the role of the Service and the Refuge System it improves their awareness of refuge regulations and policies, the reasons behind them, and reduces violations necessitating law enforcement. All public uses will be designed to increase the visiting public's understanding and appreciation of refuge resources. By increasing public understanding and appreciation of these resources, the refuge expects increased public support for protecting and enhancing refuge lands thereby achieving the overall wildlife goal of protection and stewardship of wildlife.

Strategically placed interpretive media including information panels, brochures, and posters are currently used by the Refuge. A new series of interpretive panels, using multimedia technology, will be developed as a tool aimed at educating visitors of all ages about the area's natural resources and the impacts that man's activities (i.e., human disturbance, dams, dikes, etc.) can have on wildlife.

Objective 1.4. Provide *3.7 miles* of safe, maintained trails (*Deep Creek Trail, Ole Humpback Trail, Myrtle Falls Trail, and Chickadee Trail*) for year round use by visitors of all ages and abilities. (Note: Trail mileage does not include the Auto Tour Route).

Alternatives	**Alt 1 (No Action)**	**Alt 2**	**Alt 3**
Alternative is modified by replacing text in italics above with the text in this row.	5.2 miles (Deep Creek Trail, Island Pond Trail, Ole Humpback Trail, Myrtle Falls Trail, Chickadee Trail)	3.7 miles (Deep Creek Trail, Ole Humpback Trail, Myrtle Falls Trail, Chickadee Trail)	4.8 miles (Deep Creek Trail, Kootenai River Trail, Ole Humpback Trail, Myrtle Falls Trail, Chickadee Trail)
Strategies Applied to Achieve Objective	**Alt 1 (No Action)**	**Alt 2**	**Alt 3**
Trails open during daylight hours, year round, and weather permitting to walking/hiking, dog walking (on leash only), jogging, snowshoeing, and cross-country skiing.	✓		

Trails open during daylight hours, year round, and weather permitting to walking/hiking, snowshoeing, and cross-country skiing. Dog walking prohibited on trails except for service dogs (as defined under the Americans with Disabilities Act).		✓	✓
Island Pond Trail is closed on waterfowl hunt days during the waterfowl hunting season for public safety.	✓		
Permanently close the Island Pond Trail.		✓	✓
Re-open the 1.1-mile Kootenai River Dike Trail. Repair, re-grade, and sign trail prior to opening.			✓
Coordinate with the U.S. Forest Service to address the potentially hazardous Myrtle Creek Falls Overlook which is located on FS property.		✓	✓
Implement a MOU with the U.S. Forest Service for Myrtle Creek Falls trail maintenance, signage, and law enforcement.		✓	✓

Rationale: Currently the Refuge provides 5.2 miles of primitive trails, the Deep Creek Trail (2.2 miles), the Island Pond Trail (1.5 miles), the Ole Humpback Trail (1 mile), the Myrtle Falls Trail (0.25 mile), and the Chickadee Trail (0.2 mile). All trails are open to walking, dog walking, jogging, cross-country skiing, and snowshoeing year round with the exception of the Island Pond Trail, which is closed to non-hunters on waterfowl hunt days because that trail is within the current waterfowl hunt area. The Island Pond Trail appears to get little use and has the potential to cause wildlife disturbance because walkers are highly visible to wildlife, and the trail is in the central portion of the Refuge. Closure of the trail would probably increase use of this wetland by wildlife. Therefore, closure of this trail is proposed in Alternatives 2 and 3. The 1.1-mile Kootenai River Trail was formerly popular with visitors as it provided elevated dike-top views of the surrounding landscape. It was closed in 2004 to prevent disturbance to nesting bald eagles. Since the eagle nest was abandoned a few years ago and the limbs supporting the nest fell to the ground, re-opening of the Dike Trail is proposed in Alternative 3. Jogging and dog walking are currently allowed on the Refuge's Auto Tour Road and all trails. Alternative 2 proposes to allow jogging and dog walking only on the Refuge's Auto Tour Road only, with stipulations to ensure public safety and compatibility of these uses (see Appendix B, Compatibility Determinations, Jogging, Dog Walking). Although these activities are nonwildlife-dependent public uses, it is likely that dog walkers and joggers observe and enjoy wildlife while on the Refuge. There are several reasons for limiting these uses to the Refuge's Auto Tour Road. Both dog walking and jogging can impact normal behavioral activities, including feeding, reproductive, and social behavior of wildlife. The majority of the Tour Road is sufficiently elevated and distant from key wildlife use areas that behavioral effects to wildlife from human disturbance should be negligible. Refuge trails, however, are narrow, have short sight distances, and in close proximity to critical riparian and forest habitat for song birds and other wildlife species. Restricting these uses to the Auto Tour Road should also minimize conflicts with other user groups engaged in wildlife-dependent recreational uses (bird watching, wildlife observations, and photography). Moreover, refuge trails are less visible and are less frequented by refuge staff with the likelihood that more violations are occurring on trails, including dogs off leash and their feces left on the ground. Both joggers and dog walkers can cause structural damage to plants and increase soil compacting. Impacts of trampling on vegetation and soils commonly noted on trails are unlikely to occur on the well-defined, gravel surface of the Auto Tour Road.

The 0.25-mile Myrtle Creek Trail, a very popular destination, originates on the Refuge but crosses onto U.S. Forest Service (USFS) property. At the falls overlook (located on Forest Service land), there is only a metal cable attached to two trees to prevent visitors from falling over the ledge. The USFS is currently applying for grants in order to construct a safe, barricaded overlook for visitors.

2.5.2 GOAL 2: Waterfowl Hunting

Provide waterfowl hunters of all ages and abilities the opportunity to participate in a safe, enjoyable, high-quality waterfowl hunt program that encourages a tradition of wildlife conservation and ethical sportsmanlike behavior. The waterfowl hunt program will provide opportunities to observe and hunt a variety of waterfowl species with clear and enforced regulations, easy access, minimal crowding, and minimal hunter conflicts.

Objective 2.1. Provide a quality, safe waterfowl hunt program on *605 acres* of the Refuge, with an additional retrieving zone of *225 acres*, capable of supporting up to 1,600 hunter visits per season, including youth, adults, and disabled hunters, with minimal conflicts between hunters and other user groups.			
Alternatives	**Alternative 1 (No Action)**	**Alternative 2**	**Alternative 3**
Alternative is modified by replacing text in italics above with the text in this row.	Hunt area: 740 acres Retrieving zone: 91 acres	Hunt area: 605 acres Retrieving zone: 225 acres	
Strategies Applied to Achieve Objective	**Alt 1 (No Action)**	**Action Alts (2,3)**	
Duck and goose hunting is allowed during the state youth waterfowl hunt (last weekend in September) and 4 days per week (Tuesday, Thursday, Saturday and Sunday) during the state duck and goose seasons (Oct 2 – Jan 14).	✓	✓	
Shooting hours correspond to state regulations (½ hour before sunrise until sunset). Hunters are allowed entry to the hunt units after 3:00 am on hunt days.	✓	✓	
A 200-yard (91 acres total) non-shooting zone is adjacent to the Auto Tour Route. Hunters may shoot waterfowl in the area adjacent to the Deep Creek Trail.	✓		
Establish a well-signed 200-yard (225 acres total) non-shooting zone adjacent to the Auto Tour Route and Deep Creek Trail throughout the Refuge during the hunt season.		✓	
Retrieval of game is allowed in the non-shooting zone. When travelling to and retrieving downed birds in the non-shooting zone, all firearms must be unloaded.	✓	✓	
Clearly delineate the eastern boundary of the allowable hunt zone south of the county road and west of the Deep Creek Trail.		✓	
Waterfowl hunters are allowed to use dogs for retrieval of game. Hunting dogs will be under hunter control at all times.	✓	✓	

Waterfowl hunters are allowed to use non-motorized boats, launched from Center Ditch at Center Parking Lot, to access the hunt areas.	✓	✓
Daily limit of 25 shells per hunter, non-toxic shot only.	✓	✓
Provide an equal acreage of cropland in hunt and non-hunt areas.		✓
Hunt blinds available on a first-come first-serve basis, except ADA blinds, which must be reserved in advance. No reservations or permits (other than valid state license and Federal duck stamp) required.	✓	
Increase waterfowl hunt quality and hunter success by limiting the number of hunters allowed on a hunt day to 1 hunter per 20 acres. Provide numbered parking spaces that correspond to blind numbers or free-roam area to reserve blinds and/or free-roam areas.		✓
Institute a non-reservation permit system to provide information on hunt program use and birds harvested (e.g., kiosk along the road where hunters sign in, take a card/receipt, and then sign out/return receipt with number of birds harvested, species, and hours hunted.)		✓
Continue to allow both free-roam and fixed blind hunting throughout the hunt area. Provide up to 18 spaced blinds, including at least two ADA-accessible blinds, in the waterfowl hunt area.	✓	✓
Free-roam and fixed blind hunting may be separated, or hunting allowed from fixed blinds only, if monitoring indicates unacceptable levels of disturbance and conflicts between fixed blind and free-roam hunters. An adaptive management strategy, based upon hunt program monitoring, hunter surveys, and/or data on habitat quality and waterfowl use of wetlands, would determine the location of fixed blinds and free-roam hunt areas.		✓
If monitoring and/or surveys demonstrate a need to separate fixed blind and free-roam hunt areas, designate a fixed-blind only area with assigned blinds or numbered posts. Hunters would be required to stay within a designated distance of 100 feet from the blind or post.		✓
Add (or convert an existing blind to) a third ADA-accessible hunt blind and parking area in the north hunt unit in order to accommodate the increased requests for reservations of the North ADA Hunt Blind.		✓
South Pond will be open to hunting from the ADA blind only.		✓
Issue free Interagency Access Passes to hunters with disabilities to provide proof of eligibility and an index of demand.		✓

Modify blind design—open up a panel in front so dogs can see birds and exit blind easily; add reflectors to blinds and/or numbered posts to allow hunters to find them more easily in the dark.		✓
Increase FWS presence and outreach during the waterfowl hunt season through internal sources (detail "strike teams" from Region 1, the Refuge Complex, or zone; change refuge staff schedules to cover weekends during critical time periods; use volunteers to patrol Refuge on weekends and evenings).		✓
Increase law enforcement presence during the waterfowl hunt season through external sources by developing partnerships with IDFG, and other local law enforcement agencies (County, state, Forest Service, Border Patrol).		✓
Develop a new Waterfowl Hunt Brochure and Web page to provide clear and understandable language on the Refuge's Waterfowl Hunt Program.		✓
Provide a dedicated phone line for "hunter hotline" to give hunters updated information (including refuge conditions and bird numbers) and encourage hunters to report violations.		✓
Review, update, and improve signage on the waterfowl hunt program.		✓
Offer an annual waterfowl hunting clinic in order to improve hunter success, promote ethical sportsmanlike behavior, reduce crippling losses, and reduce hunter conflicts.		✓
Monitor hunting program to document hunter numbers, species and numbers of birds taken, habitat/blind conditions, to provide data needed for ongoing adaptive management of the hunt program.		✓
Cooperate with IDFG and other agencies to conduct fall waterfowl surveys in the lower Kootenai River valley to determine waterfowl populations and use of, and movement between, habitat areas.		✓
Monitor waterfowl use of hunt and sanctuary areas to document changes in habitat utilization as moist-soil areas are developed.		✓
Within 1 year of CCP completion, revise the Refuge's Hunt Plan.		✓

Rationale: The term "quality" refers to a reasonable opportunity to shoot waterfowl on a hunt visit. Other aspects of quality include safety, minimal conflicts between hunters, or between hunters and other user groups, accessibility, and hunter satisfaction. The proposed management changes under Alternatives 2 and 3 address these various aspects of hunt quality.

In accordance with the National Wildlife Refuge System Administration Act of 1996, as amended, refuges are encouraged to provide hunting opportunities where compatible with refuge purposes. Waterfowl hunting is currently allowed on the Refuge in accordance with State seasons and regulations, on Tuesday, Thursday, Saturday, and Sunday, all day (dawn to dusk). There is currently 740 acres of the

Refuge open to waterfowl hunting, and a 200-yard (91-acre) non-shooting zone (retrieving allowed) along the Auto Tour Route to ensure safety of visitors using the route. There are 18 blinds in the waterfowl hunt area. Free-roam hunting is also allowed throughout the hunt area. The Refuge has two ADA-accessible hunt blinds and is the only facility in the local area that provides waterfowl hunting opportunities to disabled hunters. Hunt blinds are allocated on a first-come, first-serve basis. No reservations, refuge permits, or fees are required.

In Alternatives 2 and 3, a reduction in the size of the hunt area to 605 acres is proposed, by increasing the size of the non-shooting area to 225 acres. This would be a 200 yard wide zone along the west side of the Auto Tour Route and the Deep Creek Trail. This is being proposed to ensure safety of visitors using the Auto Tour Route and Deep Creek Trail, and is expected to have minimal impacts on actual hunting opportunities since these are grassland areas, not wetland impoundments. Retrieval of game would be allowed in this area.

Refuge staff believes that increasing numbers of waterfowl hunters have been using the Refuge; however, without a scientific method of counting or estimating hunt visits, this cannot be verified. (Currently the Refuge uses a voluntary waterfowl hunt survey to gather information. Staff estimates that approximately 25% of hunters turn in a survey.) Crowding appears to be more of an issue than it has been in the past, particularly on opening day of the season, more out-of-town hunters coming to the Refuge (verified from observations of license plates in hunter parking areas), and competition for popular blinds north of the county road. Few hunters use the hunt area south of the road, which contributes to increased competition for blinds on the north end. The first-come first-serve system entices hunters to set up prior to opening time, creating conflicts between hunters. Some hunters have expressed concerns about having both free-roam hunting and spaced blinds in the same area. There is also a perception that walking or bicycling on the Auto Tour Route and walking the Deep Creek Trail on waterfowl hunt days is unsafe. The strategies proposed in the Action Alternatives 2 and 3 attempt to resolve or reduce law enforcement and safety issues, conflicts between and within user groups, and disturbance to wildlife. Both action alternatives propose continuing fixed-blind hunting and free-roam hunting in the same areas, but these types of hunting may be separated in the future if hunt program monitoring demonstrates that hunter conflicts exist. Location of these areas, and blinds, would also be adjusted based on habitat conditions and results of hunter surveys. This would improve hunter opportunities, provide hunters with different types of experiences, and eliminate existing conflicts between free-roam hunters and hunters using blinds.
The Wildlife and Habitat Review (2008) recommended that an equal amount of moist-soil habitat be provided in hunt and non-hunt areas where waterfowl could feed undisturbed on hunt days. However further analysis showed that all moist-soil habitat lies within the hunt area, and habitat conditions make it unfeasible to provide moist soil outside the hunt area. If moist-soil habitat is developed and cropland reduced as proposed in the Preferred Alternative, the potential exists for inadequate undisturbed foraging time for waterfowl during the hunt season. Therefore, waterfowl use of hunt and non-hunt areas would be monitored to document changes in use.

The Refuge has received some complaints from hunters that there are fewer birds than there used to be many years ago. Waterfowl use in the Kootenai River Valley has changed since the Refuge was established in 1964 when the Refuge provided the only wetland habitat in the area. Today, waterfowl can spread out among several wildlife management areas in the Valley. In addition, waterfowl numbers vary widely from year to year based on weather patterns (e.g., timing of freeze-up, production in Canada, etc.) and consequently, timing of waterfowl migration. Improvements to wetland management infrastructure and changes to wetland management proposed in the Action Alternatives should improve waterfowl use of refuge wetlands, and therefore hunting opportunities as well. Cooperative studies of waterfowl use in the lower Kootenai River valley would also shed light on waterfowl response to weather, habitat availability, and hunting pressure.

2.5.3 GOAL 3: Fishing, Big Game and Upland Game Hunting

Fishing and hunting enthusiasts will enjoy opportunities to fish and hunt big game and upland game on the Refuge. Fishing and/or hunting programs will provide a reasonable chance of success with little or no interference by others; minimize impacts to non-target species and habitats; promote compliance with laws and regulations; and promote ethical behavior.

Objective 3.1. Provide big game hunters with hunting opportunities that have a reasonable chance of success; allow hunters to retrieve down or wounded game; and do not compromise the safety of refuge employees, visitors, adjacent landowners, and passing vehicles.

Strategies Applied to Achieve Objective	Alt 1 (No Action)	Action Alts (2,3)
Allow big game hunting (white-tailed and black-tailed deer, elk, moose, bear, and mountain lion) in the 295-acre forested area which lies west of Westside Road and west of Lions Den Road.	✓	
Allow big game hunting (white-tailed and black-tailed deer, elk, moose, bear, and mountain lion) west of Lions Den Road (173 acres). Discontinue big game hunting on the west side of Westside Road (122 acres) due to safety issues, increased poaching, and low hunt quality.		✓
Monitor white-tailed deer and elk use of the refuge and their impacts to Refuge habitats. Should numbers of, and/or problems with these species increase to the point where there is a need for population control, the Refuge will coordinate with IDFG to identify hunting opportunities and implement special permit and/or depredation hunts, as appropriate. Prior to implementation, complete all necessary compliance.		✓
Dogs allowed in pursuit of mountain lion.	✓	
Disallow use of dogs for pursuit of big game.		✓
Conduct increased law enforcement patrols to ensure compliance with big game hunting regulations.		✓
Within 1 year of CCP completion, revise the Refuge's Hunt Plan.		✓

Rationale: In accordance with the National Wildlife Refuge System Administration Act of 1996, as amended, refuges are encouraged to provide hunting and fishing opportunities where compatible with refuge purposes. Alternative 2, the Preferred Alternative, proposes discontinuing big game hunting west of Westside Road so that area of the Refuge serves as a buffer between the Refuge and adjacent lands where big game hunting does occur. The small size and long, narrow shape of the big game hunting area west of Westside Road (122 acres), its adjacency to the refuge sanctuary area where animals are likely to flee if pursued or wounded, and the fact that this area is crisscrossed by roads, creates both safety and law enforcement issues. The layout of the hunt area encourages road hunting and/or unsafe shooting. During the 2009/2010 hunt season there was a documented case of a hunter shooting across Westside Road and taking game. Also, during the 2010/2011 hunt season another hunter was observed to be hunting within 25 yards of the road. Myrtle Creek Road (Forest Road 633) bisects part of the southern half of the forested fringe along Westside Road before following roughly along the Refuge's west boundary. The average distance between Myrtle Creek Road and Westside Road between their junction and the Myrtle

Creek bridge on Westside Road is only 375 feet. Hunters shooting high power rifles west from Westside Road or east from Myrtle Road would endanger traffic on either adjacent road. The average distance from Westside Road to the Refuge's west boundary and adjacent private property, measured from the junction with Myrtle Road north to the Refuge's northern boundary, averages only 575 feet. The Refuge does not offer any significant area dedicated to parking along Westside Road, thus increasing the chance of vehicle collisions due to vehicles parked on right-of-way or partially within the road.
When hunters shoot big game in the area west of Westside Road, deer and elk often cross the road and enter the Refuge's closed area (east of Westside Road). Hunters seek out refuge staff requesting to pursue big game in the closed area. This is in direct conflict with refuge policies that a closed area is "closed" to all pursuit of game. It also creates a safety issue with refuge visitors and staff on the Auto Tour Route, which is an elevated route on the east side of the Westside Road. Since the Refuge Manager has been declining big game hunters entry into the closed area to retrieve game, hunters often illegally enter the closed area with loaded firearms, particularly on the weekends when refuge staff is absent. Each year poaching and trespassing have increased, as have conflicts with non-consumptive users who call the refuge headquarters to complain about big game hunters.

Although the forested portion of the Refuge west of Lions Den Road is small (173 acres), it is large enough for users to conduct a safe hunt and operate within the scope of laws and Idaho's hunter ethics code. When this parcel is combined with adjacent BLM and USFS lands, a much larger mosaic of Federal land presents itself for hunting access. In addition, this portion of Lions Den Road has two designated off-highway parking areas. While this area doesn't have the safety distance issues of adjacent roads or private property associated with the area along Westside Road, the safety problems caused by shooting from that roadway and the issue of wounded game entering the refuge sanctuary during closed periods remain. Poaching and road hunting issues could be addressed through increased law enforcement presence. Pursuing big game with hounds is not allowed due to the small size of the Refuge and the disturbance to other non-targeted wildlife and refuge users.

Special permit hunts and/or depredation hunts for white-tailed deer and elk on the refuge flats may be developed in consultation with the Idaho Department of Fish and Game to provide additional big game hunting opportunities on the Refuge. Such hunts would be developed if a need for population control exists, for example if monitoring demonstrates that refuge habitats are becoming degraded due to excessive deer and elk browsing, or if there are depredation issues on the adjacent agricultural lands.

Objective 3.2. Provide hunters with quality upland game hunting opportunities that have a reasonable chance of success; allow hunters to retrieve down or wounded game; and do not compromise the safety of refuge employees, visitors, adjacent landowners, and passing vehicles.

Strategies Applied to Achieve Objective	Alt 1 (No Action)	Action Alts (2,3)
Allow grouse hunting in the 295-acre forested area which lies west of Westside Road and west of Lions Den Road in accordance with State seasons and regulations.	✓	
Discontinue grouse hunting on the 122-acre forested area which lies west of Westside Road. Allow grouse hunting on the 173-acre forested area which lies west of Lions Den Road in accordance with State seasons and regulations.		✓
Allow turkey hunting on the 173-acre forested area which lies west of Lions Den Road in accordance with		✓

State seasons and regulations.		
Within 1 year of CCP completion, revise the Refuge's Hunt Plan.		✓

Rationale: In accordance with the National Wildlife Refuge System Administration Act of 1996, as amended, refuges are encouraged to provide hunting opportunities where compatible with refuge purposes. When the Refuge was established, grouse hunting was envisioned to be a very small program, an incidental use. Current use of the Refuge for upland game hunting appears to be low. However, since rifles are allowed for forest grouse hunting, the safety concerns associated with big game hunting west of Westside Road that are described in Objective 3.1, apply to grouse hunting as well.

Small populations of turkey (non-native to Idaho) do exist in the western portion of the Refuge and turkey hunting would be allowed west of Lions Den Road under both action alternatives, in accordance with State seasons and regulations, since it does not conflict with resource management. Only shotguns are allowed for turkey hunting; therefore, the safety concerns associated with big game and grouse hunting do not apply.

Pheasant hunting on the Refuge was proposed during public scoping. This alternative was considered but dismissed because (1) implementing a pheasant hunt program on the Refuge would cause conflicts with the Refuge's waterfowl hunt program; (2) because it places additional demand on a small existing land base and infrastructure (trails, Auto Tour Route, service roads, etc.); (3) potential conflicts with non-consumptive uses; and (4) the small pheasant (non-native to North America) population is insufficient to provide a sustained hunting program; and (5) "planting" of non-native species is not allowed under refuge policy (7 RM 12).

Objective 3.3. Provide fishing opportunities in Myrtle Creek for anglers of all ages and abilities.

Strategies Applied to Achieve Objective	Alt 1 (No Action)	Alternative 2	Alternative 3
Fishing on the Refuge is restricted to Myrtle Creek during daylight hours (official sunrise to official sunset) only.	✓	✓	✓
Fishing is allowed from the bank only (boats, float tubes, etc. are prohibited). Wading in Myrtle Creek is prohibited.	✓	✓	✓
Hooked bull trout must not be removed from the water and must be released immediately.	✓	✓	✓
Change regulations to allow catch and release fishing only, using single, barbless, non-baited hooks.			✓
If surveys document a need to control non-native brook trout populations, allow anglers to keep brook trout (see Obj. 7.2)			✓
If surveys indicate that the area of Myrtle Creek below the falls is critical for spawning or rearing bull trout, consider restricting fishing to the area below the pedestrian bridge (see Obj. 7.2)			✓
Improve visitor use information on access and use of the Myrtle Creek fishing area (brochures, signage, website).		✓	✓
Conduct law enforcement patrols to ensure compliance with fishing regulations.		✓	✓
Conduct fishing surveys to determine number of fishing		✓	✓

visits to the Refuge, species, and numbers of fish taken.			

Rationale: In accordance with the National Wildlife Refuge System Administration Act of 1996, as amended, refuges are encouraged to provide fishing opportunities where compatible with refuge purposes. Myrtle Creek is the only place where fishing is currently allowed on the Refuge. User numbers are unavailable but use is believed to be low. Bull trout (a threatened species), rainbow trout (which may be native redband rainbows, a depressed stock) and non-native brook trout are present in Myrtle Creek (USFWS 1995, 2011). Spawning by bull trout has not been documented.

Bull trout are listed as Threatened under the Endangered Species Act and Myrtle Creek has been designated as critical habitat for bull trout (USFWS 2010). Bull trout are primarily threatened by habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, the effects of climate change and past fisheries management practices, including the introduction of non-native species such as brown, lake, and brook trout. Brook trout have the potential to negatively impact bull trout through competition and hybridization. They also reproduce much more rapidly than bull trout since they achieve sexual maturity at an earlier age and small size.

State regulations require any bull trout that are caught to be released immediately. However, angling can be detrimental to bull trout due to angler misidentification with similar-appearing brook trout, resulting in the unintentional take of bull trout; and injuries caused by barbed hooks and/or the use of bait (making hooks more likely to be swallowed). Alternative 3 would be the most protective of bull trout than Alternatives 1 and 2 since angler misidentification leading to take of bull trout would not be an issue. In addition, the use of single, barbless, non-baited hooks has been demonstrated in numerous studies to reduce injuries and mortality to released fish. However, given that fishing pressure on Myrtle Creek is low (estimated at 50 visits annually), current regulations would continue in the Preferred Alternative. Baseline surveys and recurring surveys would be conducted every 3 years to document fish populations and the need for more protective regulations for bull trout and/or brook trout control (see Objective 7.2).

Since brook trout could no longer be kept by anglers under Alternative 3, there could be increased potential for competition and hybridization with brook trout. However, recent surveys showed few brook trout in Myrtle Creek (USFWS 2010). The presence of adult bull trout in summer indicates that habitat conditions (water temperatures) in at least the middle and upper reaches of Myrtle Creek are good; temperatures may be too cold for brook trout to compete effectively.

The removal of brook trout from Myrtle Creek could benefit bull trout; however, given the low numbers of brook trout inhabiting Myrtle Creek, this benefit would likely be minimal. Under Alternative 3, allowing anglers to keep non-native brook trout would be contingent upon surveys showing increased numbers of brook trout, creating a need to reduce their population (see Objective 7.2).

Electrofishing was considered as an alternative to liberal harvest to reduce brook trout populations. Electrofishing as a strategy to remove brook trout is not recommended at this time due to the low population of brook trout in Myrtle Creek and the potential for negative impacts on non-target species. In other streams in Idaho, liberal harvest limits, rather than electrofishing, is used to reduce brook trout populations. Electrofishing could be used for “spot control” of brook trout in small areas if an increase in brook trout population has been documented to occur.

2.5.4 GOAL 4: Environmental Education

Students from area schools will participate in quality environmental education and interpretation programs that provide memorable experiences, fosters an appreciation for the natural world around them and a strong conservation ethic, and develops into a lifelong relationship with the Refuge.

Objective 4.1. Provide environmental education and interpretation facilities and programs for use by local educators and refuge visitors.			
Strategies Applied to Achieve Objective	**Alt 1 (No Action)**	**Alternative 2**	**Alternative 3**
Allow "self-serve" use (by reservation) of Environmental Education (EE) facility by local school groups. EE programs teacher-led; no refuge-specific teacher training or curriculum.	✓		
Hire temporary or term staff to develop refuge-specific curricula for environmental education programs that meet state standards, deliver teacher training, and oversee EE program at the busiest time of year (May-June).		✓	✓
Grade K-6 EE programs on Refuge conducted by teachers who have received training and use refuge-specific curricula.		✓	✓
Conduct teacher workshops to ensure that key Refuge System messages are delivered appropriate to grade level.		✓	✓
Provide at least one environmental educational opportunity to the public each month (e.g., a presentation or event).		✓	✓
Hire seasonal/term/temporary staff to develop a quality interpretation program that fosters long-term interest in the conservation of natural resources among citizens of all ages, and fosters a connection between children and their families with nature. Staff would be responsible for developing program content and delivering training to volunteers, who would conduct the program.		✓	
Provide occasional staff-led interpretive programs upon request.	✓		
Develop self-serve interpretive modules/activities for refuge visitors. Allow visitors to sign out backpacks with suggested activities that engage children and adults and deliver NWRS messages.		✓	
Rationale: Environmental education and interpretation play a key role in encouraging current and future generations to engage in environmentally responsible behavior like supporting the protection of habitat for wildlife through the National Wildlife Refuge System. With limited staff time available, the only way the Refuge can offer high quality EE and interpretive programs is to hire a full-time environmental educator and temporary staff through work study programs like AmeriCorps and Student Conservation Association to write curriculum and conduct EE. Strategically placed interpretive media including information panels, brochures, and posters are currently used by the Refuge and will continue to be			

developed and used as an educational tool to reduce wildlife disturbance events caused by visitors. A series of interpretive panels is aimed at educating visitors about the potential impacts their actions can have on refuge wildlife. These panels will be maintained, upgraded, and replaced, as needed, by the Refuge.

2.5.5 GOAL 5: Friends Group and Volunteers
An active and committed Kootenai NWR Friends Group and volunteer work force will assist refuge staff in delivering quality visitor services programs, building and maintaining the facilities needed to conduct those programs, and supporting the Refuge's habitat restoration and monitoring efforts. The Friends Group and volunteers will increase support of the Refuge on both a local and state scale through public outreach.

Objective 5.1. Build a strong, actively engaged Friends Group and volunteer workforce that support the Refuge's goals and objectives.		
Strategies Applied to Achieve Objective	**Alt 1 (No Action)**	**Action Alts (2,3)**
Hire a term or seasonal park ranger to rejuvenate and build up the Refuge's Friends Group and volunteer workforce.	✓	✓
Over the lifetime of the CCP, develop a Friends Agreement (MOA) with the Refuge's Friends Group.		✓
Develop list of needs for the Friends Group to assist them in directing their efforts and provide them with a well defined purpose.		✓
Conduct a "member drive" to enlist "local regular" refuge visitors as Friends Group members.		✓
Rationale: In the past 10 years a network of groups, called Friends, have essentially adopted individual refuges or complexes and have begun to advocate for the needs of the refuges by providing both financial and volunteer support. It is important for the Refuge to continue to support this Friends Group as they could play a critical role in providing volunteer support for the Refuge's biological and public use programs, and as an advocate for protecting refuge wildlife and habitat. The Refuge will work to build up the Friends Group and volunteer workforce with the purpose of providing members of the Friends Group with more in depth information about wildlife and or current refuge issues that need their advocacy and support.		

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Chapter 3 Physical Environment

Sunrise at Kootenai National Wildlife Refuge
©Laura Roady

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Chapter 3. Physical Environment

3.1 Climate

The prevailing weather conditions of an area constitute its climate and include temperature, humidity, atmospheric pressure, wind, and precipitation. These conditions are affected by latitude, terrain, altitude, and nearby water bodies and their currents (Wikipedia 2010).

The climate and ecology of the Pacific Northwest (PNW) are shaped by the interactions of the seasonally varying atmospheric circulation patterns (weather) and the region's mountain ranges (Climate Impacts Group 2010). Two-thirds of the region's precipitation occurs during October to March when the PNW is on the receiving end of the Pacific storm track. During the late spring to the early fall, high pressure to the west provides the northwest with fairly dry weather. Any differences in the PNW's climate can be attributed to the region's mountains, particularly the Cascades which form a barrier between the west and east with maritime climate influences. Unlike the area west of the Cascades which experiences mild year-round temperatures, winter rains, and dry summers, areas east of the Cascades, including Idaho, experience greater ranges in annual and daily temperatures. Also, summertime day temperatures are typically hotter, winters are much colder, snow is common on the lower elevations, and precipitation is much less than west of the Cascades.

Idaho is comprised of rugged mountain ranges, canyons, high grassy valleys, arid plains, and fertile lowlands; thus, its climate is as varied as its topography. Although Idaho is located approximately 300 miles from the Pacific Ocean, it is influenced by the maritime air travelling eastward toward Idaho (WRCC 2010). This maritime influence is reflected particularly during the wintertime with increased cloudy days, a greater frequency of precipitation, and mean temperatures which are higher than those areas at the same latitude and altitude in the midcontinent. The Idaho Panhandle receives this maritime air via the Columbia River Gorge with a greater amount of moisture than at lower latitudes.

The climate of the Kootenai River Valley is characterized by relatively dry, warm summers and cold, wet winters. Temperatures and snowpack vary by elevation. The topography of the Valley varies widely with the lowest elevation occurring along the Kootenai River near Porthill at elevation 1,745 feet while mountain peaks exceed 7,000 feet in elevation. The Refuge's elevation varies from 1,755 feet to 2,310 feet. The City of Bonners Ferry, located 5 miles east of the Refuge, sits on a terrace of the Kootenai River at 1,775-foot elevation.

It is the warm, wet air masses originating in the Pacific which bring abundant rain and snowfall each year. During the winter, "Pacific air masses dominate and produce inland mountain climates that are not extremely cold, although subzero continental-polar air occasionally settles in over the mountains" of North Idaho (Dunnigan et al. 2003). The prevailing wind is from the southwest (USDA 2005).

According to the Western Regional Climate Center, historical climate records maintained for Bonners Ferry from May 1907 to July 2009, show that average temperatures range from 18.9°F in January to highs in the 80s in the summer. The average annual total precipitation is 21.9 inches while the average annual total snowfall is 65.4 inches. The data were collected at the Bonners Ferry weather station (National Weather Service Cooperative Weather Station number 101079), located about five miles from the Refuge.

Table 3.1 Period of Record Monthly Climate Summary, Bonners Ferry, Idaho (Station 101079). Period of Record: 5/1/1907 to 7/31/2009

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temp. (F)	32.2	38.7	48.2	59.8	68.9	75.2	83.7	82.9	72.4	57.0	41.6	33.9	57.9
Average Min. Temp. (F)	18.9	22.6	27.5	33.8	40.5	46.8	50.0	48.7	41.8	34.2	27.7	22.3	34.6
Average Total Precipitation (in.)	2.97	1.78	1.57	1.26	1.65	1.63	0.89	0.92	1.27	1.89	3.00	3.08	21.9
Average Total Snowfall (in.)	21.2	10.8	4.7	0.5	0.1	0.0	0.0	0.0	0.0	0.4	8.5	19.3	65.4
Average Snow Depth (in.)	8	7	2	0	0	0	0	0	0	0	1	4	2

Source: Western Regional Climate Data June 22, 2010.

3.1.1 Temperature

Data from 1907 through 2009 show average monthly temperatures ranging from 25.6°F in January to 66.9°F in July. The highest average winter temperature recorded for one month was 37.6°F in February 1991 and the lowest average winter temperature recorded for one month was 4.9°F in January 1937. The highest average summer temperature recorded for one month was 73.1°F in July 2007 and the lowest average summer temperature recorded for one month was 56.2°F in June 1914.

Average daily maximum temperatures range from 34°F in January to 87°F in July. There are, on average, 25 days between December and January with a maximum of 32°F or below. There is an average of 18 days during the summer months when maximum temperatures are 90°F or higher. Records from May 1, 1907 to July 31, 2009 indicate that the greatest number of consecutive days when the maximum daily temperatures of 90°F or higher occurred was for 6 days, May 28 to June 2, 1986. The record maximum temperature recorded was 104°F on July 16, 1941. There were three consecutive days, August 16th to the 18th in 2008, when temperatures were 99°F or higher.

The average daily minimum temperature in January is 18.9°F. On average, the daily minimum temperature drops to 32°F or below 155 days per year, with more than half of these days occurring in December, January, and February. The record minimum temperature recorded at the Bonners Ferry weather station was −33°F recorded on December 30, 1968.

3.1.2 Precipitation

The average annual total precipitation at Kootenai National Wildlife Refuge is 21.9 inches, the majority (about 64 percent) falling as rain during the fall and winter months. Almost half (49 percent) of annual rainfall occurs from November through February, and less than 16 percent of annual precipitation falls during June, July, and August. On average, precipitation greater than 0.50 inches occurs 11 days per year. The wettest year on record was in 1950 with a total annual precipitation of 34.01 inches. The driest year on record was in 1944 when the total annual precipitation was only 10.93 inches.

The average annual total snowfall measured in Bonners Ferry is 65.4 inches. The majority of the snow, almost 62 percent, falls in December and January. The driest winter on record was during 1941-1942 when only 14.3 inches of snow fell. The record snowfall of 162.9 inches was recorded during the winter of 1996-1997.

3.1.3 Climate Cycles in the Pacific Northwest

Two cycles influence climate and hydrology in the Pacific Northwest—the El Nino/Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO). ENSO is a set of interacting parts of a single global system of ocean-atmosphere climate fluctuations due to oceanic and atmospheric circulation. ENSO is responsible for the inter-annual variability in weather and climate around the world. The Pacific Ocean signatures, El Nino and its counterpart, La Nina, represent the temperature fluctuations in the surface waters of the tropical eastern portion of the Pacific Ocean. The El Nino occurs when there is a warming of the ocean water off of the coast of Ecuador and Peru when the trade winds weaken and the normal upwelling of cold, nutrient rich waters decreases. In the PNW, the El Nino winters are marked by strong and persistent air flow from the Pacific into North America, blocking the cold Canadian air thus resulting in a warmer, drier winter (WRCC 2010).

La Nina, the opposite of El Nino, has strong trade winds and colder surface waters off of the coast of Ecuador and Peru extending into the central portion of the Pacific Ocean. La Nina winters tend to be cold and snowy in the PNW (WRCC 2010) with north-south air movement and temperature alternations.

The PDO is a longer term pattern of climate variability which shifts phases, warm and cold, on an inter-decadal time scale, usually 20-30 years. Changes in sea surface temperature, sea level pressure, and wind patterns characterize the PDO. The PDO "is detected as warm or cool surface waters in the Pacific Ocean, north of 20° N" (Wikipedia 2010). During the warm phase, the eastern portion of the Pacific Ocean warms while the western portion becomes cool. During the cool phase, the opposite occurs. Climate Impacts Group researchers at the University of Washington have indicated that the PDO was in a cool phase during 1890 to 1924 and from 1947 to 1976. A warm PDO pattern occurred during 1925-1946 and from 1977 to the mid-1990s (CIG 2010).

3.1.4 Floods

The topography of the Kootenai River is dominated by steep, heavily forested mountain canyons, and valleys. The river drops less than 1,000 feet (305 meters) as it winds its way from Canal Flats, B.C., through Montana, Idaho, and north to Kootenay Lake, a 300-mile distance forming a horseshoe shape. Due to the steep mountainous terrain and numerous tributaries, the Kootenai River historically flooded its valley every spring, laying down rich deposits which contributed to the prime agricultural land north of Bonners Ferry. Flooding typically occurred during the spring when melting snowpacks were coupled with springtime rains (NMFS 2000).Mountains in the Kootenai Subbasin receive 70 to 80 percent of their precipitation as snow (USDA Forest Service KNF 2002), and the subbasin's streams are classic examples of the spring snowmelt system (see Section 3.3, Hydrology, below). Spring runoff begins in April. In unregulated tributaries flows generally peak in May or June. Typically, the hydrograph increases two to three orders of magnitude over winter base flow between April and June. Flood flows vary depending upon winter snowpack, the spring warming pattern, and rainfall (USDA Forest Service KNF 2002).

One notable effect of the overlap of maritime and continental climates in the Kootenai River Subbasin is "rain-on-snow" (ROS) events, which occur in the subbasin every 3 to 10 years (USDA Forest Service KNF 2002). ROS events are a major cause of severe runoff and flooding (Ferguson 2000). The topographic configuration of the Kootenai Subbasin allows incursion of warm, moist air from the Pacific Ocean. These Pacific air masses occasionally cause rain to fall on existing snow cover during winter and spring. The resulting floods are less frequent than on the Pacific coast, but can be equally destructive (Ferguson 2000). Even during warm, dry years, parts of the subbasin may experience a ROS event. During wet, cool years and normal years, a good deal of the subbasin can experience anywhere from 5 to 10 ROS events (Ferguson 2000 and USDA Forest Service KNF 2002). Rain-on-snow events are predicted to increase in frequency over the next century (see Section 3.2 below).

Larger scale floods in the Kootenai River Subbasin occurred in 1894, 1903, 1913, 1916, 1927, 1928, 1933, 1938, 1947, 1948, 1950, 1954, 1956, 1959, 1961, 1964, 1966, 1967, 1971, 1974, 1976, 1981, 1987, 1996, and 1997—an average frequency of more than one every 10 years. The largest recorded floods occurred in 1894, 1916, 1933, 1948, 1954, 1956, 1961, 1974, and 1996 (KTOI and Montana Fish, Wildlife and Parks 2004). The downtown section of Bonners Ferry, built on the banks of the Kootenai River, endured frequent floods from the 1920s through the 1960s (Figure 3.1). According to historical records, significant flood events in Boundary County occurred in 1933, 1934, 1948, 1957, 1964, and 1972 (Boundary County 2005).

In the 1920s dikes and drainage districts were established along the Kootenai River and many of its tributaries to drain wetlands and facilitate farming (see Chapter 4). The removal of the natural floodplain has had a dramatic impact upon the natural hydrological processes (see Section 3.3 below). In 1972, Libby Dam, located in Libby, Montana, was completed as a joint project between the US and Canada to provide for flood protection and to generate hydroelectric power. The completion of the Dam reduced the frequency and severity of floods in the lower Kootenai River Valley, but did not completely eliminate flood risk (see Section 3.3).

3.2 Climate Change

Global climate change is unequivocal and primarily due to human production of heat-trapping gases (IPCC 2007). During the twentieth century, the global environment experienced air and sea surface temperature increases, decreased snowpack, increased extreme temperature events, and sea level rise. Average annual air temperatures on the earth's surface have increased by 1.5°F since 1920 (Littell et al. 2009). Furthermore, the increase in global temperatures over the last 50 years is approximately twice the increase of the previous 50 years (IPCC 2007). Globally, surface temperatures for 11 of 12 years from 1995 to 2006 are the warmest on record since 1850 (IPCC 2007).

Figure 3.1. 1948 Flood in Downtown Bonners Ferry, ID.
(Photo courtesy of the Boundary County Museum.)

3.2.1. Global Climate Model Predictions for the Pacific Northwest

Climate models have been used to predict climate in the Pacific Northwest, which encompasses the Columbia River Basin (Washington, Oregon, Idaho, western Montana, and a small portion of southern British Columbia); Kootenai NWR is located in this area. The Climate Impacts Group (CIG) at the University of Washington has been studying global climate change in the Pacific Northwest and has analyzed simulations of future Pacific Northwest climate using 20 global climate models (GCMs) with two different, yet equally probable, greenhouse gas emissions scenarios: one near the lower limit of projected changes in greenhouse gas emissions (B1) and the other at the high end of the spectrum (A1B) (CIG 2010b).

The current state of climate change science involves analyzing ensembles, or multiple model simulations; this is in comparison to past practices of presenting results from only one or two GCMs. A range of projected changes from the ensemble of model simulations is presented along with a weighted average; this weighted average is influenced by the bias of each model's output (i.e., the model is too cool or warm, or wet or dry compared to observed twentieth century climate) and distance from the all-model average. Multi-model averages often come closer to observations than single models, and weighting techniques should produce better forecasting results (CIG 2010b; Mote and Salathé 2009).

The following discussion on Pacific Northwest climate is based on analyses conducted by the CIG for the Pacific Northwest using the ensemble of 20 GCMs and the two greenhouse gas emissions scenarios. Statistical downscaling, a method used to adjust GCMs from a coarse scale to a finer scale, was applied to these models to represent the Pacific Northwest region. The following is a summary of relevant findings (CIG 2010b; Littell 2009; Mote and Salathé 2009).

Temperature

- **The total amount of warming will be greater in the twenty-first century than that observed in the twentieth century.** Average annual temperature increases in the Pacific Northwest are projected to increase by 2.0°F by the 2020s, 3.2°F by the 2040s, and 5.3°F by the 2080s, relative to the 1970-1999 average temperature (Table 3.2). This is a substantially greater increase than the 1.5°F increase in average annual temperature observed in the Pacific Northwest during the twentieth century (Mote 2003 cited in CIG 2010b).
- **The rate of temperature change will be greater in the twenty-first century than that observed in the twentieth century.** Climate models project an average warming rate of approximately 0.5°F per decade through the 2050s (range: 0.2°F-1.0°F per decade). For comparison, the observed warming rate in the Pacific Northwest during the twentieth century was approximately 0.2°F per decade. For the second half of the twenty-first century, the projected rate of change per decade is more dependent on the choice of greenhouse gas emissions scenarios.
- **Warming will occur during all seasons.** Temperature increases are projected to occur during all seasons, with the largest increases during the summer months of June through August. Annual mean temperature changes are presented in Table 3.2.
- **The average annual temperature increase will likely exceed the range of twentieth century variability.** During the twenty-first century, the increase in average annual temperature could exceed the range of year-to-year variability observed in the Pacific Northwest during the twentieth century; this could occur as early as the 2020s. This is noteworthy because the rate of temperature change could exceed the adaptability rate of species, ecosystems, or human infrastructure.

Table 3.2. Change in Annual Mean Temperature and Precipitation.*

	Temperature	Precipitation
2020s		
Low	+ 1.1ºF (0.6ºC)	− 9%
Average	+ 2.0ºF (1.1ºC)	+ 1.3%
High	+ 3.3ºF (1.8ºC)	+ 12%
2040s		
Low	+ 1.5ºF (0.8ºC)	− 11%
Average	+ 3.2ºF (1.8ºC)	+ 2.3%
High	+ 5.2ºF (2.9ºC)	+ 12%
2080s		
Low	+ 2.8ºF (1.6ºC)	− 10%
Average	+ 5.3ºF (3.0ºC)	+ 3.8%
High	+ 9.7ºF (5.4ºC)	+ 20%

*Average changes in Pacific Northwest climate from 20 global climate models and two greenhouse gas emissions scenarios for the 2020s, 2040s, and 2080s. All changes are benchmarked to average temperature and precipitation for 1970 through 1999. Model values are weighted to produce the average. Low and high values reflect extreme values of all model scenarios and were not necessarily from the same model.

Precipitation

- **The projected change in average annual precipitation is nearly zero for all models combined.** Based on the averaged results from the 20 GCMs, no significant changes in annual precipitation are predicted for the twenty-first century compared to the twentieth century. Changes in annual precipitation are considerably different between the 20 models, with individual models projecting changes ranging from −11 percent to +20 percent. However, the projected average annual change is small, and the best estimate of annual precipitation change is an increase of 1 percent to 2 percent by the 2040s and 4 percent by the 2080s (Table 3.2).
- **In the future, existing patterns of precipitation could be intensified.** Just over half (59 percent) of the analyzed climate models and emissions scenarios indicate an increase in winter (December-February) precipitation in the 2020s and 2040s. Increases in winter precipitation are more probable in the 2080s. Over 70 percent of the models and scenarios indicate declining summertime precipitation. Regardless of projected wintertime precipitation, the models predict a larger percentage of precipitation will fall as rain rather than snow due to warmer winter temperatures.
- **Average annual precipitation is likely to remain within the range of twentieth century variability.** The intensity of precipitation events could change, even though the range of variability is not projected to shift significantly.

There is more uncertainty in simulated precipitation projections than for temperature predictions and models, so more caution should be exercised when interpreting results from precipitation simulations (CIG 2010b; Salathé et al. 2009).

3.2.2. Regional Climate Modeling for the Pacific Northwest

In general, GCMs predict climate trends in a region based on the assumption of a uniform rate of change for the entire region. In other words, they do not account for smaller-scale changes that influence local climate, such as those due to regional topography or water bodies. In some areas, physical processes, such as level of reflection off of snowpack, are also important and can affect an area's response to climate change. Regional models simulate processes involving land and water surface characteristics that are likely to respond to the changing large-scale climate; these processes are not explicitly represented in global models and are not captured by statistical downscaling used to adjust the GCMs for specific regions (e.g., Pacific Northwest). In many aspects, regional climate modeling is similar to global climate modeling in that it simulates the physical processes in the climate system, except it uses much finer resolution and covers a smaller area. Climate information about the boundaries of the region is taken from a global (parent) model and used to "force" the regional model (CIG 2010b; Salathé et al. 2009).

The CIG analyzed two regional climate models to produce 100-year simulations for the Pacific Northwest. Different global (parent) models were applied to the two regional models. The regional models, which simulate the interaction between large-scale weather patterns from a global model and the local terrain, contain biases. Unlike statistical downscaling methods in GCMs, regional climate models cannot explicitly remove systematic differences between the global model and observations, so some bias correction must be applied. In some instances projections from the two regional models were different than those projected by their respective global (parent) models; in other instances the two regional models indicated results that were different from each other. Relevant results from the two regional simulations are presented below (Salathé et al. 2009).

Temperature. In general, regional model temperature simulations were relatively similar to their global (parent) models, but there was a considerable difference in temperature changes between the two models and there were also seasonal differences. These were mainly due to the global (parent) model and responses within the regional model that are driven by changes in precipitation, cloudiness, and surface radiation.

Precipitation. In general, precipitation patterns simulated by the regional models were consistent with their global (parent) models but were intensified over complex terrain. Similarities between the regional and global models occur because large-scale storms and moisture fluctuation play a dominant role in controlling regionally averaged precipitation; however, regional processes yield the differences in magnitude and distribution of the changes. In some instances, the regional model produced changes in precipitation that were opposite from those the global (parent) model used to force the regional simulation.

Additional considerations. There were a few areas where the regional models agreed, suggesting that some local responses to global climate change are robust. The clearest instance of this in both simulations is the resulting loss of snowpack. Although there were substantial differences in the precipitation simulations, both simulations projected a substantial loss of snowpack. Changes in extreme events were also similar between the two simulations, noted by an increase in extreme precipitation.

When compared to regional climate models, multi-model ensembles of global climate projections and statistical methods may underrepresent the local severity of climate change. Additionally, because the two forcing (parent) models used to perform the respective regional modeling analyses contain unique characteristics, the fine-scale features in the regional simulations are substantially different. As a result, the differences in the global (parent) models are accentuated. This emphasizes the need for extended simulations using a large ensemble of both forcing and regional models (Salathé et al. 2009). Finally, regional climate modeling is a newer tool in climate impacts assessment and the researchers and modelers are still learning how these models respond to climate change forcing and how to best represent the uncertainty in climate projections (CIG 2010b).

Changes to hydrology and water resources. When temperature and precipitation results from the GCMs for the Pacific Northwest are combined, there are additive effects. Projected increases in Pacific Northwest temperatures are expected to result in changes to water resources. Increased temperatures are expected to result in increases in the proportion of winter precipitation falling as rain. This would reduce mountain snowpack, increase winter streamflow, and increase frequency of winter flooding. Temperature increases would also result in earlier spring snowmelt, subsequent earlier peak streamflows, and decreased late spring and summer streamflows (Karl et al. 2009; Littell et al. 2009; Scott et al. 2008). The Independent Scientific Advisory Board (ISAB) (2007) concluded that in the Columbia Basin, "Watersheds that are just above the current snow line will experience a change from a snowmelt dominated hydrologic regime to one that is driven primarily by winter rainfall or rain on transient snowpack. Even those watersheds which remain above the snow line will experience earlier snowmelt runoff." Increased frequency and severity of flood flows during winter could potentially have serious consequences for native salmonids (Williams et al. 2009; see Changes to Wildlife Populations, below). Earlier snowmelt is also associated with increased wildfire risk (Westerling et al. 2006, see below).

Williams et al. (2009) identified subwatersheds within the ranges of three inland cutthroat trout subspecies that were at increased risk of uncharacteristic winter flooding as a direct result of warmer winter temperatures due to climate change. They drew on the findings of Hamlet and Lettenmaier (2007) who analyzed uncharacteristic winter flood events for the western USA as a result of global warming. Hamlet and Lettenmaier used midwinter temperature to define three types of basins: rain dominant, snow dominant, and transient between rain and snow. Winter flooding in rain-dominant basins is a function of the individual storm event as well as the size and runoff characteristics of the catchment. Flood events in these basins will not change due to rising temperatures without a corresponding increase in precipitation. Snow-dominant basins do not typically flood in midwinter but rather flooding occurs later as spring runoff. The Kootenai River is a snow-dominant basin, although the spring river flows have been substantially reduced due to Libby Dam operations. Low- to mid-elevation, snow-dominant basins currently near the freezing line may experience a change in runoff timing and characteristics with warmer winter temperatures. Transient basins, where both rain and snowstorms occur in the winter months, are currently the primary location of significant flooding events for much of the western USA (O'Conner and Costa 2003; Hamlet and Lettenmaier 2007). The magnitude of the flood event depends on the intensity and duration of the rainstorm and the antecedent snowpack.

Williams et al. assumed that subwatersheds with a mean winter temperature less than −1°C were snow dominant, while those with a mean winter temperature greater than +1°C were rain dominant. A 3°C temperature increase was added to the current winter mean temperature, and the subwatersheds were reclassified. The greatest flood risk was assigned to subwatersheds that change from snow dominant to transient or rain dominant. Subwatersheds that change from transient to rain dominant were assigned a moderate risk score, while cold, high-elevation subwatersheds that are likely to remain snow dominant as well as the valley bottoms that are currently rain dominant were classified as low risk. They found the Kootenai River subwatershed to be at high risk for winter flooding, due to a change from snow-dominant to a transient or rain-dominant regime. They recognized, however, that the complexity of dams and reservoir management makes it difficult to analyze downstream flood effects accurately.

Changes to Kootenai River hydrology. The CIG and several regional study partners collaborated to create a comprehensive, up-to-date database of simulated hydrologic data incorporating climate change information. The ensuing project, the Columbia Basin Climate Change Scenarios Project (CBCCSP), was intended to provide support for long-term water resources planning in the Columbia River basin. Prior to this collaboration, there was a lack of publicly available information on hydrologic scenarios incorporating climate change in the Pacific Northwest. The following discussion is derived from the CBCCSP website (CIG 2010c), which includes a full report on the project along with other data, figures, and project information.

The CBCCSP used the Variable Infiltration Capacity (VIC) hydrologic model to generate 77 hydrologic simulations at 297 sites in the Columbia River Basin. One of these hydrologic simulations was based on the continuation of historical conditions, and the remaining 76 simulations assume changes in greenhouse gas emissions from historical conditions. The hydrologic simulations were based on inputs derived from 10 GCMs, two greenhouse gas emissions scenarios (A1B and B1), and three downscaling methods. Hydrologic simulations were modeled for three future time periods: 2020s, 2040s, and 2080s.

One of the study sites was located near the Kootenai NWR, on Kootenai River at Bonners Ferry (USGS ID 12309500, Hydrologic Unit 17010104, Latitude 48° 41' 53", Longitude 116° 18' 45"

NAD83). Overall, for the Bonners Ferry site, streamflow patterns and peaks in the 2020 simulations are similar under both greenhouse gas emissions scenarios and historical conditions. Although slightly lower in the historical simulation, fall and winter streamflows hover between approximately 5,000 and 10,000 cubic feet per second (cfs), begin rising in March to peak at approximately 50,000 cfs in June, and drop to approximately 10,000 cfs in August.

In the 2040 simulations, streamflow patterns under the two emissions scenarios are similar to each other but a divergence between these scenarios and the scenario based on historical conditions becomes more noticeable. Fall and winter streamflows are greater under the two emissions scenarios than the historical scenario. Under all scenarios, peak streamflow of approximately 50,000 cfs occurs in June; however, under the emissions scenarios, an initial peak occurs a few months earlier, and gradually continues to rise until peaking in June. During this late spring/early summer period, there is also a great deal of variability within the individual model simulations that make up each emissions scenario; this is due to differences in the GCM outputs that the hydrologic models are based on. The average peakflow for each emissions scenario, however, is only slightly lower than the historical projection. Summer flows are similar among all scenarios.

The greatest amount of variation occurs with the 2080 projections. First, the differences between the historical scenario and the emissions scenarios are greater in 2080 than during the other time periods. Second, there is a noticeable difference in peakflow between the two emissions scenarios. It should also be noted that under each 2080 emissions scenario, there is a much greater variability in the individual models that make up each emissions scenario when compared to the 2040 and 2020 projections. Under each 2080 emissions scenario, fall and winter streamflows are greater than those projected for the 2040s, and spring streamflow increases approximately two to four weeks earlier. In both emissions scenarios, the peakflow occurs approximately one month earlier than in the historical scenario, is approximately 5,000 cfs lower, and is protracted over approximately two months; the pattern between the two scenarios, however, is different. Under the B1 emissions scenario, the peakflow reaches a plateau for approximately two months before dropping off in the summer, and under the A1B scenario, the spring flow peaks and drops very slowly for two months before the summer drop off. Summer flows are similar among all scenarios; however, under the emissions scenarios, summer flows occur, on average, a few weeks earlier and late summer flows are slightly lower than the historical projection.

The ISAB (2007) concluded that changes in main stem flows due to hydrosystem operations in the Columbia River Basin are substantially greater than the natural runoff changes projected to be caused by climate warming in the 21st century. Current predictions suggest climate change will produce higher flows in winter and early spring due to an increase in the proportion of precipitation falling as rain and less snow storage. Late spring to autumn flows could be reduced (ISAB 2007).

The ISAB also reported that climate modeling of future water temperatures in the Columbia and Snake Rivers predicts an increase of 1°C or greater by 2040, adding to the increases caused by the hydrosystem (ISAB 2007). Although climate modeling of future water temperatures in the Kootenai River main stem has not been done, modeling of the Columbia and Snake River main stems suggest that future water temperatures in the Kootenai River main stem may increase as well.

3.2.3. Effects of Regional Climate Change on Wildlife and Habitat Forests

In its 2007 report, the ISAB reported the following key findings:

- Virtually all future climate scenarios predict increases in wildfire in western North America. Fire frequency and intensity have already increased, with more frequent, larger, and more intense fires in the past 50, and especially the past 15, years in the forested regions of the West, including the Columbia Basin.
- It is expected that global warming will cause insect outbreaks to become more common and widespread. Drought and hot, dry weather have already led to an increase in insect outbreaks in the Columbia Basin, especially outbreaks of mountain pine beetle.
- Shifts in the distributions of forest tree species will be complex, depending on altered temperature and water availability, summer maximum and winter minimum temperatures, and changing frequencies of fire and insect outbreaks.

Earlier timing of snowmelt has been associated with increased frequency of wildfire in western forests since the mid-1980s. Westerling et al. (2006) found that almost seven times more forested Federal land burned during the 1987 to 2003 period than during the prior 17 years, and large fires occurred about 4 times more often during the latter period. It was determined that year-to-year changes in wildfire frequency were strongly linked to annual spring and summer temperatures and to the timing of snowmelt. Timing of the snowmelt is important, since an earlier melt results in areas drying earlier and prolongs the fire season (Westerling et al. 2006). Higher summer temperatures and earlier spring snowmelt are expected to further increase the risk of forest fires in the Pacific Northwest by increasing summer moisture deficits (Karl et al. 2009). A warming climate, combined with a history of fire suppression and other forest management practices that have increased fuel loads over the past century, point to increasing fire intensity and frequency in western forests.

Changes to wildlife populations. Predicting the effects of global warming on wildlife populations is complicated because wildlife will be impacted by changing conditions of temperature and moisture and also by the resulting shifts in vegetation, which they depend upon for habitat and food. Climate change will also occur concurrently with other impacts. Studies of the simultaneous effects of more than a single stressor (e.g., climate and land use; climate, land use, and human population growth) generally conclude that the effects of more than a single stressor are not easily predictable, but may often be more severe than a simple combination of the single-factor outcomes (ISAB 2007).

Waterfowl. With their ability to travel long distances, waterfowl may have a better chance of adapting to climate change than species with more limited dispersal ability. Nevertheless, rising temperatures and altered precipitation patterns are predicted to reduce both the quantity and quality of North American waterfowl habitat (Wildlife Management Institute 2008). Both declining waterfowl populations, and major shifts in the geographic distribution of migrating birds, are likely.

The Wildlife Management Institute (2008) summarized potential changes to waterfowl populations as follows:

- **Changes to migration patterns.** "As warming continues, there will be delays in the fall and early winter migrations of waterfowl from northern latitudes. Birds finding open water and food sources unrestricted by a cover of ice or snow will stay in northern climates for a longer time. For species such as mallards and Canada geese, only the harshest weather conditions will move them as far south as in the past."
- **Changes to breeding habitat.** "Studies of mallards and other dabbling ducks suggest that events occurring during breeding season account for as much as 84 percent of the variability in population growth rates. Rising temperatures will have complex effects on waterfowl

breeding …. For some species in some places, warmer temperatures that melt snow and thaw waterways earlier in the spring may extend the nesting season and increase breeding success."

- *Prairie pothole region*. "Climate models predict that in the prairie pothole region, warmer temperatures will accelerate the evaporation of water bodies and reduce soil moisture, possibly by 25 percent before the end of this century. Up to 90 percent of the potholes could vanish; consequently reducing the number of the region's breeding ducks by as much as 69 percent. Among the species that would be affected are the mallard, Northern pintail, blue-winged teal, canvasback, gadwall, Northern shoveler, redhead, lesser scaup, and ruddy duck. It is unknown whether waterfowl will be able to adapt by moving from their traditional breeding grounds, or how much suitable breeding habitat they will find elsewhere. Primary prairie pothole habitat could shift from the center (the Dakotas and southeastern Saskatchewan) to the region's wetter but less productive eastern and northern fringes." However, waterfowl habitat in these areas is already constrained by wetland drainage and agriculture.
- *Boreal forests*. Many birds use boreal forests for breeding, molting or staging, particularly when the prairies are dry. Because temperature changes are expected to be greatest at the more northerly latitudes, this ecosystem could be among those most affected by climate change. Little is presently known about the relationship between the boreal forest ecosystem and ducks such as scaup and scoters that breed there, so it is difficult to anticipate how climate change will affect them.

- **Changes to food quality during spring migration and nesting.** "Persistently low lake levels could reduce the growth of the kinds of submerged vegetation most important to canvasbacks and redheads. In warming waters, algae and other non-duck foods could replace protein-rich foods such as arthropods. Feeding habitat for species dependent on an invertebrate diet could shrink." "Warmer temperatures and a longer growing season with fewer days below freezing will most likely favor the northward expansion of non-native, invasive plants, which typically are nutritionally inferior to native plants."

Fish. Warmer water temperatures during summer can have a variety of effects on native salmonids. Salmonids may be excluded from reaches with temperatures that are already close to their upper thermal limit (O'Neal 2002). Even in systems where water temperatures do not exclude use by salmonids, metabolic rates will increase. In systems where food is limited, the increased energy required for metabolic maintenance will reduce growth rates leading to smaller size at the end of the summer (Marine and Cech 2004). Both native and non-native fishes may enjoy a competitive advantage over native salmonids at elevated water temperatures. Brook trout, which are not native to Idaho, have been shown to be more efficient at obtaining food than cutthroat trout at 20°C but the two species exhibited comparable ability to obtain food at 10°C (DeStaso and Rahel 1994). McMahon et al. (2007, p. 1320) demonstrated the presence of brook trout has a marked negative effect on bull trout, an effect that is magnified at higher water temperatures (16°C-20°C [60°F-68°F]). Northern pikeminnow also prefer warmer temperatures than salmonids and may become more numerous in rearing areas of juvenile salmonids as stream temperatures increase (Petersen and Kitchell 2001).

The ISAB (2007) reported the following key findings regarding salmon and trout populations in the Columbia basin:

- An analysis of the effects of temperature increases associated with climate change suggests that 2 to 7 percent of current trout habitat in the Pacific Northwest will be unsuitable for these fishes by 2030, 5 to 20 percent by 2060 and 8 to 33 percent by 2090.
- Increased frequency and severity of flood flows during winter can affect overwintering juvenile fish and incubating eggs in the streambed. Eggs of fall and winter spawning fish, including sockeye salmon and bull trout, may suffer higher levels of mortality when exposed to increased flood flows. Higher winter water temperatures also could accelerate embryo development and cause premature emergence of fry.
- Recent projections predict 22 to 92 percent loss of habitat suitable for bull trout in the Columbia Basin as a result of climate warming.
- Warmer water temperatures may exclude salmonids from reaches with temperatures that are already close to their upper thermal limit. Even where water temperatures do not exclude use by salmonids, metabolic rates will increase, leading to reduced growth rates where food is limited and smaller size at the end of the summer. Smaller fish typically suffer higher mortality rates during winter than do larger fish.
- Predation on salmonids will likely be increased by elevated water temperatures. Northern pikeminnow generally select smaller fish when feeding on juvenile salmonids. Elevated water temperatures also will increase consumption rates and growth rates of predators.
- Numerous warm-water adapted fish, including several non-indigenous species, normally found in fresh water may expand their populations with the warmer water and seasonal expansion of freshwater habitats.

Bull trout require cold, headwater streams for spawning. Therefore, a warming climate is highly likely to disproportionately impact this species. Warming associated with climate change would probably lead to smaller and more isolated habitat patches for this species. Warming also could lead to loss of populations (i.e., local extinctions) that is disproportionate or accelerated relative to the simple loss of watershed area (Rieman et al. 2007).

By rearranging a spatial autoregressive air temperature model to predict elevation change in suitable bull trout habitat from temperature change, and assuming a uniform shift in temperature with warming, Rieman et al. (2007) predicted that for every 1°C rise in mean annual air temperature, the lower elevation limit of bull trout in the interior Columbia River basin would increase by 161 meters. Using this model, the authors predicted relative changes in thermally suitable habitat area for bull trout with 100, 250, and 800 m increases in the lower elevation limit. At a 100 m rise in lower elevation limit, corresponding to a 0.6°C rise in mean annual temperature, the number of medium and large habitat patches in the Kootenai River subregion would decline by approx 20 percent and the subregion would be considered at low risk for extirpation of bull trout. At a 250-m rise, corresponding to a 1.5°C increase in mean annual temperature, the number of medium and large habitat patches in the Kootenai River subregion would decline by approx 70 percent and 50 percent, respectively and the subregion would be considered at medium to low risk for extirpation of bull trout. However, at an 800-m rise in lower elevation limit (corresponding to a 5°C increase in mean annual air temperature) most subregions in the lower 48 states, including the Kootenai River subregion, would be at high risk for bull trout extirpation, with no medium or large patches of thermally suitable habitat remaining. Only one subregion would have medium to large patches remaining (the Methow subregion of Washington). The authors concluded, "Our results suggest moderate to high risks [of extirpation of bull trout] will extend across the [interior Columbia River] basin with even modest warming."

Models for Columbia River basin predict rise of annual mean temps of 1°C-2.5°C or more by 2050 (Leung et al. 2004; Mote et al. 2005b). Using Rieman's model, this would translate to a 161-400 m increase in the lower elevation limit for bull trout, and significant declines in thermally suitable habitat would be likely in the Kootenai River basin by 2050. Although bull trout are the most sensitive to temperature increases, declines in habitat suitability for other native salmonids would be expected as well.

Williams et al. (2009) assessed the extirpation risk to local populations of native cutthroat trout based on the combined stressors of habitat fragmentation and climate change. They first analyzed the current distribution of Bonneville cutthroat trout, Colorado River cutthroat trout, and westslope cutthroat trout to determine the likelihood of population persistence (under current conditions) based on relationships drawn from the literature between persistence and fish abundance, habitat connectivity and patch size for several trout species. They then analyzed climate change–driven environmental effects and combined these results with the results of the persistence analysis to provide a spatially explicit characterization of local extinction risk in the context of climate change. They characterized the thermal limits for each subspecies based on the relationship between each subspecies' historical distribution and air temperature. An upper thermal limit of 22°C was applied to westslope cutthroat trout. Temperatures at or above these limits were considered "unsuitable." Marginal habitat range for westslope cutthroat trout was defined as 19.1°C-22.0°C. They applied a 3°C temperature increase to 1970-2000 mean July air temperatures. This increase has been projected as the most likely scenario for the western United States within this century (Climate Impacts Group 2004).

They concluded that current westslope cutthroat trout habitat generally is at lower risk for increased summer temperature than habitat for Colorado River and Bonneville cutthroat trout, but at varied risk for increased flood and wildfire. Only 3 percent of current habitat is predicted to be at high risk from increased summer temperatures, whereas 31 percent is at high risk from increased flooding and 37 percent from increased wildfire (Table 3.3). If risk from winter flooding, wildfire, and temperature are combined, 65 percent of the current range of westslope cutthroat trout is rated at high risk from climate change, and those high-risk habitats are distributed across all geographic management units (GMUs). The Kootenai GMU is considered a high-risk area for winter flooding. High wildfire risk is concentrated more in the southern and eastern portions of the range. The composite climate change risk is high for more than 50 percent of populations meeting persistence criteria in the Kootenai GMU, including most populations in the lower Kootenai River watershed. They reported that there are 35 populations of westslope cutthroat trout in the Kootenai River basin, occupying 394 miles of stream habitat. Under a 3°C temperature increase, 71 percent of stream habitat would remain suitable (29 percent would become unsuitable) and 46 percent of the populations would persist.

Table 3.3. Increased Risk from Climate Change for Historic and Current Habitat of Westslope Cutthroat Trout as Percentages of Currently Occupied or Historic Habitat.
(Adapted from Williams et al. 2009.)

	Percent of historic habitat at risk			Percent of current habitat at risk		
Risk	**High risk**	**Medium risk**	**Low risk**	**High risk**	**Medium risk**	**Low risk**
Increased Temperature	8	42	50	3	35	62
Increased Flooding	26	5	69	31	7	62
Increased Wildfire	27	18	55	37	19	44
Composite Risk	57	35	8	65	28	7

Big game mammals. Scientists have concluded that global warming will stress populations of large ungulates in several ways (Wildlife Management Institute 2008):

- Big game health will decline and mortality will rise as infestations of parasites, pests, and disease-carrying insects, no longer held in check by cold temperatures, increase in severity and geographic range.
- Across the continent, deer, elk, and other big game populations will decline as high levels of greenhouse gases make the plants they eat less nutritious and digestible.
- Drier ecosystems will be increasingly at risk from wildfires and burn with greater intensity and frequency as invasive species will replace less fire-prone native plants.
- As temperatures rise, moose will continue to experience declining pregnancy rates and suffer poor individual health, due largely to increased winter tick infestations. Populations will shrink and drift northward.
- As fragmentation and loss of winter ranges continue, mule deer and elk will dwindle in number in the Rocky Mountain states, the Intermountain West, and the Northern Boreal Forest. In some locations, over time, both species will disappear entirely.

In general, mule deer will be more sensitive to the projected effects of climate change than white-tailed deer. Populations of white-tailed deer are likely to remain stable or increase, while populations of mule deer are likely to decrease (DeVos and McKinney 2007).

3.2.4. Potential Changes to the Refuge

Numerous changes to the Refuge's habitat and wildlife would likely result from increased ambient temperature and altered precipitation patterns over the next 50 to 100 years. However, until a more detailed analysis of the effects of global climate change can be completed on specific Refuge units, more generalized modeling will continue to be used to assess how and what the Refuge should do to prepare for upcoming changes to the natural environment.

There have been no specific studies documenting potential effects to Kootenai NWR from future climate change. Kootenai NWR habitats consist primarily of wetlands, meadows, and cultivated agricultural fields in the Kootenai River Valley. Although only a small strip of forested habitat from the Selkirk Range lies within Refuge boundaries, the Kootenai River Valley is nearly surrounded by mountains. Additionally, the three creeks that run through Kootenai NWR, Deep, Myrtle, and

Cascade Creeks, all originate in the Selkirk Mountains. As a result, impacts to mountain habitats from climate change may have important consequences for Refuge resources.

While this management plan covers only a 15-year time span, the Refuge staff will have to look further into the future. Potential impacts to the Refuge during the 21st century due to climate change include the following:

- Delayed fall migration of waterfowl. Potentially, fall-migrating waterfowl could stay in the area longer (Wildlife Management Institute 2007, 2008; Browne and Dell 2007).
- A potential increase in numbers of overwintering waterfowl, if suitable open-water habitat is available (ibid.)
- With habitat loss in the prairie pothole region, the Refuge may see increased use by breeding waterfowl if suitable habitat is available. However, without active management, earlier drying of wetlands in spring and summer will reduce quantity and quality of food available to breeding waterfowl and waterbirds (ibid).
- Longer growing seasons for crops, but reduced summer precipitation (ISAB 2007; CIG 2010c).
- Increased incidence of invasive and noxious weeds (ISAB 2007; CIG 2010c).
- Lower summer streamflows and increased temperatures due to reduced snowpack and earlier snowmelt in the Selkirk Range, with negative impacts to bull trout and westslope cutthroat trout (Rieman et al. 2007; Williams et al. 2009).
- Increased populations, or a higher percentage, of fish that can tolerate higher water temperatures, both non-native (e.g., brook trout) and native (e.g., northern pikeminnow) species (ISAB 2007; Rieman et al. 2007; Williams et al. 2009).
- Increased likelihood of fall and winter flooding in Myrtle Creek, Deep Creek, and Cascade Creek due an increased frequency of rain-on-snow events, particularly in years when PDO and ENSO are "in phase" (Hamlet and Lettenmaier 2007; ISAB 2007; CIG 2010c).
- Larger and more intense fires in the Selkirk Range. Besides direct impacts to habitat used by mule deer, elk, moose, and other native wildlife, wildfires would increase sediment loads in Kootenai River tributaries, with negative impacts to native fish (Westerling et al. 2003, 2006).
- Populations of moose and mule deer may decline locally, whereas numbers of white-tailed deer and elk using the Refuge may increase, with potentially undesirable impacts to riparian habitat (DeVos and McKinney 2007).

Changes in the hydrologic regime from reduced snowpack and earlier snowmelt will likely impact wetland, meadow, and creek habitats as well as the birds, fish, and other wildlife dependent on those resources. Lower and warmer summer flows will reduce the quantity and quality of freshwater habitat for native fish species that inhabit Refuge creeks. Reduced water quantity would also impact wetland and meadow habitats, which provide forage for grazing wildlife and habitat for mammals and birds, including many species of migrating waterfowl (Loehman and Anderson 2009; Scott et al. 2008).

Fire regimes are likely to be affected by climate change and this may result in larger and more intense fires in the Selkirk Mountains. In turn, downstream Kootenai NWR may be impacted by altered streamflows and sediment loads which could change the hydrology and vegetation of the Refuge wetlands and those species which use the wetlands (Loehman and Anderson 2009; Scott et al. 2008).

The potential implications of climate change on Refuge management are likely to include:

- Increased pumping costs to maintain Refuge wetlands. With lower summer streamflows, diverting water from Myrtle and/or Cascade Creeks in summer, and pumping water from Deep Creek at the current location, may become unfeasible. The Refuge may need to increase its water rights in the Kootenai River.
- Increased need for weed control.
- Increased need to provide food for fall-migrating waterfowl, due to delayed migration and the likelihood that waterfowl will stay in the area longer.
- Increased need to restore and maintain riparian vegetation, to counter trends toward increased summer stream temperatures and maintain suitable habitat for bull trout and westslope cutthroat trout. Riparian vegetation may also be under increasing pressure from deer and elk browsing.
- Increased risk of damage to Refuge infrastructure due to flooding. Refuge water management infrastructure is aging and in need of repair and/or replacement. Infrastructure design should take increased flood risk into account.
- Increased risk of damage to forested habitat and Refuge infrastructure from wildfire.

Wildlife-dependent public uses such as hunting, fishing, wildlife observation, and wildlife photography will likely also be impacted by climate change. By the very nature of these activities, impacts to Refuge animals and/or their habitats will result in altered opportunities for a quality experience by the public. The Wildlife Management Institute (2008) predicts that climate change will affect hunting and fishing opportunities in a number of ways, including decreased populations of big game mammals; decreased populations of native trout and char; and decreased populations of waterfowl due to loss of breeding habitat. However, some changes could benefit hunters. For example, delayed waterfowl migration may extend the hunting season in northern areas. Populations of certain upland game birds, e.g., spruce grouse, may decrease, while others (e.g., nonnative pheasant and introduced wild turkey) may increase. Potential changes to hunting and/or fishing are also possible if viable species populations cannot be maintained.

It is clear that to address an issue of this magnitude, land managers must plan collaboratively on a regional level. During the 15-year time span of this management plan, the Refuge will begin a focused effort to prepare for climate change.

3.3 Hydrology

3.3.1. Kootenai River and Changes due to Hydropower Operations

The Kootenai River (spelled Kootenay in Canada) Subbasin is an international watershed encompassing parts of British Columbia, Montana, and Idaho. Originating in British Columbia, the river flows south to Montana into the reservoir created by the Libby Dam and from there, turns west, passing through a gap between the Purcell and Cabinet Mountain Ranges, and enters Idaho where it then flows north back into British Columbia, to Kootenay Lake. The Kootenai River forms the northeastern and eastern boundaries of the Refuge for approximately 3.7 miles. The refuge currently owns two pumps which are situated on the river and has water rights to divert water from the river for wetland management (see Section 3.3.3 below).

The elevation of the Kootenai River drops from 11,871 feet (3,618 m) at its headwaters to 1,745 feet (532 m) at the confluence with Kootenay Lake; however most of the drop occurs in British Columbia, before the river reaches Canal Flats. The river drops less than 1,000 feet (305 meters) during its 300-mile course from Canal Flats through Montana, Idaho, and north to Kootenay Lake (Dunnigan et al. 2003).

The Kootenai River is the second largest tributary to the Columbia River in terms of runoff volume but is ranked third based upon its watershed area of 8.96 million acres (Dunnigan et al. 2003). The major tributaries of the Kootenai River below Libby Dam include the Fisher River, Yaak River, and the Moyie River. The Kootenai River's tributaries are "high-gradient mountain streams with bed material consisting of various mixtures of sand, gravel, rubble, boulders, and drifting amounts of clay and silt, predominantly of glacio-lacustrine origin" (Dunnigan et al. 2003). The Kootenai River basin in Idaho encompasses 1,007 square miles and the largest Idaho tributary systems include the Moyie River, Deep Creek, Boundary Creek, and Boulder Creek (DEQ 2006). Annual discharge of the tributaries in Idaho average around 2 cfs per square mile of drainage (DEQ 2006).

The Kootenai River has three distinct geomorphic reaches from Libby Dam to Kootenay Lake. The first reach, which extends 57 miles from Libby Dam to the Moyie River, is a canyon in areas with a substrate of cobbles and gravel. The second reach, from where the Moyie empties into the Kootenai down to Bonners Ferry (4.7 miles) is a braided channel with gravel substrate. The third reach, the Lower Subbasin, meanders 51 miles, from just below Bonners Ferry past Kootenai NWR to Kootenay Lake in British Columbia. Here the valley widens, averaging 2.5 to 3 miles in width. This reach of the river has a much slower velocity, less gradient (0.02 m/km) (Dunnigan et al. 2003), numerous meanders, and pools over 90 feet deep. The water level in this reach is affected by the Corra Linn Dam located at the outlet of Kootenay Lake in British Columbia (DEQ 2006). After the Corra Linn Dam, the Kootenai River passes through five hydroelectric dams before flowing into the Columbia River (DEQ 2006).

The Corra Linn Dam, completed in 1932, was the first dam constructed for water storage on the Kootenai River system. The dam was built with the goals of supplying electricity to Cominco for its new fertilizer plant in Trail and to ensure a constant water supply during the winter for the West Kootenay Power dams located downstream (Touchstones Nelson 2007). Since water storage in Kootenay Lake would affect both the United States and Canada, it required the consent of the International Joint Commission (IJC) but it was continually denied. It was not until 1938 when Idaho farmers located near the border were affected by a devastating flood and became convinced of the need for flood control, did the IJC grant permission for Kootenay Lake to be used as a reservoir (Touchstones Nelson 2007). When the lake was impounded, the water level increased by 7.8 feet with an annual drawdown now of 9.8 feet. Kootenay Lake covers 150.5 square miles with an average depth of 308 feet (DEQ 2006).

Construction of dams on the Kootenai River and its tributaries radically altered the flow regime of the river during the twentieth century. The primary dam affecting the reach of the Kootenai River upstream of the Refuge is Libby Dam in Montana which was built in 1972, creating the Koocanusa Reservoir. The Libby Dam imposes additional water level fluctuations to meet demands for hydroelectricity, agriculture, pool recharge, recreation, fisheries, and water quality priorities. Figure 3.2 shows flows over a five year period.

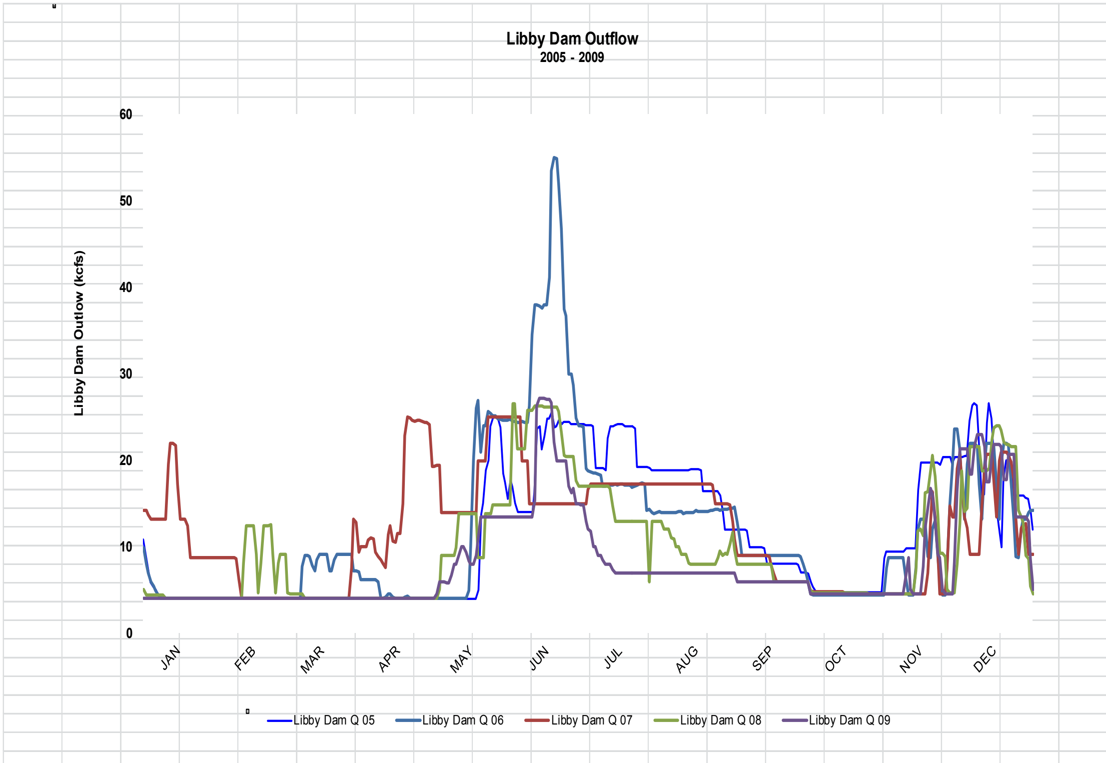

Figure 3.2. Outflow from Libby Dam, 2005-2009.
(Source: G.C. Hoffman, USACOE, Libby, MT. June 29, 2010.)

In the pre-dam era, the Kootenai River typically had relatively low flows from August through March and much higher flows during the snowmelt runoff period (the spring freshet) in the spring and summer (April-July) (Figure 3.3). The mean peak of the spring freshet typically occurred in early June with a discharge of nearly 1,700 cubic meters (60,000 cubic feet) per second (USFWS 1999). In the post-dam era, normal high water flows were reduced by over 300 percent with the peaks flattened out. Spring runoff is contained within storage reservoirs and gradually released over the year. Winter flows are higher than the pre-dam era and more variable, as the stored water is tapped for power generation (Figure 3.4). Since the 1990s, there have been several changes in operation of Libby Dam releases to protect Kootenai River white sturgeon (USFWS 1999) and Columbia River salmonids (NMFS 2000). Spring flows have been manipulated to create conditions more favorable to white sturgeon spawning, resulting in an increase in spring flows to mimic more natural conditions in the river. These spring flows are, however, much more variable than historic flows. Recently, mid- to late-summer flows have been increased in order to assist with downstream migration of salmon smolts in the main stem of the Columbia River (Figure 3.5) (NMFS 2000).

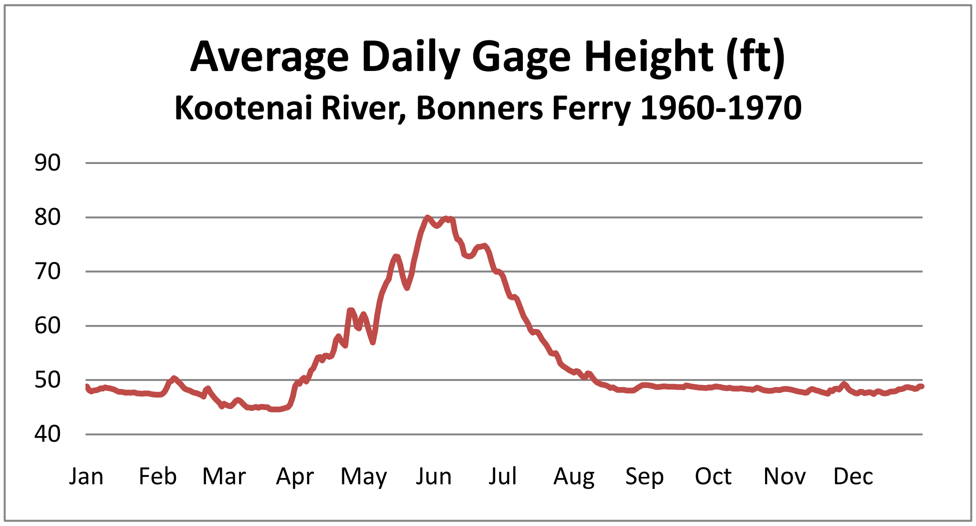

Figure 3.3. Average daily gage height of the Kootenai River at Bonners Ferry prior to construction of the Libby Dam.
(From USGS data.)

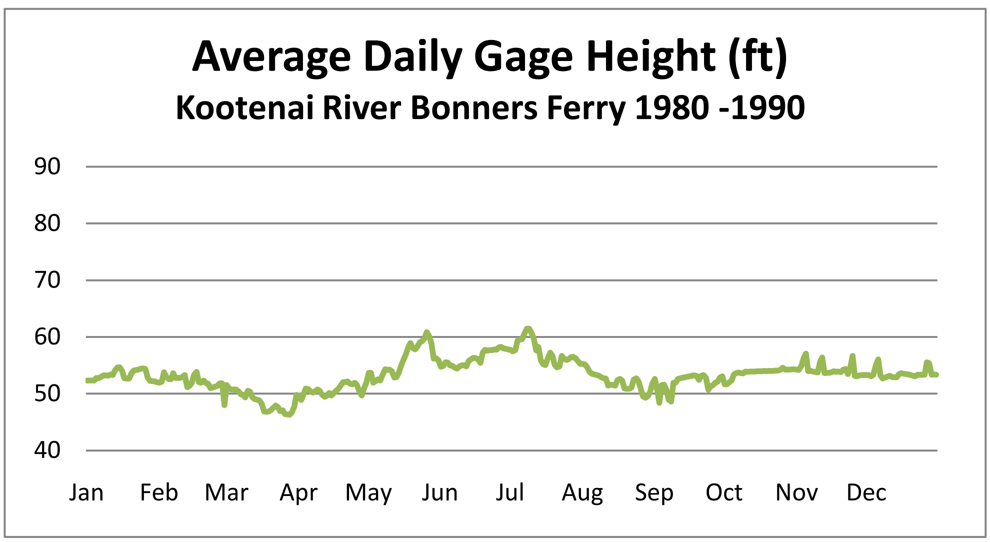

Figure 3.4. Average daily gage height of the Kootenai River at Bonners Ferry after construction of the Libby Dam.
(From USGS data.)

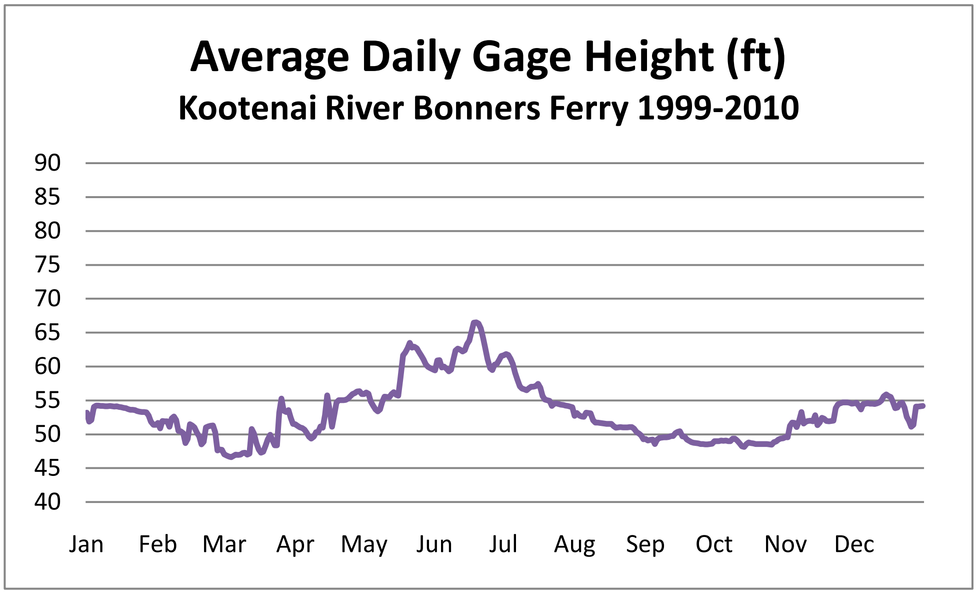

Figure 3.5. Average daily gage height of the Kootenai River at Bonners Ferry 1999-2010.
(From USGS data.)

3.3.2. Rivers and Streams

Deep Creek

Deep Creek's 116,760 acre (182 sq. mile) watershed is located in the southwest corner of the Lower Kootenai River Subbasin. Deep Creek flows north from McArthur Lake and enters the Kootenai River approximately three miles downstream of Bonners Ferry. The creek's major tributaries include Brown Creek, Twentymile Creek, Trail Creek, Dodge Creek, Fall Creek, Ruby Creek, Caribou Creek, and Snow Creek. Deep Creek's mean annual discharge is estimated to be 336 cfs with the high volume runoff occurring during the spring snowmelt and major rain-on-snow events (DEQ 2006). The Refuge's water right to pump water from Deep Creek provides for wetland management, primarily for the southern half of the refuge (see Section 3.3.3).

Between McArthur Lake and its confluence with the Kootenai River, Deep Creek is divided into three reaches for developing shade targets (see Water Quality section below; Idaho DEQ 2006). The upper reach (8.5 miles) has bankfull width of approx 13 m (the estimated natural width was 10 m). The middle reach (4.7 miles) is in a wider valley than the upstream reach, with bankfull width of approximately 25 m (estimated natural width 20 m). The lowest (bottomland) reach (1.5 miles) has channel widths that are substantially larger than the upper portion of Deep Creek due to influences of levees and the Kootenai River. The lower 2.3 miles of Deep Creek forms the Refuge's southeastern boundary; it is this entire section that was diked in the 1920s, eliminating the creek's access to its floodplain. Due to diking and Libby Dam operations, the Kootenai River backs up into Deep Creek for approximately 1.5 miles. This has made the channel of the bottomland reach much wider than it was historically. The bankfull width is 60 m at the mouth of Deep Creek, whereas the estimated natural channel width is 23-25 m. The tree and shrub vegetation along the banks of Deep Creek in the bottomland reach are setback from the banks due to inundation by the Kootenai River.

Myrtle Creek

Myrtle Creek is one of the many tributaries which flow into the lower main stem of the Kootenai River. Fed at its headwaters by several small lakes and tributaries, the Myrtle Creek drainage is approximately 23,555 square miles (Kruse 2005). Myrtle Creek flows east out of the Selkirk Mountains and enters the Refuge's western boundary near the base of Myrtle Creek Falls.

The upper portion of Myrtle Creek, from its headwaters to Myrtle Falls, is characterized by steep canyon walls, confined stream reaches, and high gradient. The substrate is dominated by erosion-resistant rocks and boulders (Kruse 2005). Myrtle Falls contains a series of steep cascade falls and a large barrier falls, approximately 120 feet high (Kruse 2005). From there, Myrtle Creek is entirely within the Refuge's boundaries as it flows in a northeasterly direction, then turns north to its confluence with the Kootenai River. From Myrtle Falls to the Kootenai River is approximately 2.5 miles. Myrtle Creek is a primary source of drinking water for the City of Bonners Ferry. The Refuge has an existing water right to allow for the diversion of water from the creek for wetland habitat management (see Section 3.3.3).

Figure 3.6. Myrtle Creek Falls in 1967.
(Kootenai NWR Annual Narrative, 1967).

The stretch of Myrtle Creek within the Refuge can be divided into three reaches, each with distinctly different types of habitat. The upper reach extends from the base of the falls downstream for approximately 0.18 miles, just downstream from the point where the stream flows under Westside Road. This reach is relatively narrow, characterized by a higher gradient, boulder and rubble substrate, and contains considerable woody debris in the stream and along the stream banks. The middle reach runs 0.16 miles, from Westside Road to the Refuge's dike, which forms its eastern bank. This reach is wider, shallower, and characterized by significantly lower stream gradient. The substrate is predominately smaller rubble, gravel, and coarse sand with occasional pockets of small boulders. Woody debris is less common, consisting of an occasional fallen tree or small piles of accumulated branches. The lower reach extends from the confluence of Myrtle Creek and the Kootenai River, upstream about 2.17 miles. Up until the late 1930s, maps showed this segment of Myrtle Creek turning east and meandering through the Refuge flats before turning west and then north to the Kootenai River (Metsker Maps 1939) and the creek channel was virtually unchanged from original GLO surveys in the 1890s (BLM 2010). Sometime after 1940 the creek was diverted to the west side of the Myrtle Creek dike and the lower reach was therefore straightened to run almost due north to the Kootenai River. This stretch of Myrtle Creek is much wider than the middle reach, with low to non-existent stream gradient, depending on the level of the Kootenai River. Substrate is primarily sand and silt with extensive vegetation growing along the riparian areas during periods of low flow in the Kootenai River. During periods of higher flow in the Kootenai River, this section of the stream becomes almost completely inundated. During periods of extremely low flow in the Kootenai River, it is not uncommon for sand bars to form at the mouth of Myrtle Creek, impeding fish movement between the creek and river (Jones and Faler 2010).

Cascade Creek

Cascade Creek is a small tributary of Myrtle Creek that flows northeasterly out of the Selkirk Mountains and into the northwestern corner of the Refuge, flowing under Westside Road via two large culverts. Upstream of the road, the stream is narrow, very high gradient, and highly influenced by the close surrounding forest riparian habitat (upper reach). Substrates are mostly large cobble and small boulder with occasional pockets of coarse gravel and sand in small pools. Immediately downstream of the culverts is a water diversion structure (Refuge has a water right) that re-directs most of the flow northward (northern diversion) away from the streams natural course and toward Cascade Pond.

After being diverted, the steam flows through another smaller culvert through a very well defined channel for about 328 feet before becoming extremely braided and losing any appearance of a definite stream. The eastern diversion is created by a small amount of stream flow that escapes through the diversion structure and makes its way easterly to Myrtle Creek, flowing through a definite channel for about 328 feet within the very shallow gradient riparian habitat of Myrtle Creek. Similar to the northern diversion, the eastern diversion becomes extremely braided and loses any appearance of a definite stream (Jones and Faler 2010). A cobble and gravel substrate exists in both of the diversions.

3.3.3. Wetlands Hydrology

Even before the construction of dams on the Kootenai River and some of its tributaries, the hydrology of the lower Kootenai River floodplain was extensively altered between 1920 and 1947 through the construction of over 80 miles of levees that constrained the river and several of its tributaries as they entered the floodplain. Sixteen drainage districts were established during this time period. The current Refuge boundary includes all of District 7. Drainage ditches and pumps drained the floodplain for farming. The result was a nearly complete separation of the river from its floodplain from the town of Bonners Ferry to its delta in Kootenay Lake.

Prior to the extensive diking and pumping, the Kootenai River and its tributaries had very dynamic floodplains. The river and stream channels would continually change course through erosive processes creating numerous off-channel wetlands (oxbows) as old portions of the stream channel became isolated. During the spring freshet the river and streams entering the floodplain would overtop their banks and spread out across the floodplain. These nearly annual flooding events would result in the scouring of stream channels and portions of the floodplain creating new channels and depressions that became wetlands. As the water spread across the floodplain and decreased in velocity, suspended gravels and finer sediments were deposited creating gravel bars near the existing channels and stream deltas and extensive mudflats across the floodplain. As the elevation of the river receded during the summer, a diverse plant community of annual moist soil species would become established on the exposed mudflats. Woody species such as black cottonwood and willow would germinate on the exposed sand and gravel bars. Off-channel wetlands, scoured depressions and old oxbows, would again be isolated and their water levels would be dictated by groundwater levels directly influenced by the river and its tributaries. Many of the deeper sloughs and oxbows would hold water year-round.

The portion of the Kootenai River Valley that became Kootenai NWR occurs on the west side of the river where three streams enter the flood plain: Deep Creek, Myrtle Creek, and Cascade Creek. These streams would have created deltas with a system of meandering and braided channels, sloughs, and depressions. Evidence of some of these features is still present on the Refuge and has been incorporated into its system drainage and wetlands. The main river channel adjacent to the Refuge consists of a portion of two meander lobes that bend to the west and then the east. On the inside of the lobe that bends to the east is a prominent point bar with several parallel gravel bars still visible inside the river dike. The floodplain is higher near the river than at the base of the Selkirks as a result of gravel and sediment deposits along the bank of the river that created a natural levee.

Reclamation of the Refuge portion of the floodplain occurred during the 1920s with the building of a dike along the western side of Deep Creek to the Kootenai River then along the west side of the river to the mouth of Myrtle Creek where it joins a dike built along the eastern side of the Myrtle Creek from the point where it leaves the Selkirks and enters the floodplain. Original GLO maps (Figure 3.7) show that Myrtle Creek originally flowed east (nearly to the Kootenai River) when it entered the floodplain and then flowed west and north to its confluence with the Kootenai River. When the Myrtle Creek dike was built, the creek was rerouted; it now runs straight north along the west side of the dike. Inside the dikes, a ditch was dug that connected several natural sloughs to an outlet in the Myrtle Creek dike where water could be drained either through gravity flow or by pump.

Current Refuge Water Management System

Following Refuge establishment, wetland units were created through the construction of water delivery systems, cross diking and water control structures. Wetlands units were primarily constructed along the eastern edge of the floodplain which represented a natural low area. There are currently 20 impoundments filled via five diversions from four primary sources and managed to meet habitat objectives for wetland-dependent wildlife by manipulating over numerous water control structures (Map 10). Three of these diversions are from streams on the west side of the Refuge which are dependent on snowpack and runoff. These diversions are Upper Myrtle Creek, Lower Myrtle Creek, and Cascade Creek. The other two sources are from pumps in Kootenai River on the east, and Deep Creek on the south.

The primary drainage for all wetland units with the exception of those filled through the Cascade Creek diversion is through the Center Ditch and into Myrtle Creek via the Center Ditch Outlet Structure. The elevation at the bottom of this structure is 1,749 feet. On the Center Ditch side of the dike there is a 7 foot flashboard riser. The maximum elevation that water can be held in Center Ditch without toping dikes into adjacent wetland units is 1,756 ft. Gravity drainage of Center Ditch can occur when the surface water elevation in Center Ditch is higher than the elevation of Myrtle Creek at the outlet structure. Center Ditch can only be completely drawn down without pumping when the river elevation is below the elevation of the outlet structure flowline (1,749 feet) which typically occurs from September-October and February-May. If additional drawdown is required during the summer when the river elevation is higher than the top of the outlet structure, then the Myrtle Creek

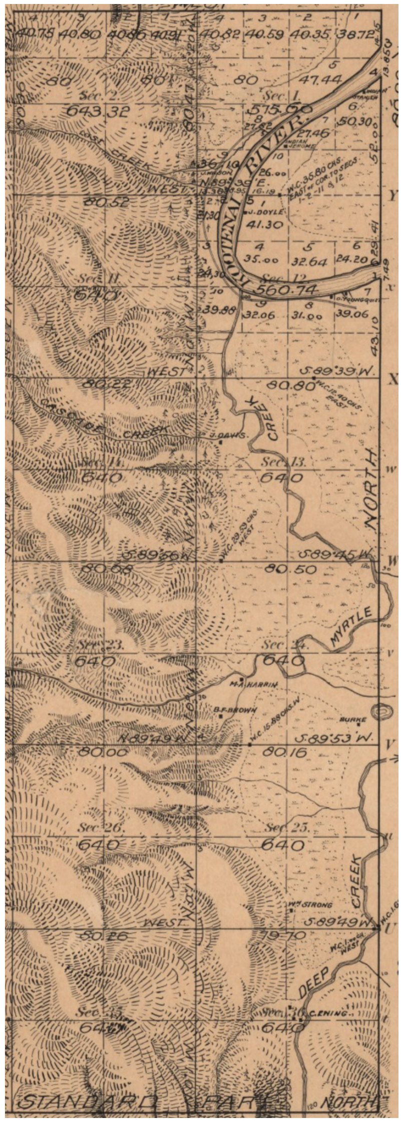

Figure 3.7. General Land Office map of T62N, R1W, Boise Meridian (including present-day Kootenai NWR), showing original course of Myrtle Creek.
(Bureau of Land Management, General Land Office Records, www.glorecords.blm.gov.)

Outlet pump (5 cfs capacity) must be activated. Draw down of ponds with outlet structures connected to the Center Ditch can occur when Center Ditch is lowered below their current elevations. Complete drawdown of a pond can only occur when Center Ditch is lower than the flowline of the pond outlet structure. Some units higher up in the system such as Greenwing Pond, Greenhead Marsh, Aspen Slough, Whitetail Slough, Curlew Flats, and River's Bend Unit can be drawdown at any time. Drawing down the East Hunt Unit is dependent upon East Ditch through to Center Ditch.

There is leakage to the ditch through the internal dikes and the boards in the flashboard riser water control structures when the water elevation in Center Ditch is lower than the adjacent ponds. This leakage amounts to about 25 percent of the capacity of ponds in the spring requiring inputs from either primary or secondary water sources to maintain objective water levels during the nesting season. During the summer when streamflows decline and inputs to wetlands are reduced, an additional 25 percent of the capacity of ponds is lost through evapotranspiration.

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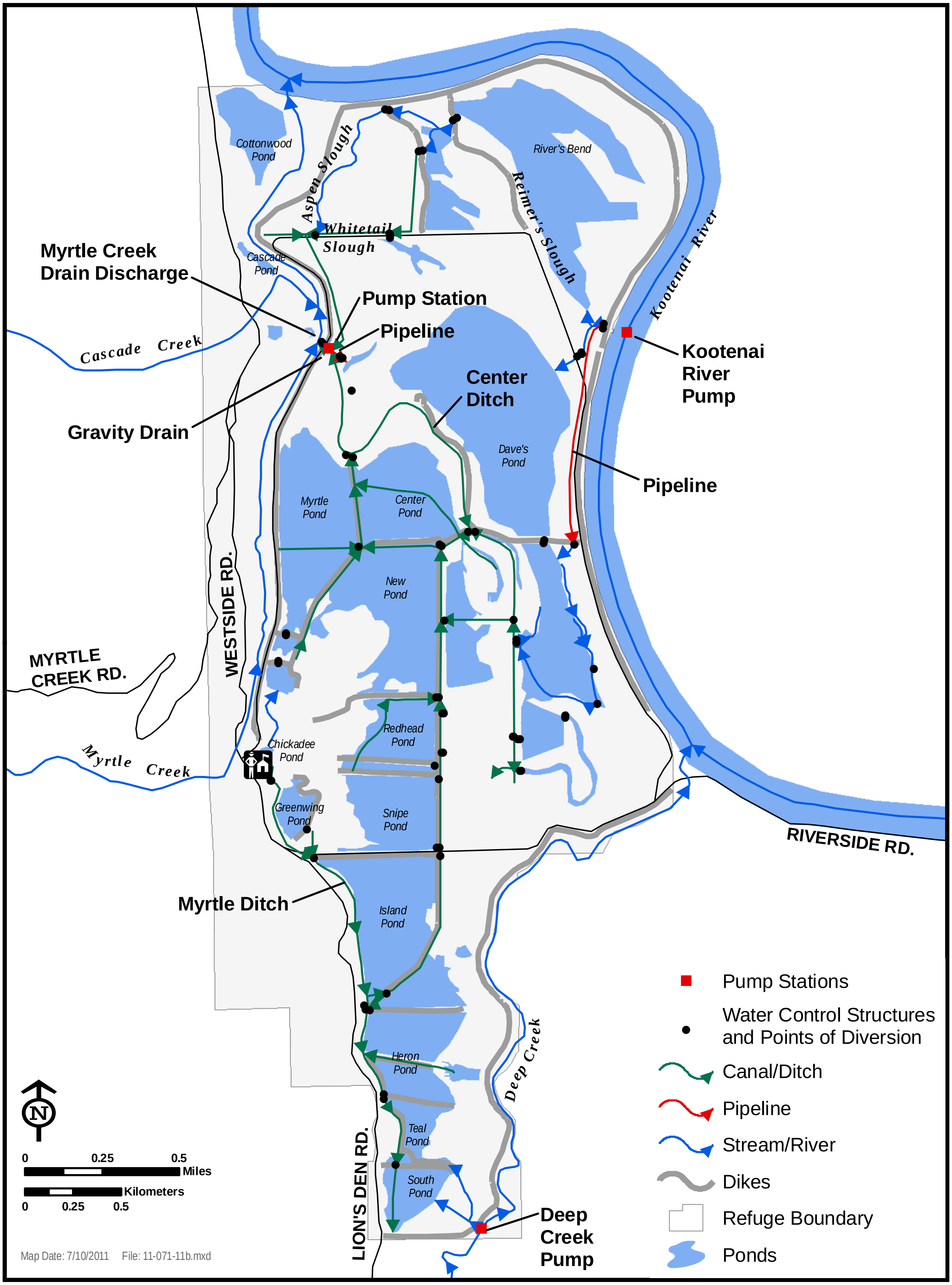
Map 10 **Water Management Infrastructure**



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Upper Myrtle Creek Diversion

This diversion originates on Myrtle Creek just below the Myrtle Creek Falls Bridge, west of Refuge Headquarters. In general, water can be diverted from the creek using this structure during all months except the winter months when there is danger of the structure freezing. This prevents management of unexpected high flow events in late winter and early spring. In most years, water is available for diversion and use from March-June, with limited flows from July to September.

From the diversion point, water is directed via ditch/channel to Chickadee Pond which is also referred to as the Distribution Pond. From this pond there are three headgates that allow water to be diverted to the north, east, and south. The northern diversion distributes water through Goldeneye, Frog, Myrtle, and Center Ponds. These wetlands must be filled in series in the above order. Both Myrtle and Center Ponds have outlet structures that allow drainage into Center Ditch when water levels in the ditch are low enough. Frog and Goldeneye Ponds must be drained through Myrtle Pond. The eastern diversion distributes water to both Redhead and New Ponds independently. Both Redhead and New Pond have riser outlet structures that allow control of water levels and drainage to the Center Ditch when water levels in the ditch are below the pond elevation. The southern diversion distributes water through the Southern Distribution Ditch to Greenwing Pond and to the ponds south of Riverside Road. From Greenwing Pond, water flows to Snipe Pond. The elevation of the Greenwing Pond outlet structure allows water to be easily passed to Snipe Pond at any water elevation. Snipe Pond has two structures that drain to Center Ditch. Myrtle Creek via the Southern Distribution Ditch is the primary source of water for Island Pond. When water levels in Myrtle Creek are high, water can be moved as far south as South Pond in this ditch. This water source is secondary to the Deep Creek Pump for ponds south of Island Pond.

Improvements to this subsystem that will allow more independent water management are the placement of water control structures between Frog and New Ponds, between Myrtle and New Ponds, and between New and Center Ponds. These structures would allow isolation of Myrtle, New, and Center Ponds increasing the ability to manage these wetlands independently.

Lower Myrtle Creek Diversion

This structure was designed to serve a dual purpose. A pump moves water from Myrtle Creek to Center Ditch or (independently) to Dave's Pond if the creek's water level permits. A concrete structure with flash boards on the east side of the dike (Auto Tour Road/Myrtle Creek dike) and a screw gate on the west side serve as an outlet for Center Ditch. Center Ditch can be used as a secondary source of water for filling all ponds with an outlet structure to this drainage system. This is limited by the maximum water level elevation in the ditch and the elevation of the pond. Currently the maximum surface water elevation in Center Ditch is 1,756 feet.

Construction of a cross dike and placement of a water control structure in Center Ditch with a maximum elevation of 1,760 feet just south of the Center Ditch Outlet would allow diversion of water north into Aspen Slough and to Curlew Flats.

Cascade Creek Diversion

This diversion distributes water to Cascade Pond and then to Cottonwood Pond. Flows occur primarily in late winter and spring. Little flow occurs in summer. The Cascade Pond Structure is an overflow culvert with no control capability. Cottonwood Pond has a flash board riser structure and drains to Myrtle Creek. Currently these wetlands are filled during high flow periods and drawn down through leakage and evapotranspiration through summer and early fall.

Kootenai River Pump

There are two pumps that distribute water through the Kootenai River Dike to the Refuge from the same general location. The old Kootenai River Pump is a 7 cfs pump set at an elevation that limits pumping to periods of high river elevations. The New River Pump has a 10 cfs capacity and is set at an elevation that allows pumping at all river elevations. The majority of pumping takes place during late summer and fall. Water from the river pumps is distributed in three directions at diversion structures through valves just inside the river dike on the south end of the River's Bend Unit and Reimer's Slough. From this point, river water can be diverted north into Reimer's Slough and the rest of the River's Bend Unit. Once it reaches an elevation of 1,758 feet water can be moved to Curlew Flat and then into Aspen and Whitetail Sloughs. This takes a significant amount of pumping especially during the summer because of the elevations north of the diversion and porous nature of soils in the River's Bend Unit. Water from the river pumps can also be diverted to Dave's Pond. This pond has 2 outlet structures that allow draining of the pond to Center Ditch near the Myrtle Creek Outlet. Dave's Pond is typically maintained at capacity in summer as storage for filling the hunt units north of the Riverside Road through Greenhead Marsh. Water from the river pumps can also be diverted directly to Greenhead Marsh via a pipeline. From Greenhead Marsh, water can be moved to the East Hunt Unit through the East Ditch and Fishhook Slough. Water can also be moved to Mallard Marsh and the West Hunt Unit through Greenhead Marsh via East Ditch and the East Hunt Unit. Mallard Marsh and the West Hunt Unit are directly connected to Center Ditch and can be backfilled from this source when it is high.

The river pumps can also help fill ponds west of the Center Ditch by filling Center Ditch and allowing water to back flow through their outlet structures. There are limitations to this strategy and these ponds, with the exception of Myrtle and Center Ponds, can rarely be brought to full capacity since the maximum elevation in Center Ditch is 1,756 feet and the ponds equalize at this level. This strategy can be used to reduce the water demand from Myrtle Creek for filling these ponds during spring.

Deep Creek Pump

A 10 cfs electric pump at the south end of the Refuge distributes water north to a series of ponds that are filled and drained in stair-step fashion. Freezing temperatures limit use of this pump to spring through fall. Just inside the Deep Creek Dike, pumped water can be diverted to either South Pond or Teal Pond, allowing independent filling. South Pond drains into Teal Pond which then drains into Heron Pond. Heron Pond is filled through Teal Pond and drains into Wigeon Pond which is an extension of Center Ditch. The elevation of Wigeon Pond can be managed at a structure on Center Ditch just south of Riverside Road. Draining a pond in this system requires that all ponds north and downstream be drained first. Because of the low and similar elevation of the outlet structures of these ponds, Center Ditch must also be held low.

As stated before, all of these ponds can receive water independently of each other from Myrtle Creek during high flows in spring via the Southern Distribution Ditch. Improvements to this system that would allow more independent management includes the extension of the distribution ditch from the pump to Heron Pond along the east side of the pond and the separation of the South, Teal, and Heron Ponds from the Center Ditch to allow independent drainage. In order to accomplish this and still maintain the ability to fill from Myrtle Creek via the southern distribution ditch, water would have to be piped across Center Ditch.

3.4 Topography and Bathymetry

The topography of an area is determined by glaciation, mountain formation, and by age and resistance of geologic formations to air and wind erosion (USDA 2005). Lying west of the Continental Divide, Boundary County, the northernmost county of Idaho, has a total area of 1,278 square miles, 1,269 square miles of land and 9 square miles of water. The county consists of rugged, forested mountains, the broad Kootenai River Valley, along with gently sloping benchlands, valleys, narrow canyons, and numerous lakes, streams, and waterfalls. The Moyie River and Round Prairie Valleys occur in the northern end of the county while Deep Creek and Paradise Valleys are in the southern end. Boundary County is bordered on the north by British Columbia, on the east by Montana, and the west by Washington. The Refuge occurs roughly 20 miles south of the border, along the west side of the Kootenai River as it winds its way northwest into British Columbia.

The lowest elevation in the county occurs along the Kootenai River, close to the Canadian border, near Porthill at 1,745 feet. The highest mountain peak in the county is the Selkirk's Fisher Peak with a 7,710 foot elevation (DeLorme 2002). Elevations on Kootenai NWR range from 1,755 feet to 2,310 feet.

3.5 Geology and Geomorphology

3.5.1 Physical Setting

The prominent land features of the area include three mountain ranges, the Purcell Mountains in the northeast, the Cabinet Mountains in the southeast, and the Selkirks in the west. Separating these ranges is the broad Purcell Trench which extends south from British Columbia. Prominent valleys in the county include: the Kootenai River Valley, located within the Purcell Trench; Round Prairie, a narrow valley in the Purcells, which extends from Copeland northeast toward Eastport, ending at Robinson Lake; Moyie River, a narrow valley extending from Eastport south to Moyie Springs; Paradise Valley, consisting mainly of lowlands and extending northeast from Naples to Crossport; and the North Bench which rises up from the Kootenai River from Three Mile to Moyie Springs (Boundary County 2008).

Boundary County is located in the Upper Columbia River Basin. Within the county are six subbasins including several watersheds which drain into the Upper and Lower Kootenai River, the Moyie River in the northeast, Priest Lake to the west, Lake Pend Oreille to the south, or into the Pend Oreille River from the northwestern tip of the county. The Kootenai River is the second largest tributary to the Columbia River in terms of runoff volume but is ranked third based upon its watershed area of 8.96 million acres (Dunnigan et al. 2003).

While there are 12 national forests located either completely or partially in the State of Idaho, two of them, the Kaniksu and the Kootenai, occur partially in Boundary County. The county's mountains are primarily forested while agriculture dominates the Lower Kootenai River Valley. This section of the Valley averages two and a half to three miles in width (S. Soults, personal communication 2010).

3.5.2 Geomorphology

The Soil Survey of Boundary County describes four predominant geomorphic units including: the Selkirk and Purcell Mountains; the Kootenai River floodplain; the North and South Benches; and the Moyie River and Deep Creek Valleys. Long winding ridges and relatively steep side slopes due to tectonic processes and drainageways make up the mountainous topography. Some ridges are broad with slopes ranging from 5 to 25 percent while others have narrower slopes exceeding 25 percent.

The Kootenai River has three distinct geomorphic reaches from Libby Dam to Kootenay Lake. The first reach, a canyon in areas due to the closeness of the mountains with a substrate of cobbles and gravel, extends from Libby Dam to the Moyie River, a distance of 57 miles. The second reach is a braided channel, consisting of gravel, from where the Moyie empties into the Kootenai down 4.7 miles to Bonners Ferry. The third reach has a much slower gradient as it meanders just below Bonners Ferry some 51 miles to its confluence with Kootenay Lake in British Columbia. This reach has been extensively diked and channelized whereas the historical flow regime no longer exits. It is along this third reach where the Kootenai River forms the northeastern and eastern boundaries of the Refuge.

3.5.3 Geologic History

Geologists use the theory of plate tectonics to explain the events that shaped Idaho. The earth's rigid outer layer and crust, called the lithosphere, moves on top of a partially molten and slippery layer called the asthenosphere. The lithosphere is comprised of a dozen or so plates which move independently creating a new ocean floor, destroying an old ocean floor, and assembling or dismembering the continents (Alt et al. 1989). Since the plates move randomly, they may pull away from each other, collide into each other, or slide past each other with the heavier of the two plates sinking beneath the other into the mantle. The mantle is the area between the earth's crust and its core.

During the Proterozoic Period 800 million years ago, the North American continent split apart with a new ocean basin created between the drifting pieces. This rift created a new west coast along the western border of Idaho until the plates collided approximately 100 million years ago. Remnants of the old continental margin and an open ocean still exist today along the state's western border particularly in northern Idaho (Alt et al. 1989).

During the Cretaceous time 70 to 80 million years ago, granite magma rose to the earth's crust, weakening it and causing the upper part to shear off and move east. This detached slab can be seen in the Purcell and Cabinet Mountains which lie along the eastern border of the Panhandle. The Purcells and Cabinets are mainly Belt formations which once covered the granite of the Kaniksu batholiths before moving east. The granite in the Kaniksu batholiths of the Selkirk Mountains lies along the western border of the Panhandle separated from the Purcells and Cabinets by the Purcell Trench. The Purcell Trench, a gently dipping fault that is slightly concave upward, is one of the most important structural elements in northern Idaho in that it separates two geologic provinces where the mountains to the west consist of rocks formed deep within the earth's crust and those to the east contain rocks which were formed at shallower depths (Alt et al. 1989).

The craggy high peaks and serrated mountain skylines of the Panhandle and Central Idaho provide the most obvious evidence of ice age glaciation. Idaho's landscape exhibits a clear record of just two major ice ages. Since glacial deposits of the earlier recorded ice age are too old to radiocarbon date, it is thought that it occurred 100,000 years ago. The most recent ice age is estimated to have occurred approximately 10,000 to 15,000 years ago (Alt et al. 1989). During the Pleistocene glaciations, a lobe of the Cordilleran Ice Sheet repeatedly advanced southward out of British Columbia, along the Purcell Trench, flooding the Panhandle's valleys. The Purcell Trench, the major structural and physiographic feature that trends north-south over 80 miles within the Panhandle, is drained by the Kootenai River. Tributary valley glaciers from the Selkirk Range and the Cabinet Range contributed to the ice stream. When the ice dammed the Kootenai River, it formed Glacial Lake Kootenai and diverted the outlet southward down the trench into the Pend Oreille and Spokane River drainages. Thick sections of glacial till, outwash, and lacustrine deposits filled the depression of the Purcell Trench, and after the continental ice retreated, the northward drainage of the Kootenai River was restored. Alpine valley glaciers persisted until nearly 10,000 years ago in the higher cirques of the Selkirk and Cabinet Ranges (Idaho Geological Survey 2009). Figure 3.8 shows the location of the Purcell Trench in the Kootenai Valley.

3.5.4 Earthquakes

The Idaho Geological Survey's geological and seismological studies predict that earthquakes are likely to occur in any of the active zones in Idaho and its adjacent states. Idaho ranks fifth in the nation for earthquake risk after California, Nevada, Utah, and Alaska. Over the past thirty years, Idaho has experienced the two largest earthquakes in the contiguous United States—the 1959 Hebgen Lake earthquake, magnitude (M) 7.5, and the 1983 Borah Peak earthquake (M 7.3) both of which caused fatalities and millions of dollars in damage.

Three earthquakes have been recorded in Boundary County. On September 9, 1952, an earthquake in the vicinity of Bonners Ferry occurred with an intensity of IV on the Mercalli scale (considered a moderate quake; magnitude unknown). On July 30, 1984, an earthquake measuring magnitude 4.1 occurred in the Purcell Mountains (latitude 48.872, longitude −116.204) and on November 11, 1984, a 3.2 magnitude earthquake occurred east of the Kootenai River, at latitude 48.871, longitude −116.381.

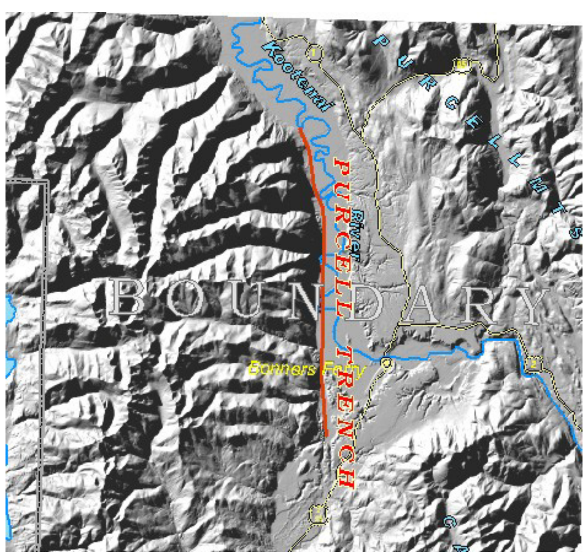

Figure 3.8. The lower Kootenai River Valley, depicting the Purcell Trench, with the Selkirk Range to the west and the Purcell Range to the east.
(Idaho Geological Survey, Breckenridge et al. 2010.)

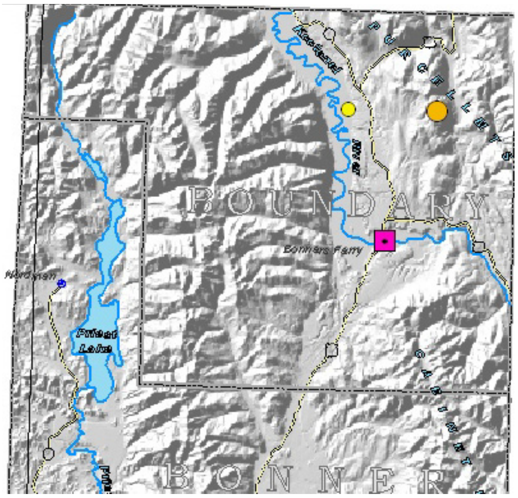

Figure 3.9. Location of earthquakes in Boundary County Idaho.
The yellow circle is the November 27, 1984 earthquake; the orange circle is the July 30, 1984 earthquake; and the square is the September 9, 1952 earthquake. (Idaho Geological Survey 2010)

Idaho Geological Survey seismicity records reveal at least a moderate threat of earthquakes throughout Idaho. Boundary County has a moderate risk of seismic activity when compared to other areas of the state (Figure 3.10).

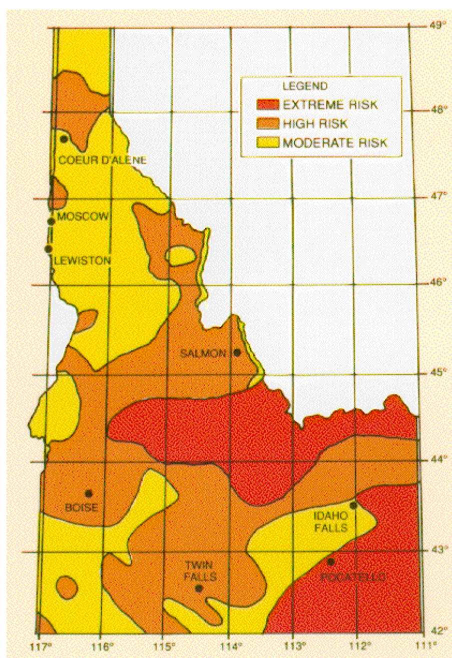

Figure 3.10. Seismic Shaking Hazard of Idaho.
(Idaho Geological Survey 2010.)

3.6 Soils

Soil units on the Refuge vary significantly but generally range from flat, very poorly drained organic material in wetland depressions, to moderately well drained silt loam on floodplains to very steep, well drained silt loam on the mountainside (Figure 3.11; USDA Natural Resources Conservation Service 2005).

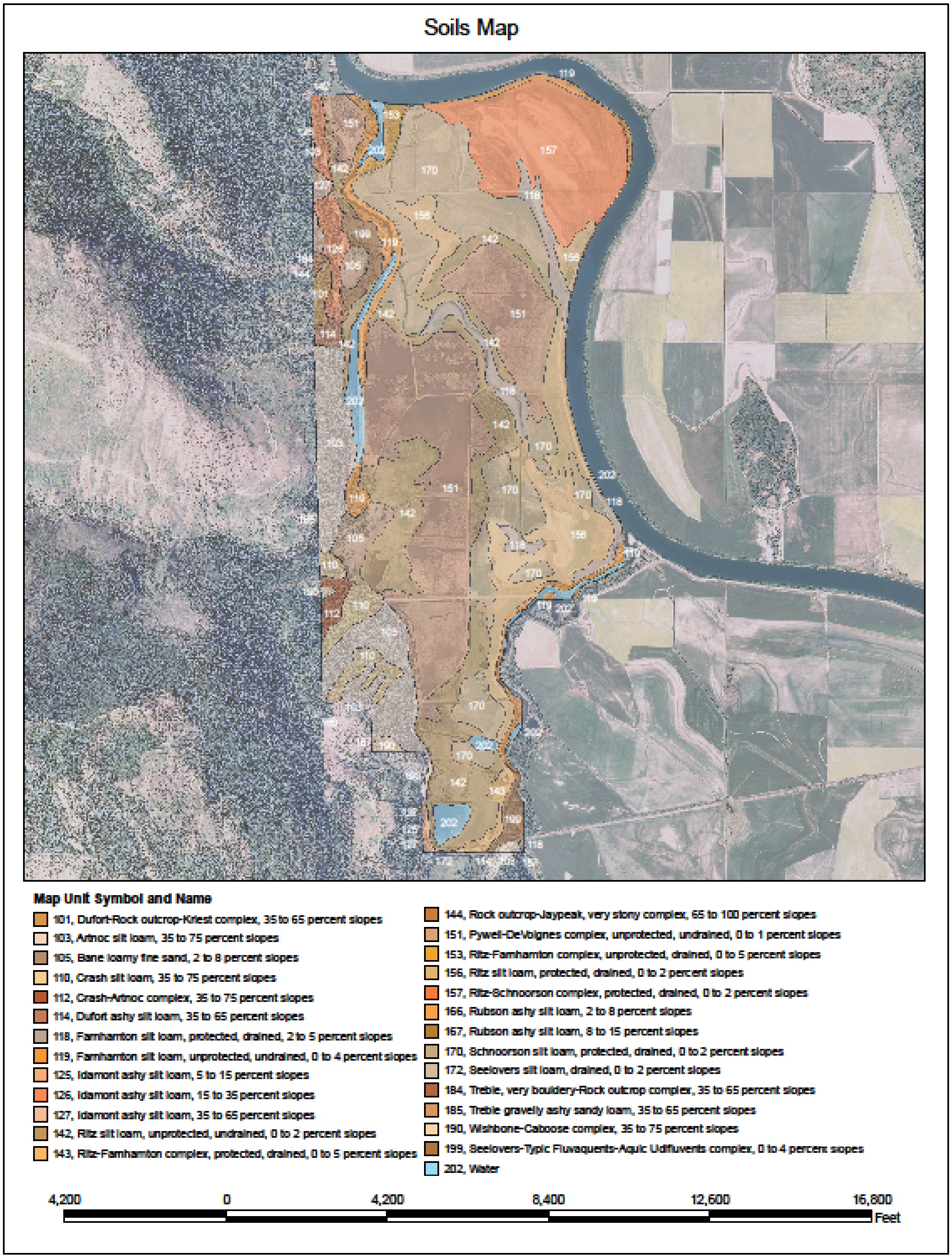

Figure 3.11. Soil map of Kootenai Refuge.
(Natural Resources Conservation Service 2010.)

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Soil units differ based upon their slope, depth, drainage, and other characteristics. For instance, soil temperatures and moisture can vary due to differences in slope and aspect. All of these differences affect management capabilities.

The most common soil types on the Refuge's seasonal, semi-permanent, and permanent wetlands are the Pywell-DeVoignes complex, including the DeVoignes, unprotected, undrained component (map unit 151); and the Ritz silt loam component (map unit 142). The Pywell-DeVoignes complex is found on drainageways, depressions, and flood plains. The parent material consists of herbaceous and/or woody organic material. Organic matter content in the surface horizon is high, about 50 percent. This soil type meets hydric criteria, and is very poorly drained and frequently flooded. A seasonal zone of water saturation is at 6 inches during January, February, March, April, May, June, July, and December.

The DeVoignes, unprotected, undrained component is found on flood plains and drainageways. The parent material consists of stratified herbaceous organic material over mixed alluvium. Organic matter content in the surface horizon is high, about 50 percent. This soil type meets hydric criteria, and is poorly drained and frequently flooded. A seasonal zone of water saturation is at 6 inches during January, February, March, April, May, June, July, and December.

The parent material of Ritz silt loam consists of calcareous silty alluvium. Organic matter content in the surface horizon is about 4 percent. This soil type meets hydric criteria, and is occasionally flooded. A seasonal zone of water saturation is at 12 inches during January, February, March, April, May, June, July, and December.

The most prevalent soil type on the Rivers Bend Unit is the Ritz-Schnoorson complex (map unit 157). This is found on the floodplain. The parent material consists of calcareous silty alluvium. The soil is poorly drained. A seasonal zone of water saturation is at 36 inches during January, February, March, April, May, and December. However, this soil type is rarely flooded or ponded, and it does not meet hydric criteria.

The most prevalent soil types on Refuge grasslands are Schnoorson silt loam (map unit 170) and Ritz silt loam (map unit 156). Both soil types are found on the floodplain on 0 to 2 percent slopes. The parent material of Schnoorson silt loam is silty and clayey alluvium, while the parent material of Ritz silt loam is calcareous silty alluvium. Organic matter content on the surface horizon for both soil types is about 4 percent. The depth of both soil types is greater than 60 inches deep (to a root restrictive layer). Both types are poorly drained but are rarely flooded. Neither type meets hydric criteria. For Schnoorson silt loam, the seasonal zone of water saturation is at 27 inches during January, February, March, April, May, June, December. For Ritz silt loam, the seasonal zone of water saturation is at 36 inches during January, February, March, April, May, and December.

The most prevalent soil type on stringers of riparian vegetation is Farnhamton silt loam (map unit 119). This component is found on natural levees and flood plains on 0 to 4 percent slopes. The parent material is calcareous alluvium. Organic matter content on the surface horizon is about 4 percent. Soil depth is greater than 60 inches (to a root restrictive layer). This soil type is moderately well drained and occasionally flooded. The soil type does not meet hydric criteria. A seasonal zone of water saturation is at 42 inches during January, February, March, April, May, and December.

The most prevalent soil types on the mountain slopes on the west side of the Refuge are Artnoc silt loam (map unit 103) and Crash silt loam (map unit 110). Both soil types are found on 35 to 75 percent slopes (escarpments). The parent material of both soil types is glaciolacustrine deposits. Both types are about 60 inches deep (to a root restrictive layer) and are well drained. These soils are highly erodible and are prone to landslides.

The upper section of Myrtle Creek is mapped as a gravelly ashy sandy loam on 35 to 65 percent slopes. This well drained soil's parent material is glacial till derived from granite, gneiss, and schist rocks with minor amounts of volcanic ash and loess in its surface layers. Volcanic ash was deposited by wind during periods of volcanic activity in the Cascade Range of Washington and Oregon. The volcanic ash adds to the moisture and nutrient-holding capacity of the soils which in turn influences tree growth.

3.6.1 Landslides

Landslides are geological phenomena that involve a wide range of ground movements, such as rock falls, deep failure of slopes, and shallow debris flows. While gravity is the primary driving force for a landslide other factors contribute to a slope's instability. Other factors may be natural such as groundwater pressure destabilizing slopes, loss of vegetation after a wildfire, erosion, slope weakening due to heavy rains or snowmelt, earthquakes, or volcanic eruptions. Landslides may be due to human activities such as deforestation, cultivation, and construction.

Significant landslides were documented in Boundary County in 1954, 1959, 1961, 1965, 1972, 1974, 1981, 1997, and 1998. The majority of the landslides were due to erosion of steep slopes adjacent to roads. A major mudslide occurred in Bonners Ferry on October 16, 1998, completely closing US Highway 95 just north of the city. This slide affected traffic flow north and south of the city for several months (Boundary County 2005).

In March 2007, a landslide occurred on the Refuge, completely blocking Myrtle Creek Road with boulders, trees, and soil. The slide originated on private property when an old logging road on the hillside above fractured, due to the silty glaciolacustrine soils.

3.7 Fire

Fire plays an important role in the ecology of western forests. Many ecosystems not only survive low-intensity fires, but benefit from them. Frequent, low-intensity fires periodically reduce fuels while leaving some trees alive, thereby maintaining healthy forests with limited fuel loads (Covington and Moore 1994). Today, forest managers distinguish between "wildland fires" (any non-structure fire occurring in a wildland area) and "wildfires" (an unplanned, unwanted wildland fire where the objective is to put the fire out for various reasons—saving life, property, or natural resources) (National Wildfire Coordinating Group 2011). Not all wildland fires are wildfires. Wildland fires include naturally ignited fires that are allowed to burn to accomplish specific resource management objectives, and prescribed fire.

In western forests fire severity is inversely related to fire frequency. The more frequently the forest burns, the less severe the fire because fuel loads remain low (Climburg et al. 2005). Fire suppression since the early 1900s has increased fuel loads and made western forests vulnerable to catastrophic fires, defined as "a fire that kills a majority of the trees in the canopy in the ponderosa pine type or in any dry forest that was, in pre-settlement times, subject to frequent surface fires" (Covington and Moore 1994). Forests can suffer massive and lasting damage from these high-intensity fires, which

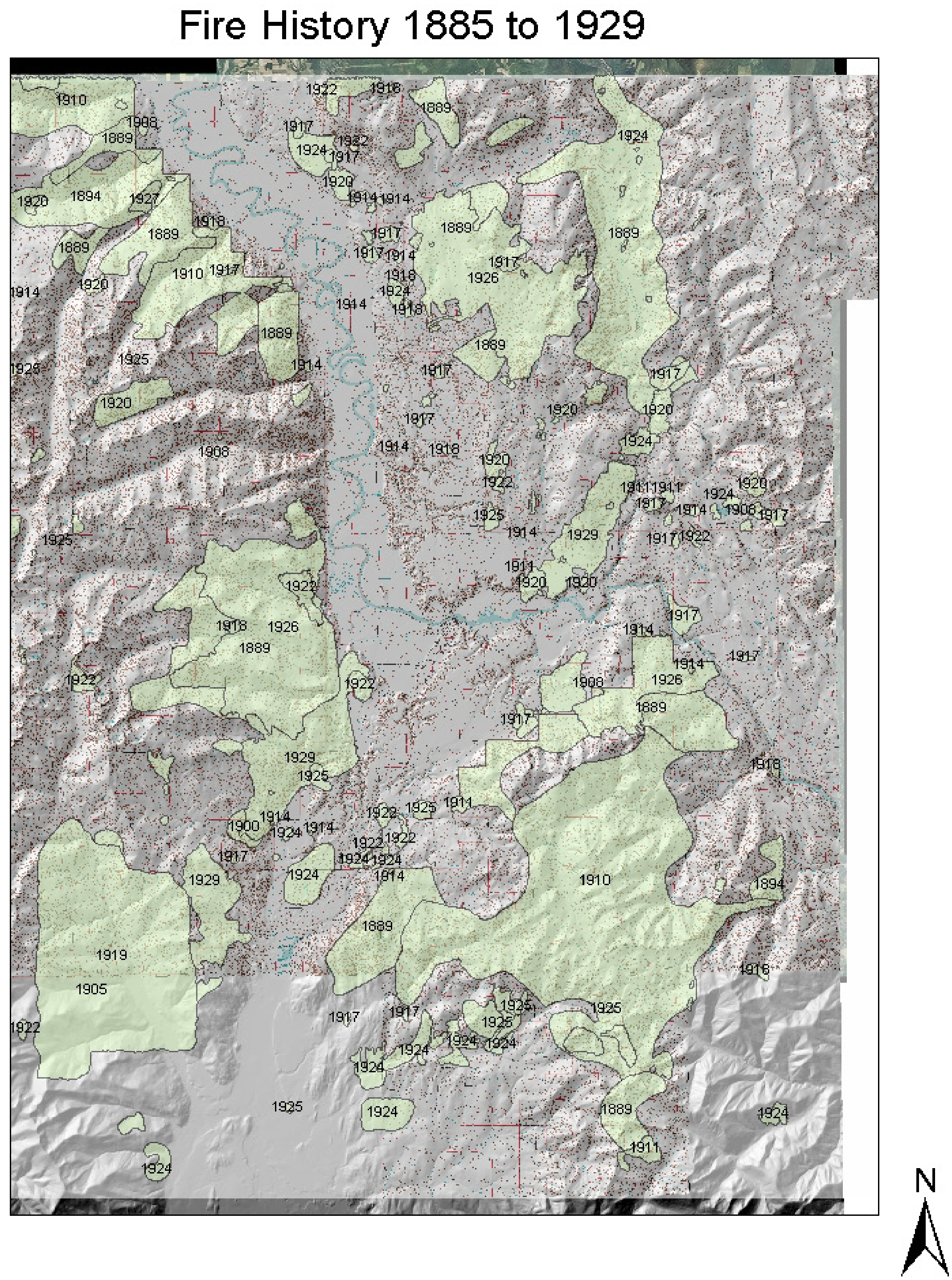

Figure 3.12. Fire history of the northern Idaho Panhandle, 1885-1926. Large fires occurred in the Selkirks, west of the Refuge, in 1889, 1918, 1922, and 1926.
(Courtesy of Wm. Lee Colson, USFS, Bonners Ferry Ranger District, Nov. 2010.)

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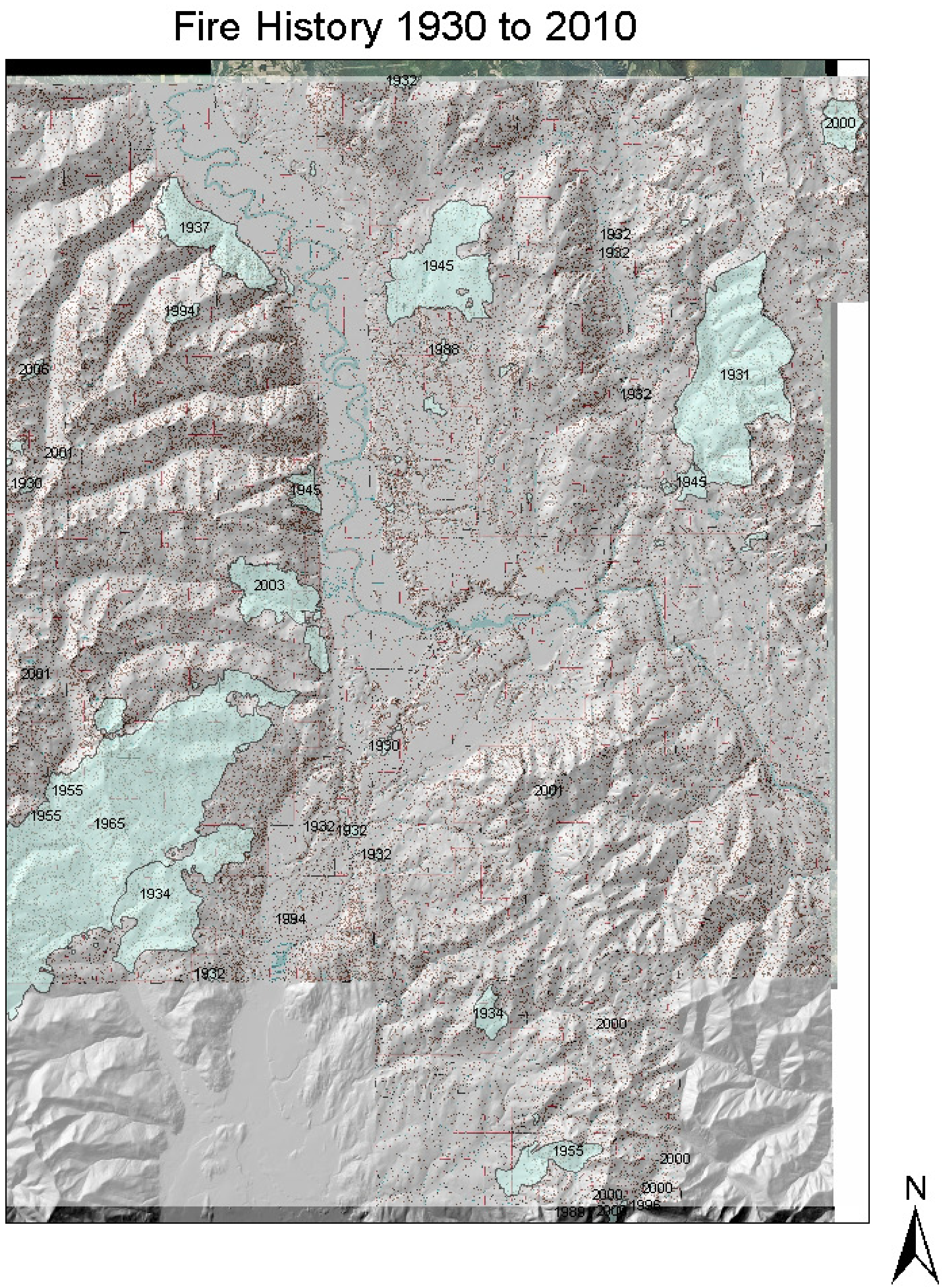

Figure 3.13. Fires in the North Idaho Panhandle, 1930-2010, including the Myrtle Creek Fire (2003) west of the Refuge.
(Courtesy of Wm. Lee Colson, USFS, Bonners Ferry Ranger District, Nov. 2010.)

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can kill virtually all vegetation on a forest site and make the site vulnerable to soil erosion during subsequent rains, compromising both soil and water quality. High-intensity wildfires are often difficult or impossible to control, and are capable of burning millions of acres of land in a single year. These severe wildfires pose grave threats both to ecosystems and to human communities located in or near wildlands (Busenberg 2004).

To reduce the threat of these catastrophic fires, Federal wildland fire policy was revised in 1995 to allow fire to function as nearly as possible in its natural role to achieve the long-term goals of ecosystem health. Fire managers have the ability to choose from the full spectrum of fire management options, from prompt suppression when human life, property, or natural resources are at risk, to allowing fires to burn. Where wildland fire cannot be safely reintroduced because of hazardous fuel build-ups, some form of pretreatment, such as thinning, must be considered (USDA Forest Service 2011).

Weather generally dictates fire danger, since fires are more likely to spread from a source of ignition on hot, dry, windy days. Both fire danger and severity increase during drought years. The height of the forest fire season in northern Idaho is typically during the mid-summer when high ambient air temperatures, low relative humidity, dry vegetation, gusty winds, and dry lightning are present (Climburg et al. 2005).

Large fires in Boundary County have been documented since the late 1800s. In 1910, a year with extreme drought and weather conditions, wildfires burned 3 million acres in western Montana and northern Idaho in just two days (August 20-21). Although Boundary County escaped the worst of the devastation, a wildfire burned along the face of Katka Peak (southwest of the Refuge) and into Montana. In 1926 the Hellroaring fire burned from Round Prairie to the top of Queen Mountain. In 1931, the Deer Creek fire which started in Lower Deer Creek, burned north and east into Canada's Yaak River drainage. In early August of 1967, a wildfire burned 108 acres in the upper Myrtle Creek drainage on the Kaniksu National Forest. Also, in 1967, two large fires occurred in the Selkirks, the Trapper Peak fire and the lightning caused Sundance fire which burned 55,910 acres from Coolin, Idaho all the way up to the Bonners Ferry (Boundary County 2005c).

Morgan et al. (2008) studied fire history and climate records in the northern Rockies during the twentieth century and suggest that climatic conditions may be partly responsible for the regional occurrences of widespread large fires that burned forests in Idaho and western Montana. Their work looked at fire atlas records for the northern Rockies from 1900-2003 and identified 11 regional fire years during that period. Six were concentrated early (1900-1934) and five (1988-2003) concentrated late in the century. During both of these periods warm springs were followed by warm dry summers and positive Pacific Decadal Oscillations. They suggest that spring snowpack was likely reduced during warm springs when PDO was positive resulting in longer fire seasons. In contrast the period from 1935-1987 lacked regional fire years and had "Generally cool springs, generally negative PDO, and a lack of extremely dry summers." They further note that this was a period of active fire suppression and that this combination of factors including climate, fire suppression, logging, and other land uses has and will continue to play a role in fire activity.

The Myrtle Creek Fire, believed to be caused by humans on September 2, 2003, burned approximately 3,800 acres. Newspaper articles reported that cost of fighting this fire was estimated from $2.4 to $4.9 million and required more than 486 personnel. Particularly devastating was that Myrtle Creek, the primary source of drinking water for the City of Bonners Ferry since 1928, experienced high levels of sediment since the municipal water supply was right in the middle of where the wildfire started. The Myrtle Creek fire burned approximately 20 acres of timber on the Refuge. On October 16th, the fire was controlled, in part due to rain from Mother Nature. Records maintained since 1982 indicate that seven wildfires have burned just over 85 acres on Kootenai National Wildlife Refuge (Steve Pietroburgo, personal communication 2010).

3.8 Air Quality

In order to provide a quantifiable way to measure air quality, the Environmental Protection Agency (EPA) established standards for the six criteria air pollutants: particle pollution (often referred to as particulate matter), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. These pollutants are called “criteria” pollutants because the EPA regulates them by developing human health-based and/or environmentally based criteria (science-based guidelines) for setting permissible levels. The set of limits based on human health is called primary standards. Another set of limits intended to prevent environmental and property damage is called secondary standards (EPA 2010). The secondary standards set limits in order to protect the public’s welfare such as visibility, injury to animals, vegetation, and buildings. Idaho’s adoption of the Federal air quality standards is stated in the Idaho Administrative Code, Rules for the Control of Air Pollution in Idaho (DEQ 2010).

The Idaho Department of Environmental Quality (DEQ) monitors five air pollutant levels throughout the state: ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide. While there are actually six ambient air criteria pollutants identified under the Federal Clean Air Act, airborne lead is no longer considered a major health threat since leaded gasoline has been phased out. An air pollutant is defined as any substance in the air capable of causing harm to humans or the environment (DEQ 2010). Pollutants can be either natural or manmade and may be in the form of a gas, liquid droplet, or a solid particle. The DEQ uses the Air Quality Index (AQI) as a guide for reporting the daily air quality. The AQI is a scale divided into six categories which indicate the level of air quality for the five major air pollutants (DEQ 2010).

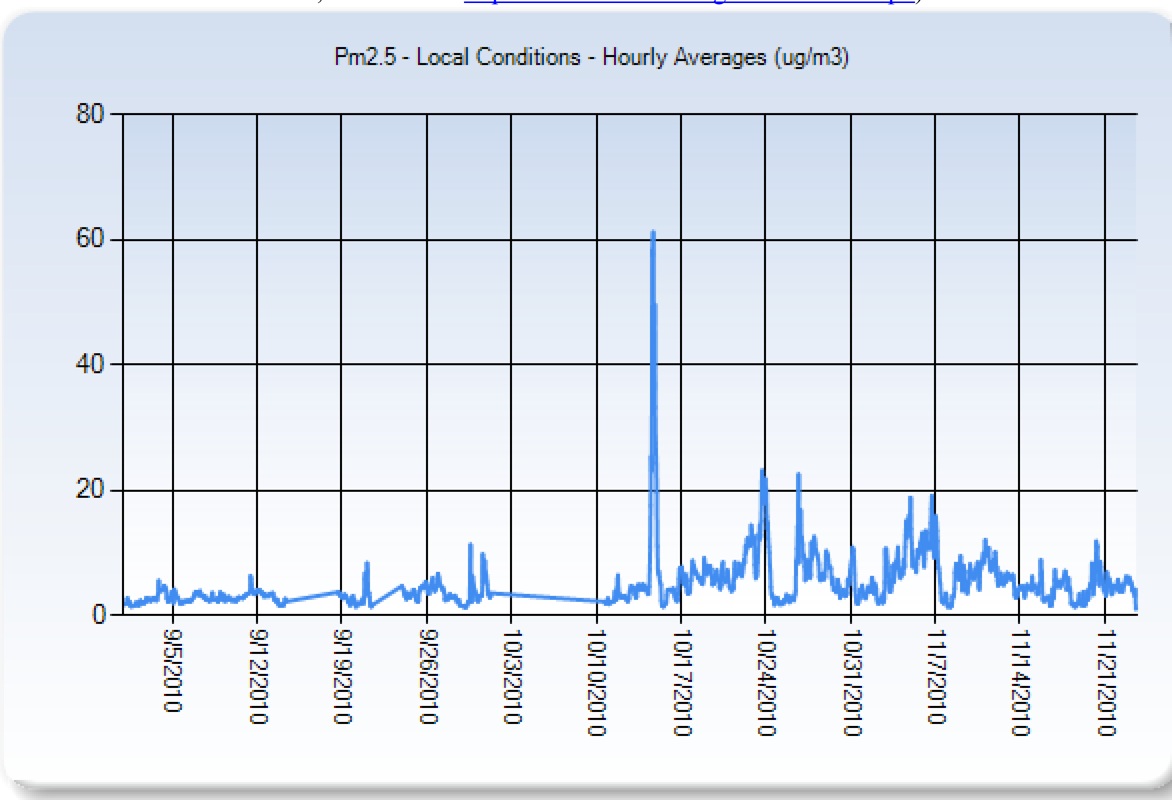
Various geographic areas are classified by EPA as “attainment” or “nonattainment” based upon their level of pollutants (DEQ 2010). An attainment area meets or has pollutant levels below the National Ambient Air Quality Standards (NAAQS) whereas a nonattainment area has pollutants which exceed the standards i.e., they have persistent air quality problems. In addition, some areas may be classified as “maintenance areas” which are geographic areas that were classified as nonattainment but are now currently meeting NAAQS. According to the DEQ, the nearest nonattainment area is Sandpoint, located 37 miles south of the Refuge, where the topography influences the particulate matter caused by residential wood burning (DEQ 2010).

Crop residue burning has been a longtime tradition in the Kootenai River Valley. Crop residue is the vegetation which remains in the farm fields after harvest. Since cereal grains account for the majority of the farmed acreage in the valley, after the grain is harvested and the stems cut for straw, the stubble is burned. Burning decreases the amount of residue buildup so disease cannot occur (DEQ 2009). Idaho is divided into 13 burn management areas (BMAs) based upon their meteorological and topographical similarities. Active crop residue burning typically occurs in the Boundary County BMU (Burn Management Unit) from September to October. Since the Kootenai River Valley is relatively narrow and is surrounded by mountain ranges exceeding 5,000 feet in elevation, smoke generated during field burning can be an issue particularly during an inversion. Under normal atmospheric conditions, the lower atmosphere, the troposphere, near the surface of the earth is warmer than the air above it due to solar radiation. But under certain conditions, such as a warm front moving in, the normal vertical temperature gradient in inverted whereby the air at the earth's surface is colder. Inversions are also created whenever radiation from the earth's surface exceeds the sun's radiation such as during the night or during the winter. Inversions suppress convection by acting as a cap and cause smoke or smog to be trapped close to the ground (Wikipedia 2010). Some of the smoke issues related to field burning have decreased in recent years due to DEQ's crop residue burning program.

The DEQ implemented a crop residue burning program (CRB) to enable growers to burn under specified conditions in order to protect the public's health from smoke impacts. Growers must first complete DEQ training on the proper burning techniques as well as smoke management and obtain a permit at least 30 days prior to burning. Burn days can only occur during daylight hours on weekdays, excluding state and Federal holidays (DEQ 2010).

A $PM_{2.5}$ ($PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter) monitor is located on lands owned by the Kootenai Tribe of Idaho in Bonners Ferry, Idaho. Table 3.4 provides the hourly averages of $PM_{2.5}$ during the 2010 fall crop residue burning season. The NAAQS for $PM_{2.5}$ is 35 $\mu g/m^3$.

Table 3.4. Hourly Averages of $PM_{2.5}$ during the 2010 Fall Crop Residue Burning Season.
(Kootenai Tribe of Idaho Airsite, 2010. URL: http://www.kootenai.org/airsite/chart.aspx)



While the DEQ's CRB program was initiated to protect the public's air quality from smoke generated within the state by field burning, smoke issues still occur when field burning is conducted just over the border in British Columbia. The mountain ranges bordering the east and west sides of the valley funnel the smoke south into the valley often blanketing it for days during inversions.

Wildfires seriously degrade air quality often for weeks or months at a time. The majority of wildfires that occur result from lightning strikes during the hot, dry summers so the time and location of their exact occurrence is unpredictable; they are often difficult to extinguish since they tend to occur on steep forested terrain; and they can easily flare up with changes in wind, temperature, and humidity. Wildfire smoke is particularly bothersome since the smoke is made up of a complex mixture of gases and fine particles produced when wood and other organic matter burn. In a 2007 study of particulate matter gathered during a fall wildfire in California, scientists concluded that "Fire emissions produce a significantly larger aerosol in size than typically seen in urban environments during periods affected by traffic sources, which emit mostly ultrafine particles" (Science Daily 2010).

3.9 Water Quality

3.9.1. Water Quality Standards

Idaho includes more than 92,000 miles of rivers and streams and more than 100 lakes and reservoirs and water is one of the state's most important resources. Idaho lakes, rivers, streams, and wetlands provide scenic beauty and supply water essential for drinking, recreation, industry, agriculture, and aquatic life (DEQ 2010).

The U.S. Environmental Protection Agency (EPA) is the Federal agency responsible for developing policies and regulations, consistent with the requirements of the Clean Water Act, and for providing guidance to the State agencies such as the DEQ. The Idaho DEQ's Surface Water Program is responsible for assuring that the state's water resources fulfill their designated beneficial use and water quality standards. Idaho's water quality standards require that wherever attainable, surface waters should be protected for beneficial uses, including existing uses, designated uses, and presumed uses. Idaho's designated uses include the public's water supply; protection of fish, shellfish, and wildlife; and recreation, agriculture, industry, and navigation. Designated beneficial uses of a water body account for actual use, future use not currently supported, and the Clean Water Act's goal that all waters should be capable of supporting aquatic life and recreation where possible (DEQ 2010). Designated beneficial uses of Myrtle Creek include cold water aquatic life, salmonid spawning, and primary contact recreation, while Deep Creek's designated uses are cold water aquatic life, salmonid spawning, primary contact recreation, domestic water supply, and special resource water (DEQ 2006).

A water quality standard outlines what the designated beneficial uses are for a particular body of water and the water quality criteria needed to support that use. Since there are often competing uses, the DEQ is required under Federal law to protect the most sensitive beneficial uses (DEQ 2010). Beneficial uses are protected by criteria, including narrative criteria for pollutants such as sediment and nutrients (e.g., nitrogen and phosphorus) and numeric criteria for pollutants such as pathogens (e.g., *E. coli* bacteria), dissolved oxygen, pH, ammonia, temperature, and turbidity (DEQ 2006a). A "pollutant" is a substance, such as bacteria or sediment, that is identifiable and in some way quantifiable (DEQ 2006b). Impairments to a stream's beneficial uses may occur naturally but are labeled "pollutants" when caused by or altered from normal background levels by human activity (DEQ 2006a).

Three categories are used to describe the status of a water body's ability to support a beneficial use: "fully supporting," "not fully supporting," and "not assessed." "Fully supporting" indicates that the water body is in compliance with the water quality standards and criteria and its designated and existing beneficial uses. "Not fully supporting" means that the water body is out of compliance with all water quality standards or criteria or is not supporting all of its beneficial uses. A "not assessed" category refers to those water bodies which have not been monitored or are missing information necessary to complete the assessment. When a water body is deemed "not fully supporting," the DEQ conducts a subbasin assessment to determine the causes and sources of pollutants. This assessment of the impaired water body enables the DEQ to develop a total maximum daily load (TMDL), a calculation of the maximum daily load of a pollutant that a water body can receive and still meet water quality standards. This load is then allocated to point source discharges, nonpoint source discharges, and a margin of safety reserve (to account for technical uncertainties). After the TMDL is developed, an implementation plan identifies the steps, timeline, and monitoring methodology necessary to improve water quality (DEQ 2010). Table 3.5 includes the most common criteria used in TMDLs for cold water aquatic life and salmonid spawning beneficial uses (DEQ 2006).

Water temperature. Water temperature is integral to the life cycle of fish and other aquatic species. Even slight changes can result in changes in stream aquatic communities. Elevated temperatures are detrimental to fish during all of their life stages, particularly if combined with other factors such as low dissolved oxygen or poor food supply. Temperature fluctuations may stunt fish growth rates particularly juvenile fish that have a lower threshold than adults (DEQ 2006a).

Many factors affect stream temperatures, both natural and anthropogenic. Natural factors include altitude, aspect, climate, weather, riparian vegetation (shade), topographic shade, and channel morphology (width and depth). Human influenced factors include heated discharges (such as those from point sources), riparian alteration, channel alteration, and flow alteration (DEQ 2006a). The State of Idaho adopted numeric water quality standards for temperature to protect the designated uses of "cold water aquatic life" and "salmonid spawning." The temperature standard for coldwater aquatic life is a 22°C or less daily maximum and a 19°C or less daily average. For salmonid spawning, the temperature standard is a 13°C or less daily maximum and a 9°C or less daily average (Table 3.5 below).

Dissolved oxygen. Dissolved oxygen (DO) is inversely linked to water temperature, meaning cold water can hold more dissolved oxygen than warm water. Coldwater aquatic life, including salmonid fish, requires higher levels of dissolved oxygen than warm-water fish. Since juvenile aquatic organisms have a high metabolism and low mobility, they are particularly susceptible to low DO levels. When the DO falls below 6 mg/L, these species are stressed. If DO levels fall below 3 mg/L for prolonged periods, many individuals may die and levels below 1-2 mg/L for just a few hours can result in large fish kills (DEQ 2006a). Oxygen is also required in order to decompose organic matter in the water column and bottom sediments. Factors such as temperature, flow, nutrient loading, and channel alteration all affect the amount of dissolved oxygen in the stream (DEQ 2006a). Dissolved oxygen minimum standards require 6 mg/L dissolved oxygen in order to support cold water aquatic life and 5 mg/L intergravel and 6 mg/L surface dissolved oxygen levels to support salmonid spawning (Table 3.5).

Sediment. Suspended sediment and bedload can negatively impact aquatic communities in a stream. While fish can tolerate suspended sediments for short periods of time, such as after a storm event, longer exposure can interfere with feeding behavior, damage gills, reduce growth rates, and may even cause death. Newcombe and Jensen (1996) found that suspended concentrations of 50 to 100 mg/L for a 14 to 60 day duration caused physiological stress, including reduced feeding rates, in rainbow trout (in DEQ 2006a). Sediment deposition negatively impacts salmonid spawning and rearing habitat and sediments deposited on top of redds can suffocate eggs. Excess sedimentation also affects aquatic insects, the primary food source of fish. Increased sedimentation also tends to favor a macroinvertebrate community that is adapted to burrowing, thus becoming less available to foraging fish. Turbidity is used as a measurement of suspended sediment for determining TMDLs (Table 3.5).

Table 3.5. Selected Numeric Criteria Supportive of Designated and Existing Beneficial Uses (cold water aquatic life and salmonid spawning) in Idaho Water Quality Standards.
(Adapted from DEQ 2006.)

Water Quality Parameter	Cold Water Aquatic Life	Salmonid Spawning (during spawning and incubation periods for inhabiting species)
Water Quality Standards (IDAPA 58.01.02.250)		
pH	6.5-9.0	6.5-9.5
Dissolved Oxygen (DO)	DO exceeds 6.0 mg/L	Water Column DO: DO exceeds 6.0 mg/L in water column or 90% saturation, whichever is greater. Intergravel DO: DO exceeds 5.0 mg/L for a one day minimum and exceeds 6.0 mg/L for a seven day average.
Temperature[1]	22°C or less daily maximum; 19°C or less daily average.	13°C or less daily maximum; 9°C or less daily average. Bull Trout: not to exceed 13°C maximum weekly maximum temperature over warmest 7-day period, June to August; not to exceed 9°C daily average in September and October.
	Seasonal Cold Water: Between summer solstice and autumn equinox: 26°C or less daily maximum; 23°C or less daily average.	
Turbidity	Turbidity shall not exceed background by more than 50 NTU[2] instantaneously or more than 25 NTU for more than 10 consecutive days.	
Ammonia	Ammonia not to exceed calculated concentration based on pH and temperature.	
EPA Bull Trout Temperature Criteria: Water Quality Standards for Idaho, 40 CFR Part 131		
Temperature		7 day moving average of 10°C or less maximum daily temperature for June-September.

Source: DEQ 2006.
[1]Temperature Exemption: Exceeding the temperature criteria will not be considered a water quality standard violation when the air temperature exceeds the ninetieth percentile of the seven-day average daily maximum air temperature calculated in yearly series over the historic record measured at the nearest weather reporting station.
[2]Nephelometric turbidity units

pH and water hardness. A pH between 6.5 and 9.5 is required for cold water aquatic life and to support salmonid spawning. Toxicity of dissolved metals in the water column is dependent upon the hardness (or mineral content); as toxicity increases when hardness decreases. Therefore, hardness based water quality criteria is more stringent at low hardness levels. The water's hardness value can be related to flow; when flow decreases the hardness increases. The hardness values in the Kootenai River vary with geographic location, the time of year, and discharge, with an overall mean hardness of 93 mg/L. Hardness values for tributaries to the river are much lower with an overall mean value of 15 mg/L (DEQ 2006).

Nutrients. No stream segments in the Lower Kootenai and Moyie Subbasins are listed for excess nutrients. While Libby Dam acts as a nutrient trap, holding back nutrients from the lower portions of the river, it does not explain the reason for the low level of nutrients in Idaho's tributaries. Some speculation is that the geologic setting may be a poor producer of nutrients.

3.9.2. Impaired surface waters on or adjacent to Kootenai NWR

Subsection 303(d) of the Clean Water Act requires that DEQ conduct a comprehensive analysis of Idaho's water bodies every two years to determine whether the water quality standards and support of their beneficial uses are met. The analysis is summarized in an "Integrated Water Quality Monitoring and Assessment Report" (Integrated Report) and submitted to the EPA for their approval. The 2008 Integrated Report determined that 27 percent of Idaho's streams met the state water quality standards, 36 percent did not, and 37 percent have yet to be assessed.

Surface water resources on or adjacent to the Kootenai National Wildlife Refuge include the Kootenai River, Deep Creek, Myrtle Creek, and Cascade Creek. DEQ's 2008 Integrated Report lists portions of each as "not supporting" the water quality standards and their beneficial uses or impaired without TMDLs.

Lower Deep Creek, from its confluence with Snow Creek to the Kootenai River (4.31 miles) is impaired due to sedimentation/siltation and temperature. The suspended solids impairment is a holdover from the 1998 303(d) list, removed in 2004. The TMDL was approved by EPA on February 6, 2007.

Waters listed (DEQ 2010d) as impaired and in need of a TMDL include:

Kootenai River, from its confluence with Deep Creek to and including Shorty's Island (5.74 miles), is impaired due to temperature.

Myrtle Creek, from its confluence with Jim Creek to its mouth at the Kootenai River (11.2 miles), is impaired due to temperature. The data collected fails EPA's Bull Trout criteria.

Cascade Creek, from its source to its mouth at Myrtle Creek (3.58 miles), is impaired due to temperature.

Deep Creek

Deep Creek was originally listed on the Idaho §303(d) list of impaired waters for sediment pollution in 1998. When the EPA made additions to the list for temperature pollution, Deep Creek was added (DEQ 2006). DEQ's additional assessments of Deep Creek in 2002 determined that it was not supporting aquatic life uses (cold water and salmonid spawning) and that it was thermally modified.

Residential development and stream bank erosion (nonpoint sources) were identified as the largest sources of sediment in Deep Creek's 116,760 acre watershed. Point sources of sediment are not believed to exist in the Deep Creek watershed. The estimated existing sediment load was calculated to be 6,122 tons per year. The TMDL set a goal of 50 percent above the natural background sediment yield based upon studies of the sediment yield from watersheds in the subbasin which are fully supporting cold water beneficial use (DEQ 2006). Since Deep Creek's natural background sediment load was estimated to be 3,491 tons per year, the load capacity at 50 percent above that equates to 5,237 tons per year. The TMDL assigns a sediment load allocation and load reduction for each land ownership type based on the difference between the sediment contribution and the load capacity at 50 percent above the background sediment load. After the TMDL is implemented, a total of 30 years has been allocated for meeting the allocations. Kootenai NWR load allocation was estimated to be 16 tons per year and a load reduction of 3 tons per year is required during the 30-year time allocation (DEQ 2006).

The Deep Creek TMDL for temperature pollution used a potential natural vegetation (PNV) approach. PNV is "The vegetation that would occur on a given site if disturbance by humans was excluded. It is a reflection of the environmental setting, or the biological potential of a land area to generate a specific ecosystem within the constraints of the nonanthropogenic disturbance regime on that site (Hann et al. 2008; Kuchler 1974; Tüxen 1956 as cited by Kuchler 1969)." From http://www.fs.fed.us/database/feis/glossary2.html#P) The idea behind using PNV as targets for temperature TMDLs is that PNV provides a natural level of solar loading to the stream. PNV is estimated from models of plant community structure. Comparing PNV and existing vegetative cover or shade indicates how much excess solar load the stream is receiving, and what can be done to decrease solar gain. The loading capacity for a stream under PNV is essentially the solar loading allowed under the shade target levels for that stream or reach (a 6 month average, April-September, is used to calculate solar loads). The difference between existing and potential solar load, assuming existing load is higher, is the load reduction necessary to bring the stream back into compliance with water quality standards. For the bottomland reach of Deep Creek (the lowest 1.5 miles) an effective shade target of 30 percent was chosen, for the middle portion of Deep Creek the effective shade target was 60 percent, and for upper Deep Creek, the effective shade target was 72 percent. In the floodplain reach of Deep Creek, existing shade is only 10 percent or 1/3 of the target of 30 percent, and the existing summer solar load is 5 KWh/m^2/day, while potential (desired) solar load is 3.85 kWh/m^2/day. The average existing shade level on Deep Creek (40 percent) is 57 percent lower than target (potential) shade levels of 70 percent, and existing solar loading of 3.3 kWh/m^2/day is nearly twice the potential summer load of 1.7 kWh/m^2/day (DEQ 2006).

The Kootenai River TMDL Implementation Plan (TerraGraphics 2005) identifies projects to reduce pollutant loading to Boundary, Cow, and Deep Creek to meet the requirements of the TMDL. The report concludes that for Deep Creek, "A substantial time frame may be needed to reach PNV [potential natural vegetation] after implementation strategies have been installed."

Myrtle Creek

Myrtle Creek was assessed but not included in the 1998 303(d) list. Myrtle Creek, from its source to its mouth, was added to the 303(d) list in 2002. It is listed as impaired for temperature but a TMDL has not been developed. Although the lower portion of Myrtle Creek is substantially altered from historic conditions, the presence of relatively low populations of non-native brook trout, and the presence of native salmonids that require colder water temperatures, indicates that water quality in the middle and upper reaches is relatively high (USFWS 2010 IFRO).

Water quality in Myrtle Creek has improved over the past 50 years (Kruse 2005). Turbidity measurements dropped from a range of 10-40 NTUs (Nephelometric Turbidity Units) to less than 5 NTUs. After the early 1960s, sediment loading decreased to around 30 to 35 tons per square mile since heavy logging activity in the upper watershed decreased. While the Myrtle Creek wildfire in the summer/early fall of 2003 did not affect much of the riparian vegetation in the creek's upper watershed, a heavy rain event in July of 2004 resulted in an excessive amount of suspended solids and sediment moving down to the floodplain below the falls. The basic water quality and metals concentration measurements indicated good water quality. pH dropped down to 5-6 in September 2004 but returned to normal (7-7.5) by December. The drop in pH was attributed to the movement of acidic sediment and particulate matter associated with runoff following the Myrtle Creek fire in 2004 (Kruse 2005).

3.10 Environmental Contaminants

Contaminants include both naturally occurring chemicals in unnaturally high concentrations, and chemicals that are novel to natural environments, produced by human activity and released either intentionally or accidentally (Monosson 2009). Like the proverbial "canary in the coal mine," fish and wildlife frequently show the effects of contaminants which ultimately affect people and their quality of life (USFWS 2005).

In 2005, an estimated 17 percent of national wildlife refuges had major contaminant issues in need of cleanup (USFWS 2005). Today, refuges still face a wide variety of contaminant threats including pesticides, industrial waste, drainwater from agricultural irrigation and mining, and oil and hazardous waste spills. Studies of major rivers and streams across the country detected one or more pesticides or their degradates more than 90 percent of the time in streams influenced by agriculture, urban development, and mixed-uses, while water samples collected from undeveloped streams revealed one or more detectable pesticides or degradates at least 65 percent of the time (Gilliom et al. 2006).

Contaminant Studies/Issues

- A Contaminant Assessment Process (CAP), a comprehensive approach to assess threats from environmental contaminants on national wildlife refuges, was conducted on Kootenai NWR by the U.S. Fish and Wildlife Service using the Biomonitoring of Environmental Status and Trends (BEST) Program developed by USFWS and USGS. A site visit in May 1997 did not identify any contamination created or left by old homesteads. A site visit in September 2008 identified no contaminant issues, "with the exception of an unoccupied house built with asbestos materials. Asbestos was abated and the house was removed in 2010. The concern at this time would be the diversion of the Kootenai River and Deep Creek onto the Refuge. However, there has not been any indication that the water from these two systems is presenting any problems." (USFWS 2011).
- During the fall of 1985, Kootenai NWR participated in a nationwide monitoring program for lead exposure in waterfowl conducted by the U.S. Fish and Wildlife Service. From 1983 through 1985, samples from more than 8,000 waterfowl were collected on National Wildlife Refuges and analyzed at the National Wildlife Health Center (National Wildlife Health Center 2009). Livers collected from 128 hunter-killed mallards from Kootenai NWR were submitted to the National Wildlife Health Laboratory for analysis. Of these, seven (5.5 percent) had elevated liver lead concentrations. Ingested lead shot was found in the gizzards of 6 (4.6 percent) of 130 hunter-killed mallards. Of the 38 waterfowl carcasses which were

also submitted to the lab, lead poisoning was diagnosed in four (10 percent). An additional four carcasses also exhibited elevated liver lead concentrations but had insufficient gross lesions to support a diagnosis of lead poisoning. The Idaho Department of Fish and Game (IDFG) had previously documented lead pellet ingestion for several hunting seasons (1974-1984) on the Refuge. Combined data from the seven seasons showed that 43 (4.9 percent) of 875 mallard gizzard contained ingested lead shot. IDFG reported an ingestion rate of 29.2 percent in 240 gizzards collected in 1984-1985 from the Coeur d'Alene Wildlife Management Area located 90 miles south of Kootenai NWR (From Refuge Files).

Soil samples collected on the Refuge in 1977 and 1979 were analyzed for lead pellets. The samples were washed through a screen to collect the shot. In 1977, 5 $m^2 \times 10$ cm samples averaged 22,600 pellets per acre. Of the samples collected in 1979, Island Pond was calculated to contain approximately 98,010 expended pellets per acre. The study found the number of pellets in the top 10 cm of soil was not affected by tillage. A grain field in the hunting area contained approximately 53,960 pellets per acre prior to spring plowing and contained 48,564 pellets per acre after plowing.

While the use of lead shot for waterfowl hunting was banned in 1991, expended lead pellets still pose a concern on the Refuge. Stationary Refuge waterfowl hunt blinds accumulate large amounts of expended lead pellets in the surrounding soils. Since tillage did not affect the top 10 cm of soils lead shot may still pose a threat to feeding waterfowl. A secondary concern is lead poisoning in raptors particularly bald eagles that frequently feed on hunter-crippled waterfowl.

Pesticides Used on the Refuge

- In May 1966, the Refuge was included in the Bonners Ferry, Idaho Mosquito Abatement District. Mosquito larvae were found in the northwest corner of the Refuge. At the time, the district's representative felt that this could be the cause for the mosquito problem in the City of Bonners Ferry, located five miles away. In the interest of public relations, the Refuge agreed to spray 10 acres in the northwest corner with a 1 gallon per acre rate (2 percent active ingredient) Pyrethrum with a backpack sprayer.
- Refuge Manager Eugene C. Barney in the 1968 Refuge Narrative reported that Refuge farming cooperators used "Malathion for clover weevil instead of DDT as they did prior to refuge ownership." Cooperators also used 2,4-D to control weeds especially Canada thistle. When the 2,4-D was aerially applied, Manager Barney noted that "Spraying close to the ditches sometimes affected aquatics such as watercress and occasionally trees and brush where the aircraft would raise off the field to make his swing for the next swath." No studies have ever been conducted on the Refuge to address the long-term effects of pesticide use on wildlife resources.
- During the summer of 1968, the University of Idaho Agricultural Extension Service informed Kootenai and Grays Lake NWRs that they were under consideration for inclusion in a control study to chemically control horn flies (*Haematobia irritans*) and face flies (*Musca autumnalis*) on cattle. During that time period, cattle grazed on Kootenai NWR. The test program proposed to use Malathion ULV at a rate of 6-8 oz. per acre; Trichlorfon at a rate of 6 oz. per acre; and Fenthion at a rate of 1.6 oz. per acre. Due to the concern of Fenthion's (also known as Baytex) potential impact on avian species using the Refuge, Malathion was approved. On July 18-19, 1969, the cattle were sprayed with a fixed wing aircraft with ultra-low volume Malathion (10.25 lbs. active per gallon) at 6 fluid ounces per acre.

- Refuge files from January, 1979, report 20-50 pound bags of Ortho DDT 5 Dust were properly disposed of at Wes-Con, Inc., an approved pesticide disposal facility located in Grandview, Idaho.

3.11 Surrounding Land Uses

Kootenai National Wildlife Refuge is located in Boundary County, Idaho's northernmost county. The county has a total area of 1,278 square miles comprising 1.46 percent of Idaho's land base (Wikipedia 2010). Land ownership is 61.0 percent Federal, 13.2 percent state, 25.6 percent private, and 0.2 percent city- and county-owned (Idaho Dept. of Commerce 2010). The Federal land ownership is comprised of:

U.S. Fish and Wildlife Service (Kootenai NWR)	2,774 acres
Bureau of Land Management (BLM)	4,636 acres
U.S. Forest Service	485,817 acres

More than 90 percent of Boundary County is forested. Approximately 65 percent of forest land is under Federal ownership (the Kaniksu and Kootenai National Forests) and the remainder is about equally divided between state and private ownership. Federal and state forest lands are managed for multiple uses (timber production, wildlife habitat, and recreation) while private forest lands are managed primarily for timber production. The timber industry has been a mainstay of the county for more than a century. Changes to the lumber industry over the past decade caused a general decline in logging resulting in the 2002 Bonners Ferry Mill closing.

Agricultural uses dominate the valley floor and benchlands. The basin's lowland portion is mainly in private ownership and approximately 50,000 acres of the river's historic floodplain and bench areas above the floodplain are farmed (DEQ 2006). Crops grown on the valley floor include hay, spring and winter wheat, barley, oats, canola, clover seed, and alfalfa. The drier benchlands are used primarily for hay production and grazing. According to the Idaho Department of Commerce, land use in Boundary County is categorized as:

Land Use	**Acres**	**%**
Urban Land	2,700	0.3%
Agricultural	70,100	8.5%
Forest	743,200	90.4%
Water	5,800	0.7%
Total	**821,800**	**100.0%**

The Boundary County Airport, a county owned, public airport located less than three miles from the city of Bonners Ferry, provides service for small- and medium-sized aircraft. Two major freight railroad company lines pass through the county, Burlington Northern/Santa Fe (BNSF) and Union Pacific. BNSF's transcontinental line was constructed along the banks of the Kootenai River from Libby, Montana to Bonners Ferry, where the line then turns south to Sandpoint. Union Pacific's tracks run along Deep Creek up to Bonners Ferry, passing near the southeast corner of the Refuge, and then across the Moyie River and up to Cranbrook, BC.

There are two US highways, totaling about 66 miles, crossing Boundary County. US Highway 95 runs north from Sandpoint through Bonners Ferry and north to Eastport at the Canadian border. US Highway 2 converges with Highway 95 out of Sandpoint, runs north to Bonners Ferry, and then diverges at Three-Mile Junction to run east to the Montana border. A network of over 300 miles of county roads provides access to residential areas outside of the city limits of Bonners Ferry and Moyie Springs. Additional gravel roads are located on U.S. Forest Service property and are maintained by that Federal agency.

The City of Bonners Ferry maintains and operates the Moyie River Hydroelectric Dam in order to provide electricity to the City and Moyie Springs. The 92-foot-high concrete gravity dam is located approximately 1.5 miles upstream of the Moyie's confluence with the Kootenai River. The dam's three powerhouses were constructed in 1921, 1941, and 1982. The Smith Creek Power System operates a small diversion dam on Smith Creek which generates approximately 34 megawatts of power at its power station.

Two major utility corridors pass through Boundary County. A major gas pipeline crosses the county from north to south, delivering natural gas from Alberta, Canada to southern California. The other corridor, the Bonneville Power System electric transmission line, enters the county from Montana along the Kootenai River. This line ties the Libby Dam into the grid with other dams along the Columbia River. Electric transmission lines connect the Smith Creek Hydroelectric plant and the Moyie River Dam with the Bonneville Power System (Boundary County Mitigation Plan 2005).

With its scenic beauty and abundant fish and wildlife, the Idaho Panhandle has been a popular recreation area for decades. Consumptive uses (hunting and fishing) remain popular, while non-consumptive uses (nature tourism, wildlife observation, and photography) are increasing (see Chapter 5). Bonners Ferry was voted Idaho's "Friendliest City," and this gateway community has seen a drastic increase in tourism since the establishment of The International Selkirk Loop, North America's only multi-country scenic loop. This 280-mile international scenic byway winds through northern Idaho, eastern Washington, and British Columbia. In 2005, the Selkirk Loop was designated as an "All American Road" by the U.S. Department of Transportation and in 2009, was featured as one of five "Best of the Roads" in Rand McNally's Atlas. Sunset Magazine named the Loop as "The West's Best Scenic Drive." This recognition may explain increased Refuge visitation (see Chapter 5).

3.12 References

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Mountain bluebird
© Stan Bousson

Chapter 4 Biological Environment

Chapter 1 Introduction and Background
Chapter 2 Management Alternatives
Chapter 3 Physical Environment
Chapter 4 Biological Environment
Chapter 5 Refuge Facilities and Public Use Programs
Chapter 6 Cultural Resources and Social/Economic Environment
Chapter 7 Summary of Effects
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Chapter 4. Refuge Biology and Habitat

This chapter addresses the biological resources and habitats found on the Refuge. The chapter begins with a discussion of biological integrity (historic conditions and ecosystem function), as required under the Refuge System Improvement Act. The bulk of the chapter is then focused on the presentation of pertinent background information for habitats used by each of the Priority Resources of Concern (ROCs) and other benefitting species designated under the CCP. Background information consists of a description, location, condition and trends of habitats; key ecological attributes of habitats; and finally, stresses and sources of stress (collectively, "threats") to the habitats and/or associated ROCs. The information presented was used as the CCP team developed goals and objectives.

4.1 Historic Conditions and Changes in Wildlife and Habitat

4.1.1 Historic Descriptions of Habitat and Wildlife

During presettlement times the floodplain of the lower Kootenai River valley included approximately 70,000 acres of wetlands, wet meadows, and floodplain forest. Historian Paul Flinn, who was born in Bonners Ferry in 1913, wrote that "prior to 1921, the Kootenai River Valley floor was a labyrinth of cottonwood trees, lakes, mud, shallow waters, mosquitoes and numerous treed islands" (Boundary County Historical Society 1987). The lower Kootenai Valley had the highest habitat and aquatic species diversity of any portion of the watershed (KTOI and MT Fish, Wildlife and Parks 2004). This diverse mixture of habitats was created and renewed by spring floodwaters from the Kootenai River watershed. The natural hydraulic cycle of the Kootenai River included stable, low flows in winter; a high-flow event during the spring melt (late May through early June); and relatively constant low flows throughout the remainder of the year (Marotz et al. 2002).

The Kootenai Subbasin Plan (KTOI and MT Fish, Wildlife and Parks 2004) describes the spring flooding that historically occurred:

> "The magnitude and duration of the spring flooding depended on the amount of winter snowpack in the mountains. First, low-elevation snowmelt and rainfall partially filled depressions on the floodplain. Then, in May, flows in tributary streams peaked. When they reached the relatively flat floodplain, their rates of flow diminished and they lost energy. Large boulders, gravel, and sand accumulated in alluvial fans at the foot of the mountains, while in the floodplain, tributary flows swelled to fill the deeply incised stream channels and overtopped their banks. They spread out across the floodplain, depositing silt along the stream banks and forming natural levees of higher ground.
>
> "Tributary flows throughout the watershed were still very high in June, and they would eventually bring the Kootenai River to its maximum annual elevation. The flows filled Kootenay Lake due to the restriction at Grohmann Narrows and backed up the Kootenai River to Bonners Ferry. Floodwaters spread across the floodplain in what was a still-water segment of the river, depositing silt on the river banks, forming natural levees higher than the adjacent floodplain. The finest material, high in clay content, was deposited on the

> floodplain farthest from the river's channel. Over thousands of years, this cycle of annual flooding resulted in deep accumulations of rich alluvial soil on the floodplain."

The first written description of the spring freshet was by David Thompson, the earliest Euro-American explorer to visit the region, in 1808 (see chapter 6). On May 14 he wrote from his camp near Kootenay Lake: "The water, from the melting of the snow in the Mountains, had risen upward of six feet; and overflowed all the extensive fine meadows of this country." On his return trip from Kootenay Lake to present-day Bonners Ferry, he travelled by canoe over the "overflowed meadows," "avoiding the current of the [Kootenai] River which we knew to be unnavigable" (Thompson 1916).

In 1882-3, William Adolph Baillie-Groman investigated the feasibility of developing the valleys of the upper and lower Kootenai Rivers for agriculture, and provided the first technical description of the region's hydrologic processes:

> "It was just as well that I first saw the country at its worst, when the huge volume of water with which one has to deal made itself so impressively apparent … In spring, when the snow begins to melt and the rivers and creeks increase to double and treble their ordinary size, the narrow outlet of [Kootenay] lake no longer suffices; and, finding no other place of discharge, the lake rises, and continues to rise, for more than a month, till at last, about the end of June, its level is from 10 to 20 feet higher than it is about March. As the whole valley is raised only slightly over the level of the lake at low water, this rise suffices to inundate the vast 'bottoms' as the flats separated from each other by spurs jutting out from the side hills are called, to a depth varying in different years from 2 feet to 8 feet" (Baillie-Groman in Wheeler 1905).

In July, the annual flooding receded and the wetland basins on the floodplain were left filled with water but isolated from the tributary streams and the main river by the natural levees built up by the deposition of sediments. The length of time the wetland basins retained water varied annually depending upon summer temperatures, precipitation, and the depth of the wetland basins (KTOI and MT Fish, Wildlife and Parks 2004). This mix of shallow, seasonal wetlands and deeper wetlands and sloughs that retained water throughout the summer, created a great diversity of plant communities, which in turn attracted large numbers of breeding and migrating waterfowl and waterbirds.

The large expanses of wetlands, sloughs, and meandering, low-gradient reaches of tributaries provided a diversity of habitats that supported the specific needs of different life stages and species. Channels through wetlands and meandering tributaries with overhanging shrubs along the banks favored bull trout, cutthroat trout, kokanee (Bursik and Moseley 1995), and probably Columbia River redband trout and other native species. Slow moving, deep waters of sloughs with overhanging shrubs and continual recruitment of deciduous and coniferous trees favored burbot and juveniles of numerous species including white sturgeon (KTOI and MT Fish, Wildlife and Parks 2004).

Baillie-Groman wrote that "The waters fall much more rapidly than they rise, and in ordinary years the bottoms are high and dry by the latter part of July. Each annual overflow, of course, raises, as I have already said, the surface of the bottoms by a film-like sheet of earthy deposit …" and that "later on in the summer it is hard to believe the extent of the freshet." Indeed, in late summer the valley presented a very different aspect:

> "From the moment the [Kootenai] river enters the valley it assumes majestic proportions—i.e., an uniform width of six hundred to seven hundred feet, with a similarly uniform depth of from forty-five to sixty feet, unvexed by rapids, eddies or falls.… In great loops the river winds its way through the perfectly flat valley towards Kootenay lake, which terminates the valley.… [the valley is] sixty or sixty-five miles long and from three to four miles wide … from end to end almost perfectly level, and gradually merging into the lake at one extremity, the land being nearly on the same level with the water of the lake, and overflowed by it when the spring freshets cause the lake to rise. Through the broad extent of this billiardtable-like land—in summer a luxurious pasturage—the stately river flows on its way to the lake, fringed on both sides by groves of fine elm-like cottonwood trees and alder thickets, giving the broad level meadows that intervene between the bank of the river and the densely-forested slopes of the side hills a most attractive park-like appearance, which is not lessened, if we see it in late summer, by the five and six feet high grasses that grow on these flats in almost tropical rankness, betraying the great fertility of the soil" (Baillie-Groman in Wheeler 1905).

Figure 4.1. "Paddler's Lake—widening of the Kootenay—from hills just above Chelemta on left bank looking S. across the Kootenay Valley." James Alden, Northwestern Boundary Survey, ca. 1860.
(National Archives, Cartographic and Architectural Records Section, Special Media Archives Services Division, College Park, MD. Record Group 76: Records of Boundary and Claims Commissions and Arbitrations, 1716-1994. ARC Identifier 305514/Local Identifier 76-E221-ALDEN27.)

The joint British-American Northwestern Boundary Survey, which camped near Bonners Ferry in 1860-61, provided other early descriptions of the region. Unfortunately nearly all documentation of the American portion of the survey was lost except for some watercolor paintings by the expedition's artist, James Madison Alden. One of Alden's watercolors (Figure 4.1), of a view looking south from the hills above Chelemta depot (near present-day Bonners Ferry), shows the bottomland forest, wetlands, and wet meadows of the lower Kootenai River valley in considerable detail. The stringers of cottonwoods and shrubs that grew along the natural levees along the Kootenai River and its tributaries can be easily distinguished, as can the narrow wetlands located in swales between scrollbars created by the migration of river meanders across the floodplain.

In 1893, Amos Robinson, a surveyor for the General Land Office (now the Bureau of Land Management) surveyed the lower Kootenai River Valley around present day Bonners Ferry and Kootenai National Wildlife Refuge. He wrote:

> "This township [T62N R1E] is composed, for the most part of bench and bottom lands. The former covered with a heavy growth of fir, pine and tamarack timber of fair quality, the soils a sandy loam, not very well watered, most of the streams being in deep ravines. The bottoms have a very rich, deep alluvial soil and are about equally divided into marsh, meadow, and timbered lands. The two former classes being subject to annual overflows. The timbered bottoms lie along the banks of the Kootenai River and its tributaries, which are much higher then [sic] the lands back of them, forming natural dikes and very seldom overflowing so that with comparatively small expense large tracts of marsh lands may be reclaimed and the meadow lands greatly improved. The timber is a heavy growth of cottonwood with very dense thickets of thorn and willow." Robinson's survey notes indicate that the banks were between 15 and 25 feet high, with an average of 22 feet (Bureau of Land Management, GLO Records, Notes for Survey of T62N R1E, approved 2/7/1894.)

Figure 4.2. "Chelemta Depot. From the Right Bank of the Kootenay Looking Up." James Alden, Northwestern Boundary Survey, ca. 1860.
(National Archives, Cartographic and Architectural Records Section, Special Media Archives Services Division, College Park, MD. Record Group 76: Records of Boundary and Claims Commissions and Arbitrations, 1716-1994. ARC Identifier 305513/Local Identifier 76-E221-ALDEN26.)

Combined, these early descriptions paint a relatively clear portrait of the habitat of the lower Kootenai River valley: of a variety of seasonal, semipermanent, and permanent wetlands, sloughs, and oxbow lakes; large tracts of floodplain forest and shrub; and seasonally inundated wet meadows. These meadows are distinct from upland grassland communities, which were rare in the Kootenai subbasin during presettlement times and accounted for probably less than one percent of the total subbasin landscape (IBIS 2003). Not surprisingly, wetland resources—fish, waterfowl, and plants used for building houses, traps, and fish weirs—were heavily used by the Kootenai people.

The high spring flows from snowmelt runoff had numerous and wide ranging effects, including:

- Flushing nutrients stored in riparian areas and fine sediments from spawning gravels, depositing them onto floodplains (Marotz et al. 2002);
- Sorting river gravels, defining channels, and removing tributary deltas, creating a healthy environment for native fish and the food organisms they depend on (Deiter 2000):
- Altering channels and creating backwater sloughs and log jams, providing resting areas and hiding cover for fish and other organisms (ibid.); and
- Moving fine sediments out of the river and onto floodplains, bringing a flush of nutrients to wet meadows and riparian communities used by foraging bears, deer, and elk (ibid).

In addition to the annual floods, larger scale floods occur in the Kootenai River Subbasin about once every 10 years. The largest recorded floods occurred in 1894, 1916, 1933, 1948, 1954, 1956, 1961, 1974, and 1996 (KTOI and Montana Fish, Wildlife and Parks 2004). The flood of 1948 covered the entire valley floor except Wiggley Bend (river km 193.2) which is located in Drainage District #6 (Paragamian et al. 1997). In naturally functioning large river-floodplain systems, major floods unleash enough energy to move large quantities of material—from boulders and large woody debris, to fine organic material and silt—both downstream and across the floodplain (Williams et al. 2000). Debris jams can create temporary obstructions in rivers that, during peak flows, cause local channels to move and floodplains to be inundated. This movement of material produces a shifting mosaic of habitat characteristics, and increases the structural complexity and diversity of habitats. It is this physical habitat diversity and its dynamic nature that provide for the increased biological diversity associated with natural floodplain ecosystems (Williams et al. 2000).

Black cottonwood is one of the primary species that benefit from floods, and Robinson's surveys indicate the forest and shrub wetland communities once covered about a third of the valley floor (Bureau of Land Management, GLO notes 1893). Black cottonwood gallery forest supported many species, from beaver to migratory landbirds. Riparian vegetation along the river margins slowed water velocities, allowing sediment to settle and creating the natural levees noted by early explorers and surveyors (Marotz et al. 2002). Riparian vegetation provided bank stability and flow resistance, substantially reducing the erosion of silt into the river, and adding nutrients to aquatic systems (Deiter 2000). The near-shore habitat created by riparian vegetation is productive and critical to fish. Stable, cool, temperatures during summer and winter low-flow periods sustained fall spawning and enabled aquatic communities to recover from flood disturbances and benefit from increasing flow of nutrients, ambient temperatures and light (KTOI and MT Fish, Wildlife and Parks 2004).

Large downed trees and coarse woody debris located in channels and floodplains created low-velocity flow refugia, scoured deep pools, and trapped sediments and fine organic material that contributed to aquatic food webs. They provided a diverse and stable habitat mosaic that was used heavily by many kinds of organisms, including salmonid fishes (Williams et al. 2000).

Historically, beaver damming was a major natural process on tributary streams. Beavers built dams on river channels, streams, and ponds, creating an aquatic environment that sustained a rich community of aquatic plants and animals. The dams helped to regulate runoff in watersheds and buffered the downstream transport of organic matter, nutrients, and sediment. Beaver dams effectively stored water in river systems without disrupting watershed connectivity (KTOI and MT Fish, Wildlife and Parks 2004).

Coniferous forests. Historically, approximately 20 percent of the overall, generalized landscape of the forests in the U.S. portion of the Kootenai River subbasin was in an "old growth," or late seral condition (Losensky 1993 in KTOI 2004). The pattern (frequency and intensity) of disturbance events determined the distribution of this successional stage at any given point in time. In moist riparian areas and upper elevation cool, moist sites this old growth took the form of a multi-story, multi-age forest, while on warm, dry sites that experienced frequent, low-intensity fire events, stands were open and park-like and composed of mature trees with light understory. Twenty percent of the landscape was also in an early seral state (ibid.), and in these stands, stand-replacing fires occurred at different rates and created different patch sizes. Intervals between stand-replacing events varied from 150 to 400 years in the cool, moist environment and 150 to 200 years in warm, moist habitats (Leavell 2000 in KTOI 2004). The balance—sixty percent—of the U.S. portion of the subbasin is thought to have been in a varied, mixed-age, mixed-height, mixed-conifer, and mid-seral condition (Losensky 1993 in KTOI 2004).

David Thompson's journals (1808-1812) suggest that historically, coniferous forests had lower stem densities and trees reached larger sizes than seen today. David Thompson measured a larch during his 1808 trip to the lower Kootenai valley: "at [a height of] five and one-half feet above the ground I measured one thirteen feet girth and one hundred fifty feet clean growth, and then a fine head. This is one of many hundreds" (KTOI and Mt Fish Wildlife and Parks 2004). The western Kootenai people organized communal hunts in the fall for both white-tailed and black-tailed deer, and also hunted elk, bighorn sheep, mountain goat, and woodland caribou, travelling to high elevations to hunt game when necessary (Magocsi 1999). Another important forest resource for the Kootenai people was the western white pine, which they used to sheath bark canoes. Large pines would have been needed to provide the large sheets of bark needed for the 18 to 20 foot canoes "all made of one piece" [of bark] noted by David Thompson in his journals (Thompson 1916).

4.1.2. Changes to Kootenai River Valley Wildlife and Habitats

Although mineral and timber resources brought the first major waves of Euro-Americans to northern Idaho, visitors noted the deep, rich soil of the lower Kootenai River Valley. While the feasibility of developing the valley for agriculture was investigated as early as the 1880s (Jordan 1956), large scale diking was not undertaken until the 1920s (see Chapter 6). On August 16, 1920, the first of 16 drainage districts in the valley was created to facilitate a concerted effort to dike the river and drain the wetlands. District sizes and locations were determined by the mountain streams flowing into the river (Figure 4.3).

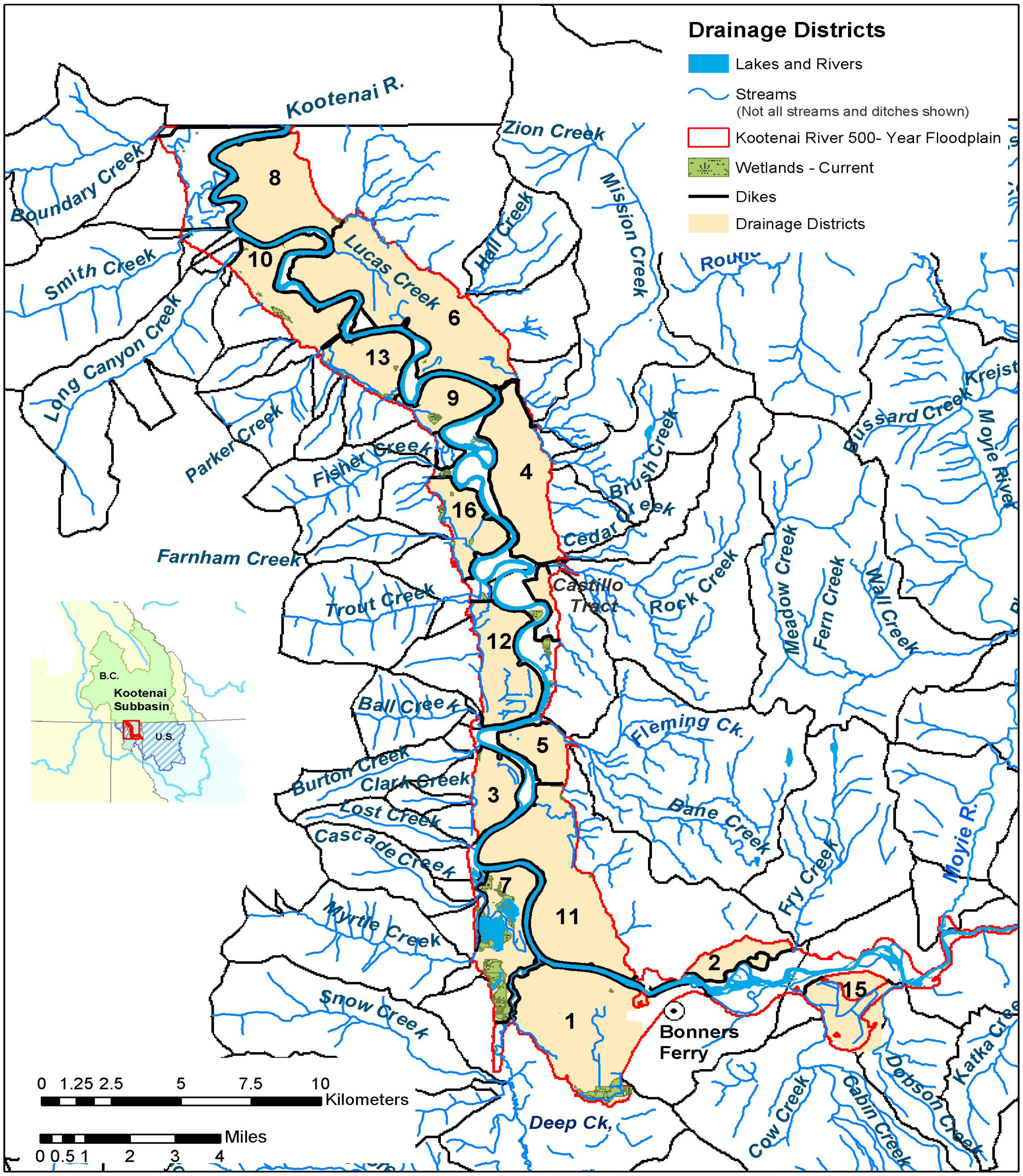


Figure 4.3. Drainage districts in the Kootenai River valley. The first district was created in 1920 and the last district (No. 16) in 1947. District 7 (today's Refuge) was created in 1925. (Courtesy S. Soults, KTOI.)

As stated in Idaho Code, Volume Eight, Title 42, Chapter 29, Section 42-2939, all of the drainage districts had the right of eminent domain, with power by their own board of commissioners to oversee the construction and maintenance of a drainage system. The Code states that for "the purpose of the drainage of any such district, the whole or any portion of any natural watercourse, or river, which drains such district, may be diked, improved, enlarged, widened, deepened or straightened, or any natural obstruction may be removed therefrom."

Beginning in 1921, 47 miles of the Kootenai River, and many of its tributaries, were diked. In 1925, the area that would one day become a national wildlife refuge was established as Drainage District # 7. Dike construction separated the river and its tributaries from their natural flood plains within the Kootenai River Valley. By 1947, virtually all of the available floodplain had been converted to agriculture, and 95 percent of the valley's historic wetlands had been lost.

Prior to its establishment, the refuge's land base (Drainage District #7) produced winter wheat, barley, and oats. White Dutch clover was grown for seed and in some years, peas were grown as well. In the fall, stubble was plowed or burned, leaving little food for migrating waterfowl. Even though the dikes were in place, significant springtime floods still occurred, often resulting in a total loss of crops (see Chapter 3, section 3.1.4, Floods). In 1972, Libby Dam, located in Libby, Montana, was completed as a joint project between the US and Canada to provide for flood protection and to generate hydroelectric power. The completion of the Dam reduced the frequency and severity of floods in the lower Kootenai River valley, but did not completely eliminate flood risk (see Chapter 3, section 3.3, Hydrology). The combination of diking and alteration of Kootenai River hydrology due to dam operations had dramatic negative impacts on wetland, instream, and riparian habitats, and associated fish and wildlife (see sections 4.3-4.6 and 4.8. below).

4.1.3. History of Refuge Management

1960s: Refuge Establishment

In the early 1960s, the Migratory Bird Conservation Commission (MBCC) realized that there was "a pressing need for the restoration of waterfowl habitat in this part of the Pacific Flyway to increase nesting habitat, provide feeding and resting areas during migration, and to facilitate waterfowl management techniques in crop protection." The MBCC stated that "At present waterfowl generally pass over the Kootenai Valley for lack of resting or feeding areas. The general practice of plowing stubble in the fall leaves little food for waterfowl. There is some minor crop depredation particularly in the spring on newly planted grain fields. An increase of crop depredation is anticipated following construction of Libby Dam and resultant intensive agricultural development along the Kootenai River." On June 24, 1964, the MBCC authorized the acquisition of land to create Kootenai National Wildlife Refuge (MBCC Memorandum Number 6, 1964). The first refuge lands were purchased in August 1964 and by the close of 1965, most of the lands within the refuge acquisition boundary had been purchased (see Chapter 1, section 1.6.2).

1965: Early Refuge Management

When it authorized the purchase of lands for the Kootenai National Wildlife Refuge, the MBCC proposed that marshes in bottomlands would be restored on the new refuge through the use of water control structures, drainage ditches, and pumps. Regulating the flow from Myrtle Creek would create about 800 acres of marsh which would be managed to support natural stands of pondweed, duckweed, muskgrass, and smartweed. A series of low dikes on the natural drainages would create pothole habitat for breeding waterfowl. Stands of reed canarygrass would be established and then cut in mid-summer for hay in order to provide meadowland attractive to Canada geese. Approximately

600 acres of cropland would be seeded to cereal grains and left standing for waterfowl food (MBCC 1964).

In his first Narrative Report (1965), Refuge Manager David Brown described the Refuge as "predominantly agriculture quickly changing to coniferous forest where the valley floor rises up into the Selkirk Mountains along the western boundary. The refuge is bordered on the north and east by the Kootenai River but is separated from the river by a dike rising some 37 feet above the streambed elevation. Deep Creek meanders along the southeast and Myrtle Creek flows near the western edge. Both creeks were diked out of the main center of the refuge for agriculture. A system of drainage ditches occurs throughout the agricultural fields and the ditches all lead to Myrtle Creek where seepage water is lifted over the dike and into the creek to keep the area dry enough for farming."

Refuge Manager Brown remarked that the most recent flooding in Drainage District #7 occurred in 1948, 1954, and 1956. During those years, all of the crops were lost resulting in considerable financial loss to the farmers. In 1965, the river crested at 27 feet high. The top of the dike was 37 feet; however, the river's crest was higher than most of the land in the valley and seepage water had to be pumped out in order to allow farming.

Under the terms of the sales agreements, some former landowners retained all farming rights and all of the crops during 1965, while the Refuge received a share of the crop on certain tracts. Of the 16 tracts of land purchased, 13 landowners retained the crops and hay on 1700 acres, and 3 landowners farmed a total of 176 acres under cooperative agreement.

Figure 4.4. Former landowner, Wayne Tucker, harvesting grain on the Refuge, 1965.
(Kootenai NWR archives.)

Crops grown on the Refuge included fall- and spring-planted wheat, barley, Rodney oats, white Dutch clover (grown for seed), and hay (alfalfa, alsike clover, timothy, brome, reed canary, and quack grass). Commercial fertilizer was applied by the farmers on almost all of the fields and crop yields ranged from 1 to 1½ tons per acre while hay yields averaged three tons per acre. The sharecrop operations provided the Refuge with 1,012 bushels of Rodney oats at harvest time, and of that 812 bushels were transferred to the National Bison Range for use as feed. Crops left standing for waterfowl included 20 acres of Rodney oats, 4 acres of wheat, and 4.6 acres of barley in addition to grain stubble, clover, alfalfa, and grass.

Only two small potholes located near the southern boundary (about an acre each), retained water that year. Due to the lack of wetlands on the Refuge, few migrating waterfowl visited the Refuge in 1965. In mid-December about 1,000 mallards were observed feeding in the Refuge's standing grain fields during the evenings until heavy snow in late December forced the birds to move south.

1965: Wildlife Species Observed the First Year

In the 1965 Refuge Narrative, Manager David Brown reported that killdeer, spotted sandpiper, Forster's terns, and great blue herons were observed on the Refuge during the summer and early fall. Upland game birds included ruffed grouse, spruce grouse, and ring-necked pheasant. Manager Brown remarked that "black bear, mule deer, and white-tailed deer occur on the Refuge and according to former landowners, moose and elk at times have come down into the valley but neither of these two species was observed during the year. A high percent of the deer population moves up into the surrounding mountains during the summer and migrate down to the valley for the winter, particularly mule deer." Species such as mink, weasel, and striped skunk were fairly common while muskrat and beaver numbers were low. Other observations included "a small number of marsh, red-tailed, and sparrow hawks and occasionally a golden eagle."

Figure 4.5. Postcard of the Kootenai River Valley, circa 1965. The new Kootenai NWR is the hatched area to the left of the river.
(Kootenai NWR archives.)

1966: Wetland Restoration and Wildlife Observations during the Second Year

During the spring migration in 1966, the waterfowl population reached a high of 3,600 for a brief two-week period. Later that year, three impoundments were constructed, the 120-acre Myrtle Pond, the 25-acre South Pond, and the 80-acre Island Pond. In September, Myrtle Pond was filled by gravity flow from Myrtle Creek, and at the end of the month, there were 3,500 mallards using it, with a peak of 6,300 in late October. In 1965, no geese were observed on the Refuge but in 1966, Canada geese accounted for 5,180 use days during late October and November. The geese used Myrtle Pond as a resting area and fed in the adjacent clover and grain fields. In March of 1966, 50 to 80 tundra swans stayed on the Refuge for about two weeks, a contrast to the previous year when no swans were recorded on the Refuge. Standing grain, approximately 89 acres of barley, was gleaned entirely by waterfowl during the fall migration whereas 12 acres of standing wheat was hardly touched. The total duck use days in 1966 reached 403,410 whereas in 1965 it was only 30,555 giving credence to the saying, “build it and they will come.”

Mule and white-tailed deer were observed on the Refuge, more frequently during the winter and spring. Black bear and coyotes were seen more frequently. One bald eagle and three golden eagles were recorded in 1966. It was surmised that a pair of golden eagles nesting on the mountain adjacent to the Refuge were responsible for the majority of pheasant takings.

Throughout the year, fishing in Myrtle Creek, Deep Creek, and the Kootenai River from the Refuge’s shoreline, was allowed. While only 147 fishermen were recorded, the success rate was considered good with rainbow trout being the primary species taken, some in the 5 pound class. In the fall, a small run of kokanee spawned in Myrtle Creek.

As was the case in 1965, some of the former landowners retained all of their farming rights and crops produced on the tract that they sold. Only part of the Refuge, 948 acres, was farmed under cooperative agreement with the Refuge while 740 acres were not under an agreement. 1966 marked the last year whereby former owners retained all of the crops grown. It is interesting to note that Refuge Manager Dave Brown remarks in the 1966 Narrative that “No waterfowl fed in refuge grain before harvest was completed and none of the permittees lost any of their share due to wildlife damage.” Some grazing (119 AUMs) did take place on the Refuge, a right retained by the former landowners in 1965 and 1966. Three permits to harvest hay were issued on a total of 175 acres with the first cutting occurring on July 1, resulting in no observed conflict with wildlife nesting.

1967

Cottonwood Pond was created by building a small dike on the wetland’s north end and using Cascade Creek as a water supply. Other refuge “improvements” during the year included planting 500 multiflora rose shrubs along the old Myrtle Creek channel for upland bird habitat; planting orchard grass and reed canarygrass seed for cover on the dikes; and removing all trees greater than 6 inches in diameter from the Kootenai River dike as recommended by the U.S. Army Corps of Engineers.

All farming on the Refuge was completed under a cooperative agreement with barley being the dominant grain crop along with oats and wheat. Grazing by 38 cattle was covered under Special Use Permits for the three permittees.

Duck use days during the spring increased to 150,000, nearly three times that of the previous year. New species recorded during the spring migration included Bonaparte’s gulls, dowitchers, and avocets. Fishing pressure on Myrtle Creek increased with quite a few rainbow trout being caught. Fishermen reported that fishing for ling (burbot) was poor with the decline thought to be due to commercial fishing for ling in Canada.

1968-1999: Restoration of Wetlands Continues

In 1968 when the ditches were cleaned out, the spoil was used to construct a dike for the 100 acre impoundment called Dave's Pond. An additional 300 acres of cropland was flooded for the fall migration resulting in a 100 percent increase in the number of duck use days as compared to 1967. Cooperative farming continued on the Refuge and the crops grown included barley, oats, winter wheat, and clover seed. Dikes and other disturbed areas were seeded with a timothy, reed canarygrass, and white Dutch clover mixture. Three grazing permits were issued during the year for 53 cattle and 2 horses.

In 1970, all cooperative farming agreements were amended to eliminate government shares of harvested grain due to a decreased demand for grain at the Refuge as well as at other refuges. This resulted in an additional 200 acres of standing grain left for waterfowl on the Refuge.

During the fall of 1971, "Middle Pond" (name later changed to "Center Pond") was constructed and was flooded with overflow water from Myrtle Pond. In 1972, New Pond was constructed in order to provide 100 surface acres of permanent water for waterfowl.

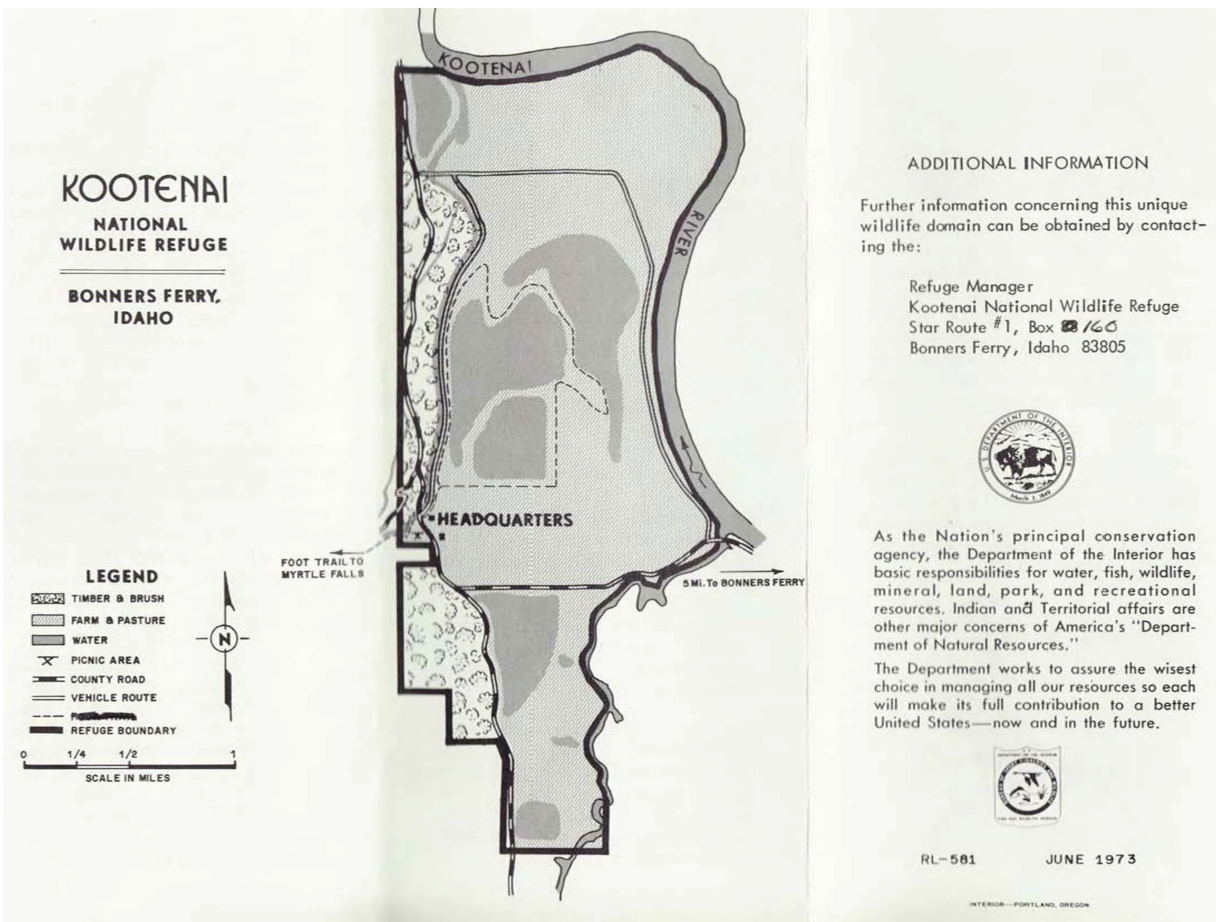


Figure 4.6. 1973 refuge brochure showing wetlands that existed at that time.
(Kootenai NWR archives)

In 1974, the Refuge began phasing out the haying and grazing program for the two remaining permittees. During the year, two cooperators farmed 705 acres under a 60/40 share crop agreement with the Refuge. Cooperator shares included winter wheat, barley, and white Dutch clover while the Refuge retained barley and various patches of alfalfa to provide cover for wildlife. As the agricultural footprint continued to decrease, aquatic habitats increased inducing several species of birds to nest on the Refuge for the first time. American bittern, once rare on the Refuge, produced 10 young. Black terns also nested on the Refuge. Other species observed included Wilson's phalarope, greater and lesser yellowlegs, black bellied plovers, Baird's and pectoral sandpipers, long billed dowitchers, and American avocets. During the fall migration, 25 western grebes used Island Pond during October. The first river otter was recorded on the Refuge during the year and beaver and muskrat observations became common.

In the 1976 Annual Narrative Report, Refuge Manager Delano A. Pierce reported that the Idaho Fish and Game Commission closed the elk season in Boundary County so that the small herd of six elk which use the Refuge could remain relatively undisturbed. "The county is a marginal habitat area for elk." In addition, Manager Pierce reports that no kokanee were observed spawning during the fall whereas an estimated 2,000 ran up Myrtle Creek the previous year. During most spawning years, an average of 20-40 kokanee used the creek for spawning.

Teal, Heron, and Wigeon Ponds were restored to permanent wetlands in 1994 whereas previously they were drained during the spring and partially planted to grain which was harvested and then flooded in the fall (1999 Annual Narrative Report). During 2002, Ducks Unlimited partnered with the Refuge to construct the 15-acre Greenwing Marsh, located east of the Refuge's Environmental Education Center, for educational opportunities. In the fall of 2002, a 175-acre restoration project was initiated in partnership with Ducks Unlimited at the Refuge's northeast boundary in an effort to reclaim historic floodplain habitat. The two areas, River Bend East Unit and River Bend West Unit, would provide additional seasonal wetlands for waterfowl.

As the wetland footprint continued to increase over the years, the agricultural footprint decreased. In 1999, the last cooperative farmer, Wayne Tucker, planted 584 acres of winter wheat and barley leaving 196 acres of standing barley for the Refuge's 40 percent share. 2000 marked the last years of cooperative farming when the winter wheat crop seeded in 1999 was harvested. Beginning in 1999, the Refuge hired a career seasonal employee to continue with the grain production for waterfowl with the seeding of winter wheat, tall wheatgrass, 46 acres of Japanese millet, and 164 acres of barley. As reported in the 1999 Annual Narrative Report, the non-forested uplands on the Refuge were used primarily for cereal grain production. Any grasslands that existed were found between the wetlands and grain fields and consisted primarily of quack grass on the drier sites and reed canarygrass on the wetter sites.

4.1.4. Changes in Wildlife Populations after Refuge Establishment

The principal changes to wildlife populations after refuge establishment were the result of a reduction in the number of acres farmed, an increase in the quantity of crops available for migrating waterfowl, and construction of infrastructure to restore wetland habitat and manage water for wildlife. See Condition and Trends in sections 4.3-4.8 of this chapter for detail about changes to populations of waterfowl and other wildlife.

4.1.5. Exotic and Invasive Plants and Animals

Land clearing and human habitation can have significant detrimental effects on native ecosystems since disturbed habitats are more prone to invasive species. Invasive plants and animals frequently degrade, change, or displace native fish, wildlife, and plant resources. When invasive plant species displace native vegetation, they alter the composition and structure of the vegetation communities, affecting food webs, and modifying the ecosystem processes, resulting in considerable impacts to native wildlife (Olson 1999). The Kootenai River Valley is no exception. The widespread land clearing that occurred in the 1920s to facilitate farming not only removed the native vegetation but also provided the avenue for exotic species to invade and flourish. Livestock grazing caused further degradation since the native grasses and forbs were not adapted to the heavy grazing pressure and soil disturbance and exotic grasses and forbs had a competitive advantage over the native species. In addition, many non-native pasture and forage grasses were intentionally introduced into the valley, further displacing native vegetation and altering wildlife habitats.

When the Refuge was first established, the majority of the pasture units were not under refuge management since the current landowners retained their rights for a year following the land sales. At that time, grazing took place on four tracts for cattle and horses and in general, the pastures were not of the best quality. Hay fields on the Refuge consisted of alfalfa, timothy, brome, alsike clover, reed canarygrass, and quack grass (1965 Annual Narrative). In 1965, Canada thistle was the primary noxious weed in the area. Control was conducted by aerial spraying of 2-4-D amine (using water as a carrier) on all of the grain fields on the Refuge, resulting in almost 100 percent kill in the treated areas (1965 Annual Narrative). Today, the most prevalent State-listed noxious weeds occurring on the Refuge's uplands include yellow toadflax, spotted knapweed, orange hawkweed, houndstongue, and Canada thistle. A variety of management tools such as mowing, hand pulling, prescribed burns, biological control, and herbicides are used to control these invasive plant species.

Exotic Plants in Riparian and Wetland Systems

One exotic plant which has proliferated in the wetlands and riparian areas is reed canarygrass (*Phalaris arundinacea*), a circumboreal perennial grass species. Although reed canarygrass is native to North America and the Pacific Northwest (Merigliano and Lesica 1998), a more aggressive European cultivar or hybrid has been widely used as a forage grass species. Seed for this cultivar has been commercially available since the late 1920s (Always 1931). Prior to refuge establishment, reed canarygrass was planted by the previous landowners as a hay component. Early refuge narratives (1967) mention that orchard grass and reed canarygrass were planted for cover on the dikes following wetland restoration. Currently, reed canarygrass is the most abundant invasive plant on the Refuge, typically forming dense monocultures in seasonally flooded wetlands, wet pastures, and the understory of open canopy riparian forests.

Reed canarygrass is highly competitive in shallow, seasonal wetlands, posing a major threat to native vegetation. This species often forms monotypic stands in suitable areas and once established, its creeping rhizomes typically form a thick sod layer excluding all other plants (Tu 2004, Kilbride and Paveglio 1999). Some native wetland plants, such as common spike-rush (*Eleocharis palustris*) and cattail (*Typha latifolia*) can survive within canarygrass infestations, but wetlands without canarygrass tend to have a much higher diversity of native species. Reed canarygrass may provide some benefit to wildlife such as thermal and nesting cover. Short (mowed or grazed) reed canarygrass may provide some value as goose browse however it is not preferred particularly if other sources of green browse, such as winter wheat, are available.

Cattails, while native, can also become invasive. Cattails are very prolific and can quickly dominate a wetland turning it into a monotypic cattail marsh whereby reducing the overall value of the habitat for wildlife. A single cattail head contains about 250,000 seeds which can remain viable in the seed bank for up to 100 years. Similar to many other emergent plants, cattails will not germinate if the water level is greater than 0.5 inches (1.3 cm) deep (Sojda and Solberg 1993). Control of cattails can be achieved by cutting, crushing, or disking. Cattails survival can be significantly reduced if a wetland can be sufficiently dried to allow disking in the fall and the following spring and summer (Sojda and Solberg 1993).

Eurasian watermilfoil (*Myriophyllum spicatum*) is an aquatic plant species which displaces native aquatic plant communities. It was accidentally introduced into North America from Europe and quickly spread by boats and water birds. Watermilfoil can form thick underwater stands of tangled stems and vast mats of vegetation at the water's surface, interfering with water recreation such as boating, fishing, and swimming. The plant's floating canopy enables it to crowd out native water plants. Eurasian watermilfoil has the ability to reproduce by seed and from stem fragments. Eurasian watermilfoil has been documented in the Kootenai River but not on the Refuge.

Introduced Birds

Over the years in many areas across the country, non-native game birds were introduced in order to allow sportsmen greater hunting opportunities. The pheasant is the greatest example of a non-native species being introduced into the U.S. In 1966, Idaho Department of Fish and Game biologists released 500 pheasants (Japanese green and Chinese ring-necked) on the Refuge, the majority of which were preyed upon by eagles and coyotes. Today, ring-necked pheasants can still be found on the Refuge, typically in the grain fields. While a few have been able to reproduce naturally, most of the birds were originally released on adjacent farms and have moved onto the Refuge where food and cover is obtainable year-round.

Wild turkeys, while native to North America, are not native to Idaho but were transplanted in 1961 by the Idaho Department of Fish and Game. Three subspecies, Merriam's, Rio Grande, and Eastern were introduced to provide increased hunting opportunities. It is the Merriam's wild turkey which is distributed throughout the Idaho panhandle. Over the last few years less than a dozen have been observed on the Refuge.

Other non-native bird species occurring on the Refuge include the house sparrow, rock dove, and European starling. House sparrows and starlings are both cavity nesters, competing with native birds such as the western bluebird for nest locations. Resident house sparrows and starlings select nesting territories early in the breeding season thus, when the native cavity nesting birds arrive from migration all of the prime cavities are occupied and breeding territories aggressively defended by the non-native species. Recently, house sparrows have been linked with the spread of human diseases and may be a vector in the transmission of West Nile Virus (Pimentel 2007).

Introduced Reptiles and Amphibians

Bullfrogs (*Rana catesbeiana*), native to the eastern United States, were introduced to the Pacific Northwest in the 1920s/1930s to be raised as food. Bullfrogs prey upon native amphibians, turtle hatchlings, and even ducklings. Bullfrogs introduced in the western United States have been implicated in localized declines of native amphibian species through predation and competition (Bury and Whelan 1984, and Kupferberg 1997). Bullfrog presence on the Refuge was first mentioned in the 1970 Annual Narrative Report but was not common. The 1971 Annual Narrative reports that bullfrogs were observed in South Pond in June of 1971. No bullfrog control has been conducted on the Refuge.

Introduced Fish

There are 67 classified fish species in Idaho, 39 native and 28 introduced either legally, illegally, or accidentally (Simpson and Wallace 1982). The majority of non-native species that have been introduced into Idaho were for sport, food, bait, and fish forage. While many introduced species have provided increased angling opportunities they have had a detrimental effect on native stream ecosystems. Often native fish decline is attributed solely to habitat degradation while the introduced non-native fishes may be an equal or greater threat (Schade and Bonar 2005). Non-native species compete for food and spawning grounds and often prey upon native species.

Some of the most common non-native species in the Kootenai River drainage include the brook trout (*Salvelinus fontinalis*), largemouth bass (*Micropterus salmoides*), yellow perch (*Perca flavescens*), pumpkinseed (*Lepomis gibbosus*), black crappie (*Pomoxis nigromaculatus*), and brown bullhead (*Ictalurus nebulosus*) (Simpson and Wallace 1982).

Surveys conducted in Myrtle Creek, Cascade Creek, Big Blowout Pond, and Little Blowout Pond in July 2009 found both non-native brook trout, and a brook trout x bull trout hybrid in Myrtle Creek. Bull trout, federally listed as threatened, were also found in Myrtle Creek, but no spawning has been documented. Therefore the hybrids probably originated in another watershed.

Big Blowout and Little Blowout Ponds were sampled using standard minnow traps and a floating experimental gillnet. Only two species were collected, brown bullheads and a yellow perch. A single yellow perch was collected from Big Blowout Pond. The low population could be due to predation by otters.

Brown bullheads were planted into numerous water bodies across Idaho as a popular game fish. Spawning in the spring or early summer when water temperatures exceed 65°F, bullheads typically live near the bottom of lakes and ponds and the slack water of rivers and streams. Omnivorous in nature, they feed on snails, worms, aquatic insects, fish, fish eggs, algae, and other types of plant materials. Since bullheads are highly tolerant of warm water, low oxygen, and high carbon dioxide, they are extremely difficult to eradicate with chemicals (Simpson and Wallace 1982).

Yellow perch are native to North America, ranging from Nova Scotia south along the Atlantic Coast to South Carolina and from the Dakotas east to the Atlantic Coast. While it is not known exactly when yellow perch were first introduced into Idaho, this species can be found in all of the major drainages in the State preferring lakes with clear, cool water and abundant vegetation. Young perch feed almost entirely on zooplankton and then aquatic invertebrates and small fish as they grow larger (Simpson and Wallace 1982).

Control Efforts

Service policy (569 FW 1, Integrated Pest Management) allows control of wildlife and plant pests on units of the Refuge System to ensure balanced wildlife and fish populations in support of refuge-specific wildlife and habitat management objectives. An Integrated Pest Management (IPM) approach is used, which consists of a variety of tools including the prevention of new introductions or the spread of established pests to areas not infested, mechanical or physical control methods, cultural methods, biological controls, pesticides, and habitat restoration/maintenance. The current draft IPM program for the Kootenai is included as Appendix F. Control efforts are planned annually and Pesticide Use Proposals (PUPs) are submitted to regional and/or national IPM coordinators for approval. The State-listed noxious weeds which may occur on the Refuge and their control are listed in Table 4.1.

Table 4.1. State Listed Noxious weeds and Other Weeds of Concern Occurring on Kootenai NWR, and Herbicide Treatments.

Problem Weeds	Noxious*	Herbicide	Rate per acre
American (wild) licorice (*Glycyrrhiza lepidota*)			
Canada goldenrod (*Solidago canadensis*)		Escort	0.5 oz.
Canada thistle (*Cirsium arvense*)	YES	Curtail or Milestone	1 qt or 7 oz.
Common mullein (*Verbascum thapsus*)		Escort	1 oz.
Common tansy (*Tanacetum vulgare*)		Escort	1 oz.
Common (fuller's) teasel (*Dipsacus fullorum*)		Escort	1 oz.
Dalmatian toadflax (*Linaria dalmatica*)	YES	Escort	2 oz.
Fiddleneck tarweed (*Amsinckia lycopsoides*)		Escort	0.5 oz.
Hawkweeds (orange and yellow) (*Hieracium aurantiacum, H. caespitosum*)	YES	Milestone	5 oz.
Henbit deadnettle (*Lamium amplexicaule*)		Harmony Extra	0.6 oz.
Horseweed (*Conyza canadensis*)		Milestone	5 oz.
Houndstongue (*Cynoglossum officinale*)	Species of Concern	Escort	1.5 oz.
Poison hemlock (*Conium maculatum*)	YES	Escort	1 oz.
Purple loosestrife (*Lythrum salicaria*)	YES	none for years	Escort 2 oz.
Russian knapweed (*Acroptilon repens*)	YES	none for years	Milestone 7 oz.
Spotted knapweed (*Centaurea stoebe* ssp. *micranthos*) Syn: *C. maclulosa*	YES	Milestone	7 oz.
St. Johnswort (*Hypericum perforatum*)		Escort	1.5 oz.
Tansy ragwort (*Senecio jacobaea*)	YES	Milestone	5 oz.
Tall tumble mustard (*Sisymbrium altissimum*)		2,4-d	1 qt
Biennial wormwood (*Artemisia biennis*)		Milestone	7 oz.
Yellow toadflax (butter and eggs) (*Linaria vulgaris*)	YES	Escort or Telar	2 oz. or 1.5 oz.

* Listed in Idaho Department of Agriculture. 2006. Noxious weed rules (24 May 2006). Idaho Department of Agriculture. URL: http://www.agri.state.id.us/Categories/PlantsInsects/NoxiousWeeds/watchlistsci.php

4.2 Selection of Priority Resources of Concern

4.2.1. Selection Process

Early in the planning process, the planning team identified 24 priority species (resources of concern) for the Refuge, as recommended under the Service's *Policy on Habitat Management Plans* (620 FW 1). In this policy, resources of concern (ROCs) are defined as:

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

The Service's Draft *Identifying Resources of Concern and Management Priorities for a Refuge: A Handbook* (USFWS 2008) states that "Habitats or plant communities are resources of concern when they are specifically identified in refuge purposes, when they support species or species groups identified in refuge purposes, when they support NWRS resources of concern, and/or when they are important in the maintenance or restoration of biological integrity, diversity, and environmental health." Therefore, resources of concern for a refuge may be a species or species group, or the habitat/plant community that supports a priority species/species group. (Resources of concern are called *conservation targets* in conservation planning methodologies used by other agencies and NGOs).

These priority resources of concern (ROCs) frame the development of goals and objectives for wildlife and habitat. Resources of concern may be species, species groups, or features that the Refuge will actively manage to conserve and restore over the life of the CCP; or species that are indicators of habitat quality for a larger suite of species (see "Other Benefitting Species," Table 4.2). Negative features of the landscape, such as invasive plants, may demand a large part of the refuge management effort, but are not designated as resources of concern. The main criteria for selection of the resources of concern included:

- reflective of the Refuge's establishing purposes and the Refuge System mission;
- species that may be used as an indicator of the health of one the main natural habitat types found at the Refuge;
- recommended as a conservation priority in the Wildlife and Habitat Management Review (August 2008); and
- federally or State-listed, candidate for listing, or species of concern.

Other criteria that were considered in the selection of the resources of concern included:

- species groups and/or refuge features of special management concern;
- species contributing to the biological diversity, integrity and environmental health of the Kootenai River ecosystem;

Table 4.2 displays the resources of concern that were selected and are the main focus of this plan, as well as other species that would benefit from management of habitat for the ROCs.

Table 4.2. Priority Resources of Concern for the CCP.

Focal Species	Habitat Type	Other Benefiting Species
Mallard	Wetlands	Refuge purposes species: Canada goose, American wigeon, northern pintail, green-winged teal, wood duck, gadwall, and tundra swans. ID PIF moderate priority species: American bittern, wood duck, gadwall, bufflehead, bald eagle, northern harrier (foraging), peregrine falcon (foraging), marsh wren. Other species: great blue heron, Virginia rail, sora, American coot, common snipe, red-necked phalarope, migrating shorebirds (sandpiper species, long-billed dowitcher, and lesser and greater yellow-legs) red-winged blackbird.
Common snipe		Waterfowl pairing (cinnamon and blue-winged teal, northern pintail, and mallards) Waterfowl migration foraging (American wigeon, mallard, northern pintail, gadwall, northern shoveler, tundra swans) Migrating shorebirds (lesser and greater yellow-legs, Wilson's phalarope) Other species: sandhill crane (foraging), long-billed curlew (foraging), amphibians breeding (northern leopard frog, Columbia spotted frog, long-toed salamander), rails, common yellowthroat (foraging), American bittern (foraging), bobolink (nesting and foraging on drier sites w/diverse floral component)
Redhead		Nesting: ruddy duck, American bittern, American coot, pied-billed grebe, northern harrier, yellow-headed blackbird, common yellowthroat, and marsh wren Foraging: northern leopard frog and Columbia spotted frog
Sora or Virginia Rail		American bittern (nesting and foraging,) northern harrier (nesting), Columbia spotted frog (breeding), red-winged blackbird (nesting)

Focal Species	Habitat Type	Other Benefiting Species
Redhead		Gadwall (brood rearing), black tern (foraging), red-necked grebe (nesting brood rearing), western grebe (foraging), pied-billed grebe (brood rearing, foraging), horned grebe (foraging), common loon (foraging), common goldeneye (brood rearing, foraging), common merganser (foraging), tundra swan (foraging). Open water also provides resting areas for migrating waterfowl (mallards, northern pintail, American wigeon, Canada geese). ID PIF high priority species: western grebe (foraging), Barrow's goldeneye (foraging), hooded merganser (brood rearing, foraging). ID PIF moderate priority species: red-necked grebe, eared grebe, canvasback, ring-necked duck, lesser scaup, bufflehead, ruddy duck, osprey (foraging only if fish present), bald eagle, Wilson's phalarope, ring-billed gull, California gull, black tern (nesting near emergent edge and foraging). Other species (all foraging): bank, barn, tree, and cliff swallows; bat species; western painted turtle; blotched tiger salamander.
Mallard or gadwall	Grasslands	Dabbling ducks, including mallard, gadwall, teal; lesser scaup, ring-neck duck, western meadowlark, savannah sparrow, grasshopper sparrow (although not confirmed nester) Other species: meadow vole, badger, northern pocket gopher, coyote (foraging)
Meadow vole		Western meadowlark, grasshopper sparrow, savannah sparrow, and vesper sparrow (nesting), western bluebird (foraging), bobolink (foraging late season mowed habitat), great blue heron and sandhill crane (feed on voles), long-billed curlew (potential nester, not confirmed), cinnamon and blue-winged teal (nesting), northern shoveler (nesting), northern harrier (foraging), short-eared owl (foraging and nesting), red-tailed hawk (foraging), elk (foraging).
Western Canada goose	Croplands (foraging areas for geese, ducks)	Mallard, pintail, wood duck, American wigeon, lesser Canada goose, long-billed curlew (early spring)
Bull Trout Redband Rainbow Trout	Riverine/ Instream	Kokanee, westslope cutthroat trout, bald eagle (foraging), osprey (foraging), kingfisher, common merganser, American dipper, river otter (foraging), beaver
Alluvial Riparian Woodland—Mid to late Successional		
Lewis' woodpecker	Large snags	Cavity-associated species such as tree swallow, downy woodpecker, house wren, northern flicker, northern flying squirrel, and bats.
Red-eyed vireo	Canopy	Western wood pewee, warbling vireo, American redstart, orange-crowned warbler, MacGillivray's warbler, and mountain chickadee

Focal Species	Habitat Type	Other Benefiting Species
Veery	Understory	Swainson's thrush, calliope hummingbird, song sparrow, spotted towhee, and gray catbird Other benefiting species: wood duck, Barrow's goldeneye, hooded merganser, red-naped sapsucker, rufous hummingbird, black-chinned hummingbird, dusky flycatcher, willow flycatcher, bald eagle, osprey and other raptors (large cottonwoods—roosting, nesting), owls (nesting), great blue heron (cottonwoods, nesting), kingfisher (bank nester), mule deer, white-tailed deer, elk (foraging, thermal cover)
Wood duck		Burbot (potential rearing habitat in ponds) common goldeneyes, hooded mergansers, western painted turtle
Willow flycatcher	**Riparian scrub-shrub**	Dusky flycatcher, lazuli bunting, black-chinned hummingbird, rufous hummingbird, white-tailed deer, elk
Moist mixed coniferous forest (Low-elevation, moist mixed conifer, late-successional forest)		
Vaux's swift	Large snags	Pileated woodpecker, Williamson's sapsucker, hairy woodpecker, great gray owl, golden-crowned kinglet, chestnut-backed chickadee, red-breasted nuthatch, flammulated owl, varied thrush, winter wren, brown creeper, and silver-haired and big brown bats.
Varied Thrush	Structurally varied, multi-layered	Golden-crowned kinglet, chestnut-backed chickadee, hermit thrush, blue grouse, Townsend's warbler, and winter wren.
Townsend's warbler	Overstory canopy closure and foliage volume	Northern goshawk, great gray owl, pileated woodpecker, golden-crowned kinglet, and chestnut-backed chickadee.
MacGillivray's warbler	Dense shrub layer in forest openings and understory	Fox sparrow, song sparrow, orange-crowned warbler, spotted towhee, Wilson's warbler.
Olive-sided flycatcher	Edges and openings created by wildfire	Western tanager, Cassin's finch, western wood-pewee, mountain bluebird, northern flicker, American kestrel, and American robin.
Ruffed grouse	Mixed moist deciduous forest (water courses above floodplain)	Red-naped sapsucker, warbling vireo, orange-crowned warbler, ruffed grouse (aspen stands); cavity nesters; deer, elk, moose, and hoary bat.

Focal Species	Habitat Type	Other Benefiting Species
Brown creeper	Late seral dry forest (Dry Ponderosa Pine and Douglas Fir series)	Hammond's flycatcher, hairy woodpecker, brown creeper (ID PIF priority species), white-breasted nuthatch, wild turkey, pygmy nuthatch

4.2.2. Analysis of Priority Resources of Concern

Wildlife and habitat goals and objectives were designed directly around the habitat requirements of species designated as priority resources of concern. In developing objectives, the team followed the process outlined in the Service's Draft *Identifying Resources of Concern and Management Priorities for a Refuge: A Handbook* (USFWS 2008).

In developing its listing of Priority Resources of Concern, the team selected not only species identified in refuge purposes and international, national, regional, State, or ecosystem conservation plans, but also species that captured the key ecological attributes of habitats required by larger suites of species. A key ecological attribute of an ROC is defined as:

> "a characteristic of the resource's biology, ecology, or physical environment that is so critical to the resource's persistence, in the face of both natural and human-caused disturbance, that its alteration beyond some critical range of variation will lead to the degradation or loss of the resource within decades or less" (Unnasch et al. 2009).

The team analyzed the key ecological attributes of habitats that are necessary to meet the life history requirements of ROCs, and are therefore critical to sustain the long-term viability of the ROC and other benefitting species (see Appendix E). KEAs include habitat patch size; adjacency to or contiguity with other habitats; vegetation structure, species composition, age class, and seral stage; frequency and duration of flooding; and frequency and intensity of fire. These key ecological attributes provide measurable indicators that strongly correlate with the ability of a habitat to support a given species. For most attributes, the team developed "desired" conditions that were based partly on scientific literature review and partly on team professional judgment. These desired conditions for specific attributes were used to help design measurable habitat-based objectives, as presented in Chapter 2. Not all key ecological attributes or indicators were deemed ultimately feasible or necessary to design an objective around. In addition, while the key ecological attribute identifies a desired condition for most indicators, other factors, such as feasibility and the ability to reasonably influence or measure certain indicators, played a role in determining the ultimate parameters chosen for each objective. Thus the key ecological attributes should be viewed as a step in the planning process, but the ultimate design of objectives was subject to further discussion and consideration. Appendix E serves as a supporting appendix to Chapter 2.

The team analyzed limiting factors for the habitats that support the ROCs. A limiting factor is a threat to, or an impairment or degradation of, the natural processes responsible for creating and maintaining plant and animal communities (see Appendix E). In developing objectives and strategies, the team gave priority to mitigating or abating limiting factors that presented high risk to Resources of Concern. In many cases limiting factors occur on a regional or landscape scale and are beyond the control of individual refuges. Therefore objectives and strategies may seek to mimic, rather than restore, natural processes. For example pumps and water control structures may be used to control water levels in wetlands in areas where natural hydrology has been altered by dam operations. The structure of plant communities used by ROCs can be created, rather than restoring native species composition. For example, mowing and/or grazing may be used to maintain a desirable vegetation structure, when restoring native grassland communities may be impractical.

4.3 Waterfowl and Supporting Habitat

4.3.1 Description and Location

Migrating ducks in the thousands and hundreds of geese and swans use the refuge wetlands, grain fields, and improved pastures during fall, winter, and spring. A smaller but significant number of waterfowl use the refuge uplands and wetlands during the breeding season for pairing, nesting, and brood rearing. Duck populations during all seasons are dominated by dabblers which constitute over 80 percent of the observed numbers. Mallards are by far the most abundant duck species in all seasons. The greatest use of refuge habitats by migrating waterfowl occurs in the fall followed by the spring. Much smaller numbers use the Refuge during the winter after refuge wetlands freeze up and grain crops are covered by snow.

Dabbling Ducks

Data collected prior to 1997 reveal that daily populations of dabbling ducks peak in November (Figure 4.7) and average 14,000 birds. Mallards represent over 74 percent of this population with peak numbers reaching 30,000 birds. In winter daily populations of ducks average 3,500 birds again consisted mostly of mallards (83 percent). Peak populations of 23,000 mallards have been observed during this season. In spring, dabbler duck populations average less than 4,000 birds during migration, however over 13,000 northern pintail and 8,000 mallards have been observed during this season. Dabblers still remain the largest proportion of the spring migrant population. The percentage of mallards in the spring population (50.1 percent) is somewhat lower as northern pintail and American wigeon populations gain importance. Refuge dabbling duck populations are reduced to an average of 479 (range 133-858) breeding pairs by mid -May. Forty–four percent of these are mallards. Other dabbling ducks with over 30 breeding pairs on average include gadwall, cinnamon teal, and blue-winged teal. Breeding pairs of wood ducks averaged 26 with as many as 44 estimated in one year.

Diving Ducks

Diving ducks, represented principally by redheads, common golden-eyes and ring-necked ducks, account for less than 3 percent of the fall duck use with numbers averaging less than 400 birds with peak populations of nearly 500 birds being observed for each of the three common species. Wintering populations of diving ducks average less than 100 birds with ring-necks, golden-eyes, common mergansers, and redheads representing over 75 percent of this population. Average daily populations of diving ducks (380 birds), primarily redheads, golden-eyes and ring-neck ducks, are similar and highest in spring and summer and likely represent the local breeding population.

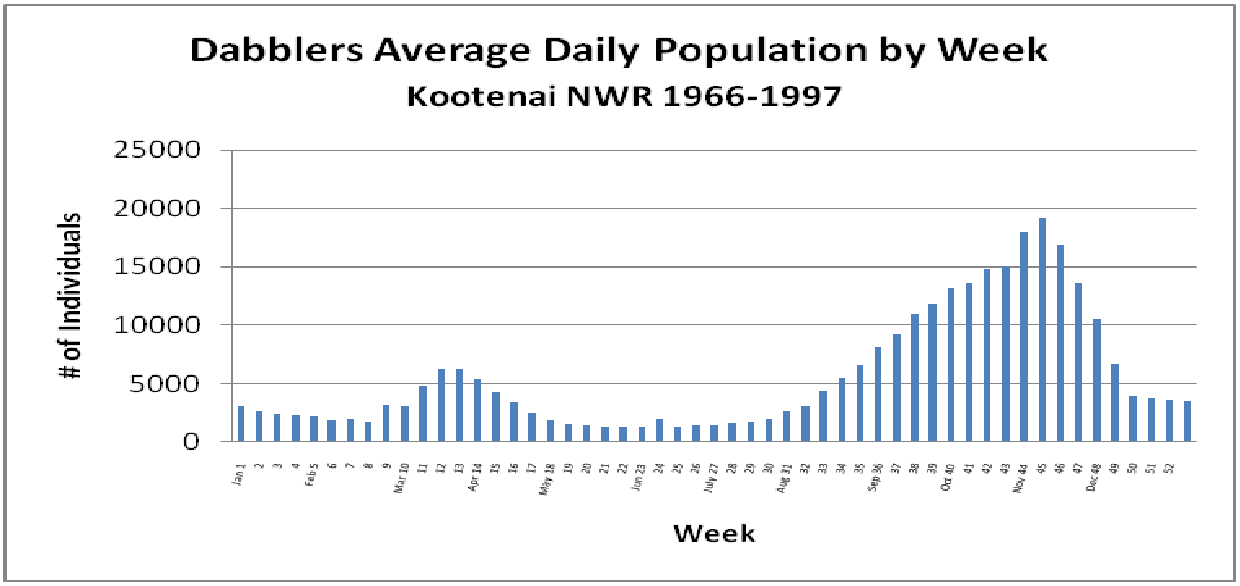


Figure 4.7. Average daily populations of dabbling ducks on Kootenai NWR by week, 1966-1997.

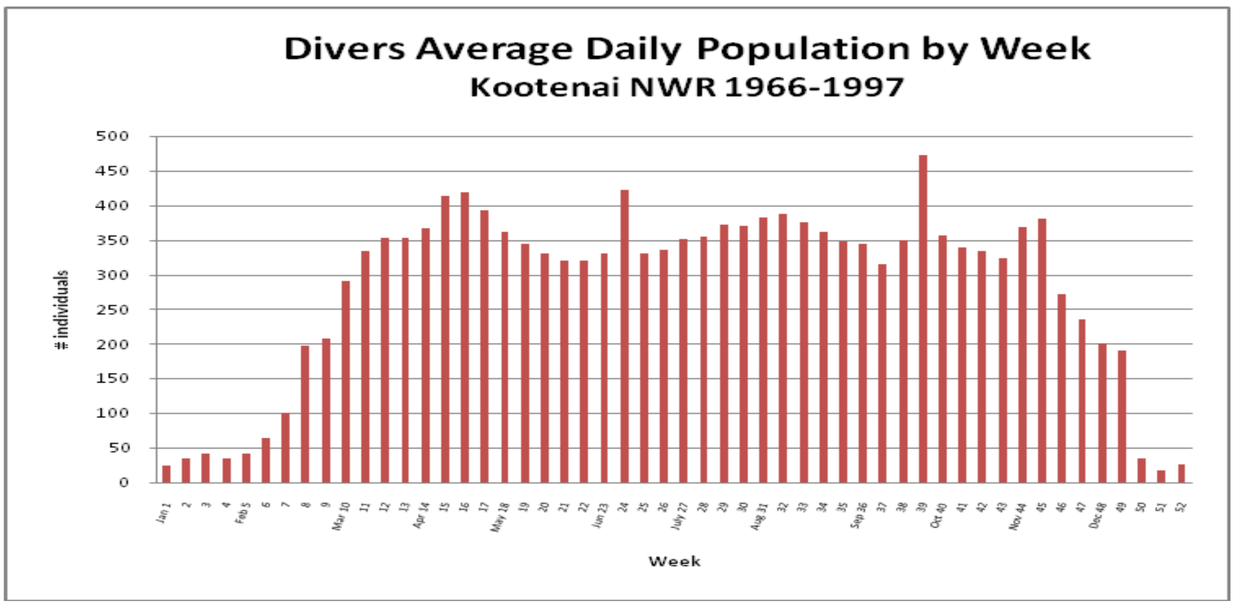


Figure 4.8. Average daily populations of diving ducks on Kootenai NWR by week, 1966-1997.

Canada Geese

With the exception of the fall migration period, daily Canada goose populations average less than 400 birds. In the fall, the daily average nearly doubles with peak populations of over 4,000 geese having been observed. Canada goose breeding populations averaged 94 pairs with a maximum of 140 pairs observed in 2009.

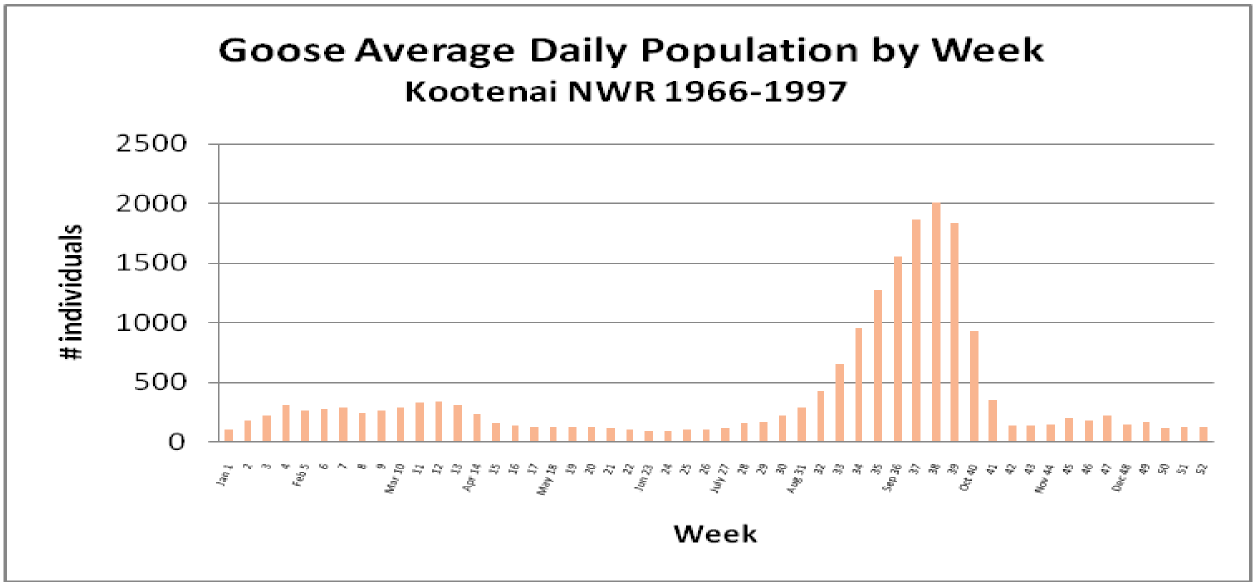


Figure 4.9. Average daily populations of geese on Kootenai NWR by week, 1966-1997.

Tundra Swans

Tundra swans are only present during the fall and spring migration periods. Fall populations average 40 birds with peaks of 300 birds observed in November. Spring is the season of greatest tundra swan use with peak populations of 500 birds seen in March.

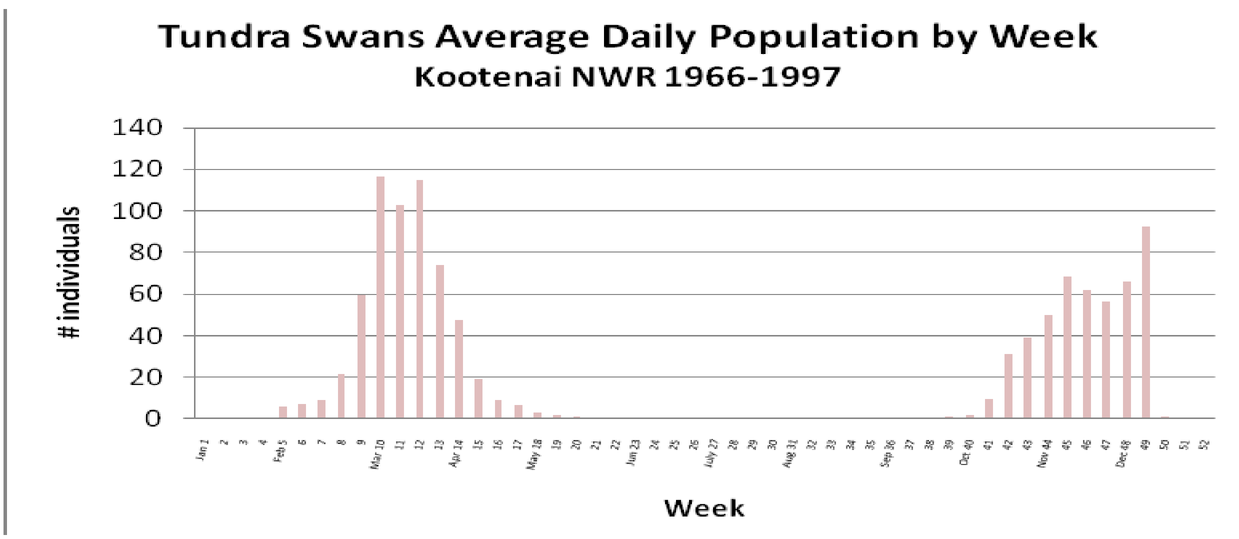


Figure 4.10. Average daily populations of tundra swans on Kootenai NWR by week, 1966-1997.

4.3.2. Condition and Trends

Following refuge establishment, major changes occurred to the refuge area in terms of the amount of grain available for migrating waterfowl and the acreage of wetlands available both during migration and the nesting season. Waterfowl species respond to these changes in the availability of wetland habitats, green browse, and croplands with a dramatic increase in use of the Refuge during its first 10 years.

From 1966 to 1996 the Refuge was surveyed on a weekly basis providing information on daily waterfowl populations, and annual and seasonal use days for most species of waterfowl. A recent search of files found the weekly data available for the years 1966-1971 and 1978-1996. Annual use-day data summarized for ducks, geese, swans, and coots was found for the entire time span of this survey in refuge narratives. Only scattered data are available for seasonal waterfowl populations from 1997 to the present. Waterfowl breeding pairs were estimated from survey data from 1978-1997. Data for the years 1986-1989 could not be located in refuge files. Waterfowl pair surveys were conducted in 2009 and 2010 for comparison to historic figures.

Annual summaries of waterfowl use days estimated from weekly surveys indicate that duck use increased dramatically through the first 10 years of refuge status reaching a peak of 3.3 million use days in 1977 (Figure 4.11). This increase was the likely the result of an increase in the refuge share of grain crops (from 28 to 300 acres) and the development of wetland habitat by internal diking and improved water delivery increasing wetlands acres from 60 to 500 acres (see Section 4.5). From 1978 to 1985, annual use of the Refuge by ducks declined to less than 2 million use days, but returned to peak levels again by 1988. Trends in duck use through 1988 are similar to trends in breeding populations for traditional waterfowl survey areas (Figure 4.11). Annual use stayed above 2.5 million use days until 1993 when use dropped by 500,000 use days and remained fairly stable through 1996. The apparent trend from 1988 to 1996 appears to be opposite that observed in traditional continental survey areas. Although some changes in water management occurred from 1978 to 1996 and adjustments were made to refuge farming programs, acres of wetlands and refuge croplands stayed relatively stable through this time periods. Comparing fluctuations in annual use to total annual precipitation indicates a nearly opposite trend than expected. Annual duck use appeared to decline during above average water years and increased during drought years. This apparent response to climatic conditions is more apparent when trends in use from 1978-1996 are looked at for dabblers in different seasons (Figure 4.12). It appears that dabbler use in fall decreased during wet years and increased during below average precipitation years, whereas spring use shows nearly an opposite trend. Winter dabbling duck use of the Refuge is strongly influenced by snow depths. Periods with several years of above average snowfall had lower dabbler use than years with below average snowfall years (Figure 4.14). Diving ducks also exhibited very different trends in fall and spring (Figure 4.15). Fall use appeared to increase and decrease during periods of increasing and decreasing precipitation, respectively, but use continued to decline following a return to wetter conditions after the prolonged drought of the mid-1980s to early 1990s. Spring use also appeared to follow precipitation trends except during the latter described drought and following recovery when use actually increased and then decreased. Winter diving duck use was small and showed no discernible trend with snowfall.

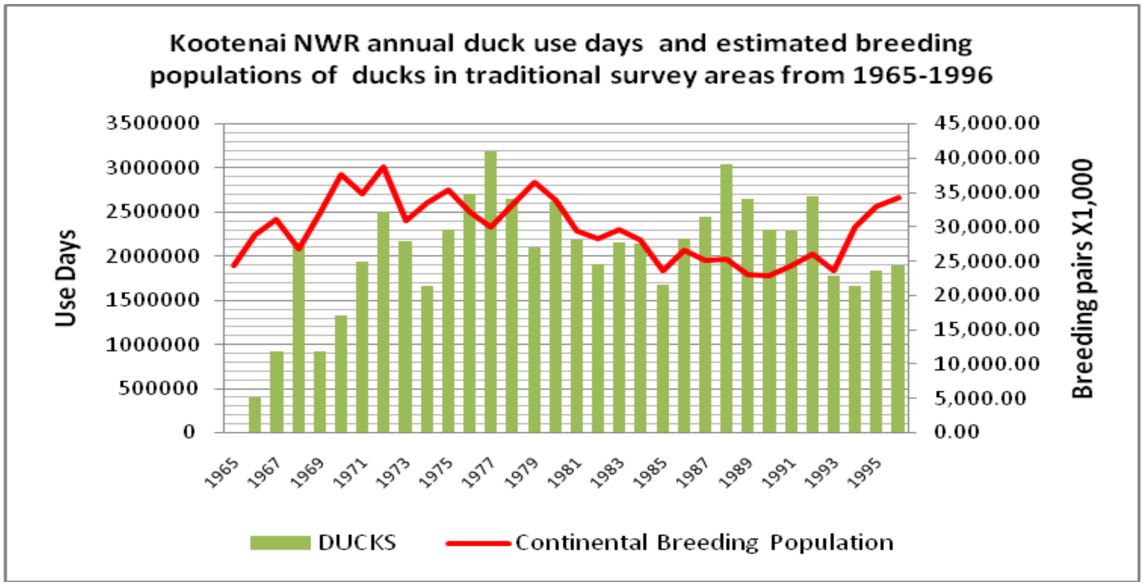


Figure 4.11. Annual duck use days and estimated breeding populations of ducks, 1965-1996.

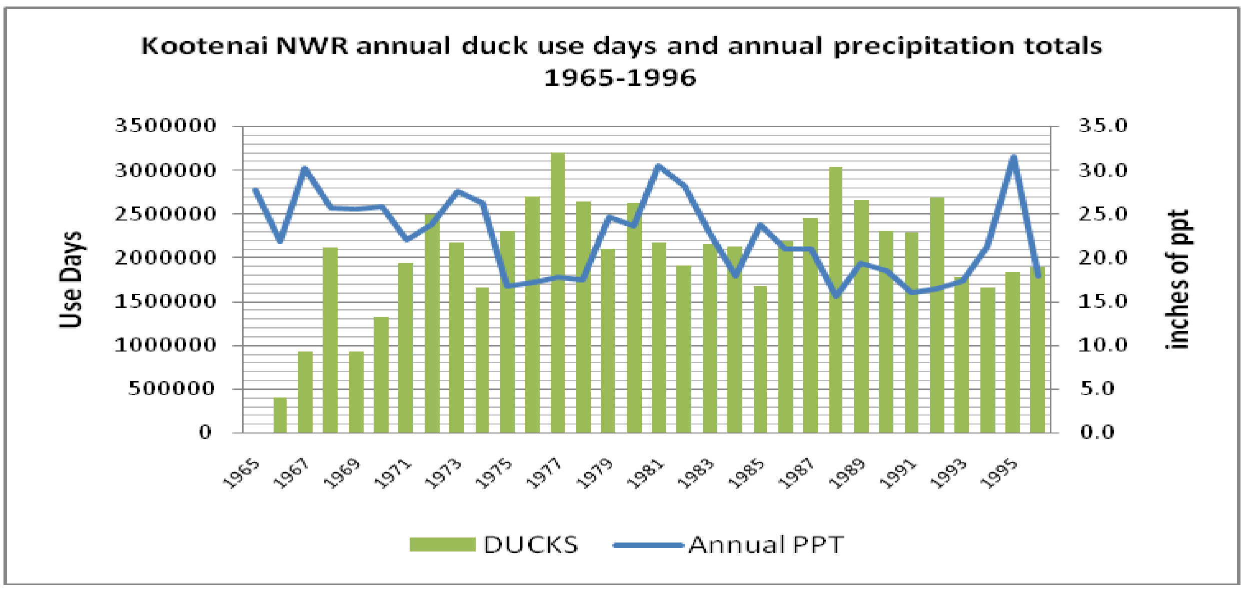


Figure 4.12. Annual duck use days and annual precipitation totals, 1965-1996.

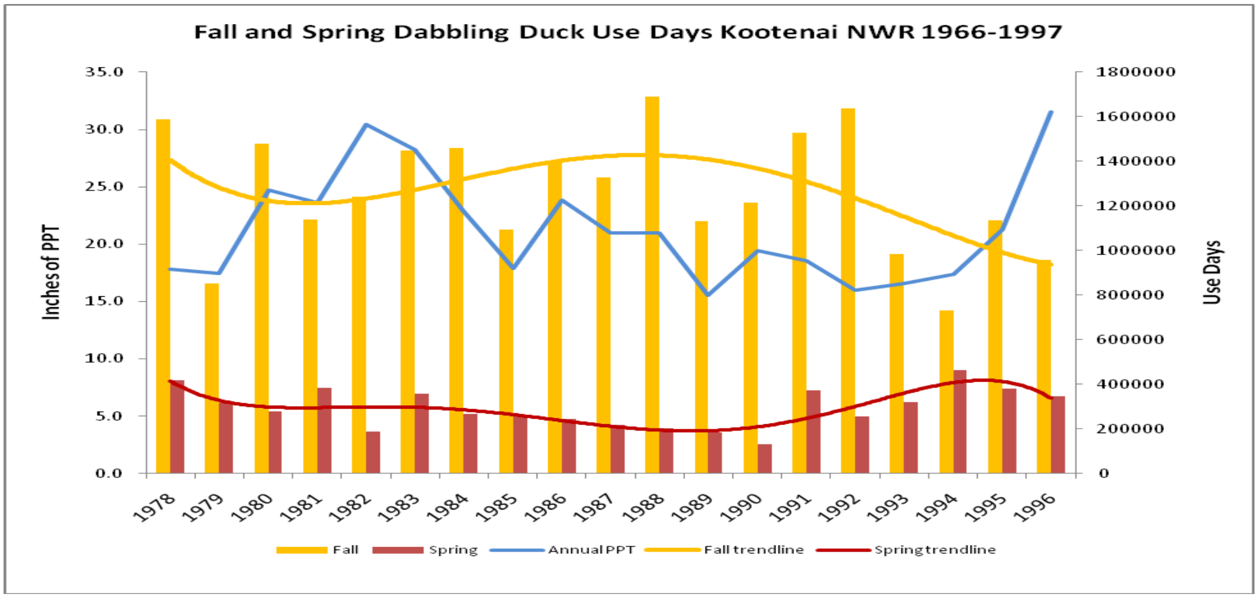


Figure 4.13. Fall and spring dabbling duck use days, 1966-1997.

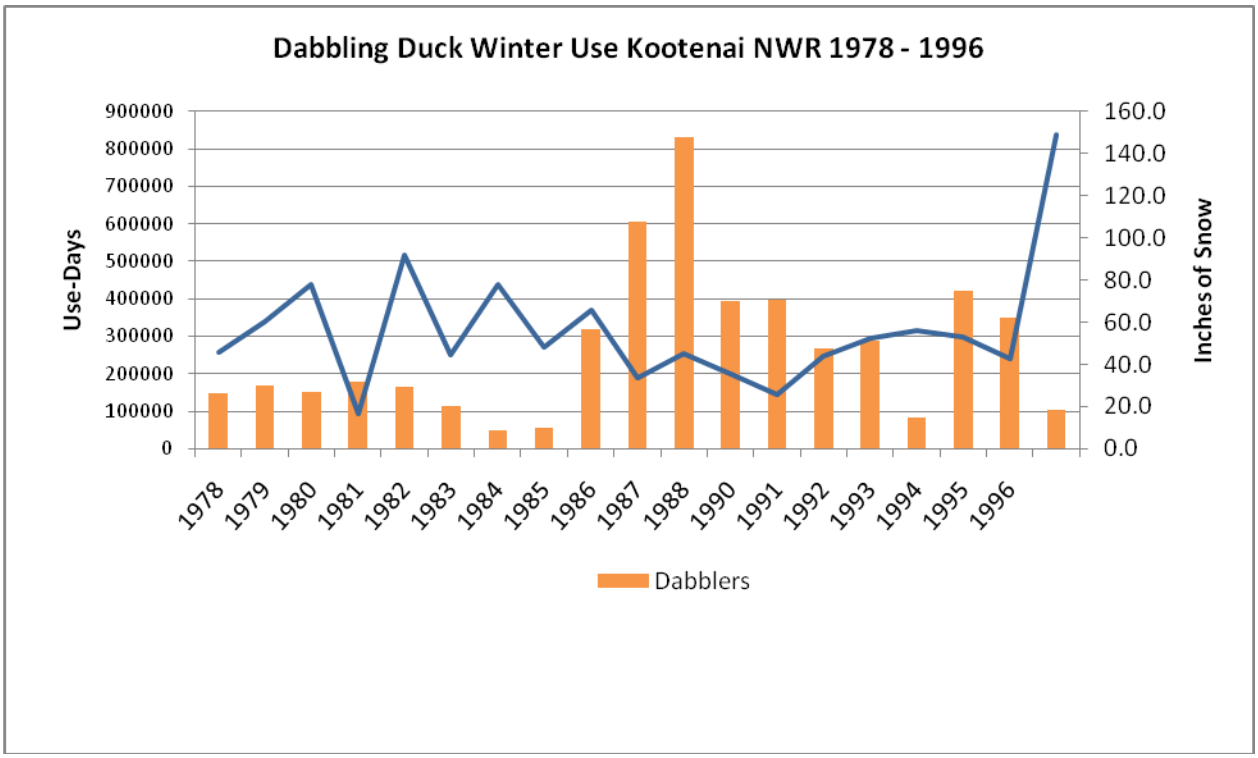


Figure 4.14. Dabbling duck winter use and snowfall, 1978-1996.

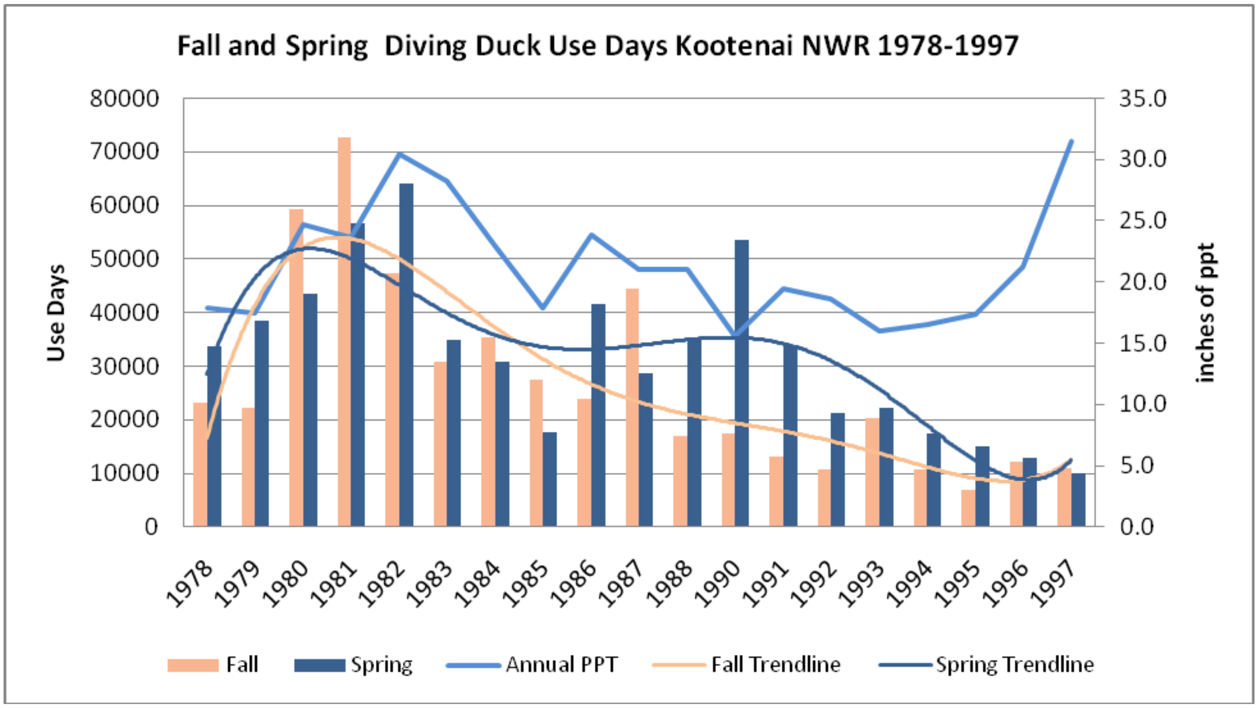


Figure 4.15. Fall and spring diving duck use days, 1978-1997.

Canada Goose

Canada goose annual use trends follow a similar pattern as ducks. After an initial increase post refuge establishment, use stabilized at around 150,000 use days until the early 1990s when use increased to over 200,000 use days (Figure 4.16). The same pattern of increase during drought years and decline during wet years was also observed beginning in 1990. Spring use was relatively stable throughout the 30 year survey period (Figure 4.17). Fall use was more variable showing an increase in the first 15 years followed by an almost 10 year slump with numbers near or below 60,000 use-days. Numbers again peaked in 1990 at almost 140,000 use-days. By 1996 use returned to the lower numbers of the 1980s. Winter goose use of the Refuge is strongly influenced by snow depths. Periods with several years of above average snowfall had lower goose use than years with below average snowfall years (Figure 4.18).

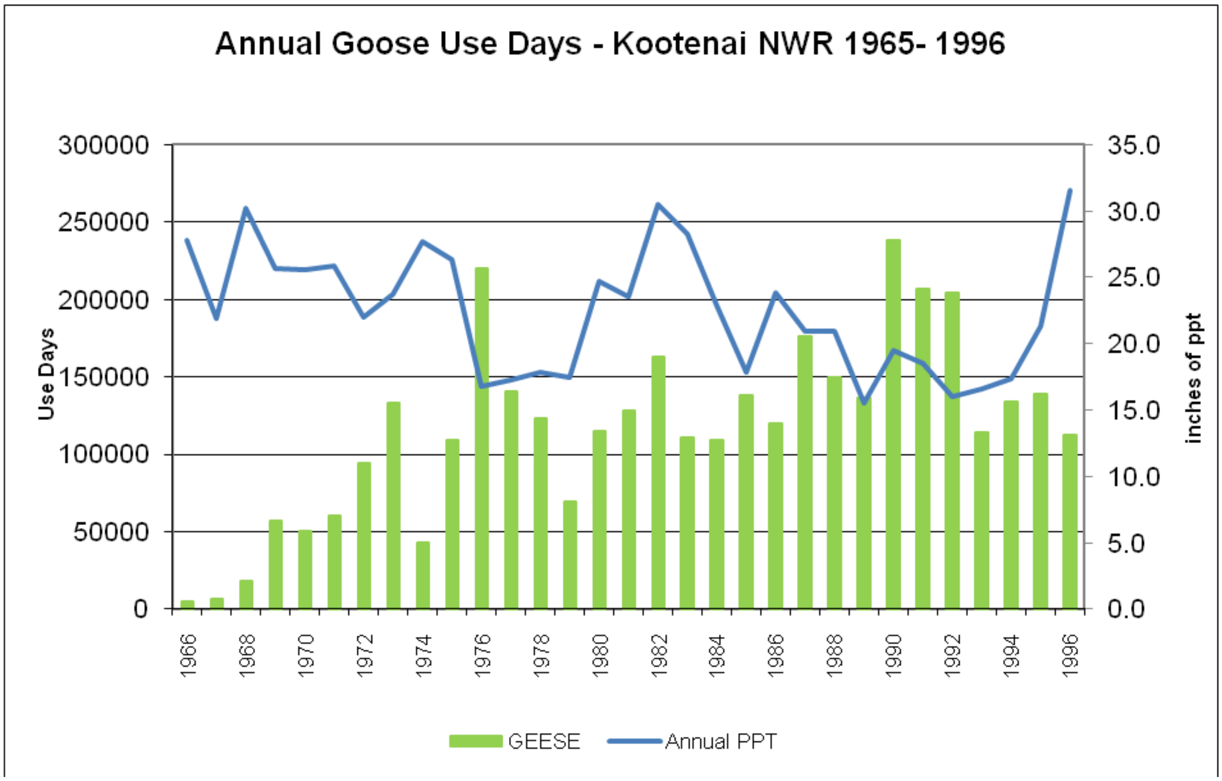


Figure 4.16. Annual goose use days, 1965-1996.

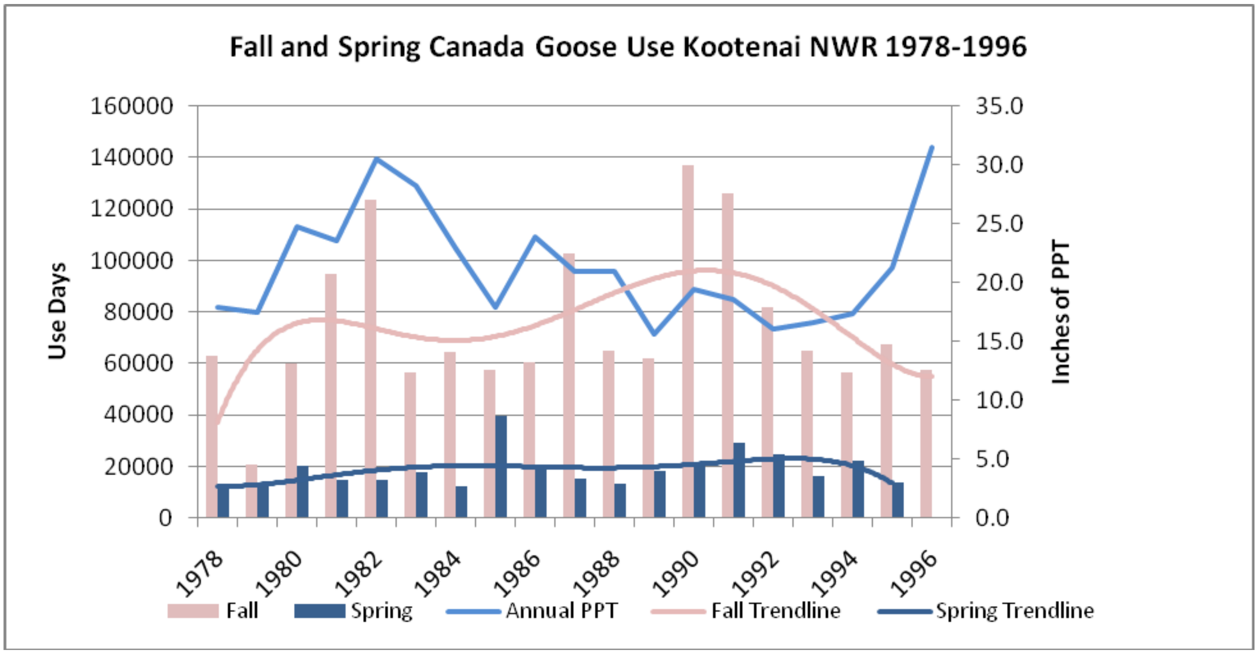


Figure 4.17. Fall and spring Canada goose use, 1978-1996.

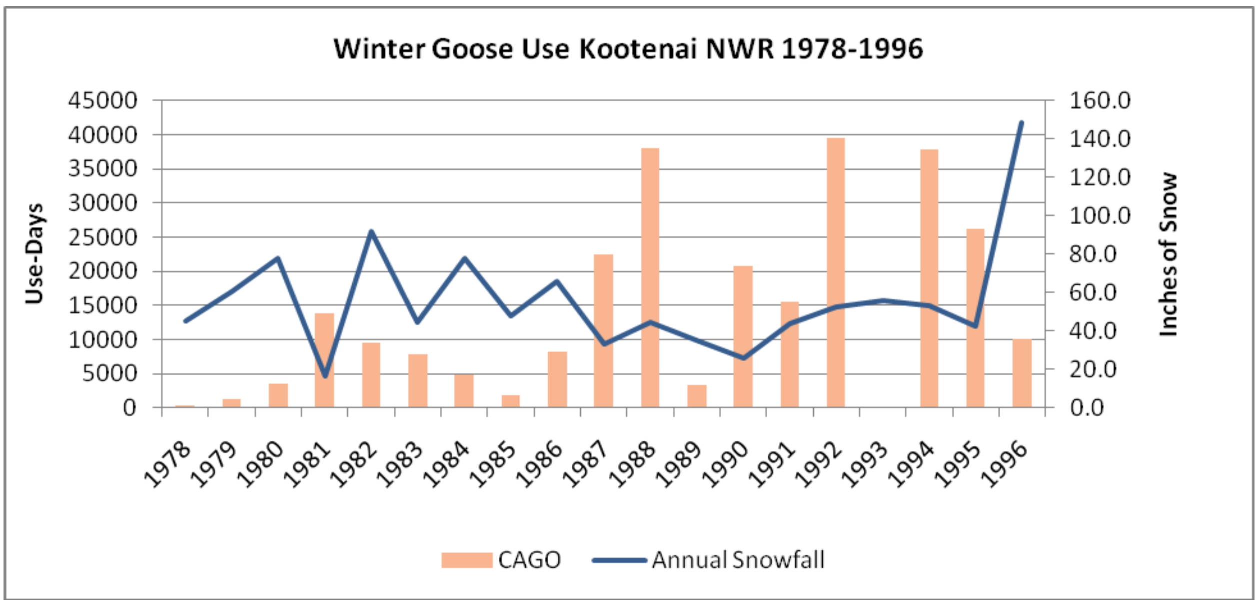


Figure 4.18. Winter goose use, 1978-1996.

Swans

Annual swan use also increased initially post refuge establishment (Figure 4.19). Swans then exhibited a declining trend through 1975. This decline occurred during a period of relatively stable annual precipitation. From 1975 to 1996 swan use of the Refuge had several highs and lows but the overall trend was increasing with over 12,000 use days estimated in 1995. Peaks and lows did not correspond with annual precipitation amounts. From 1986 to 1996, a period of increasing use began during a period of below average precipitation years. The lack of data since 1997 limits any description of recent trends, however, personal observations of refuge staff indicate that swan use is still fairly high. Looking at seasonal swan use for the years where weekly data are available (1978-1996), spring use was fairly variable but did not correlate well with annual precipitation, there was only a slight increasing trend over the 18 year period. Fall use during this time span exhibited a definite positive trend with most increases taking place during a period of below normal annual precipitation.

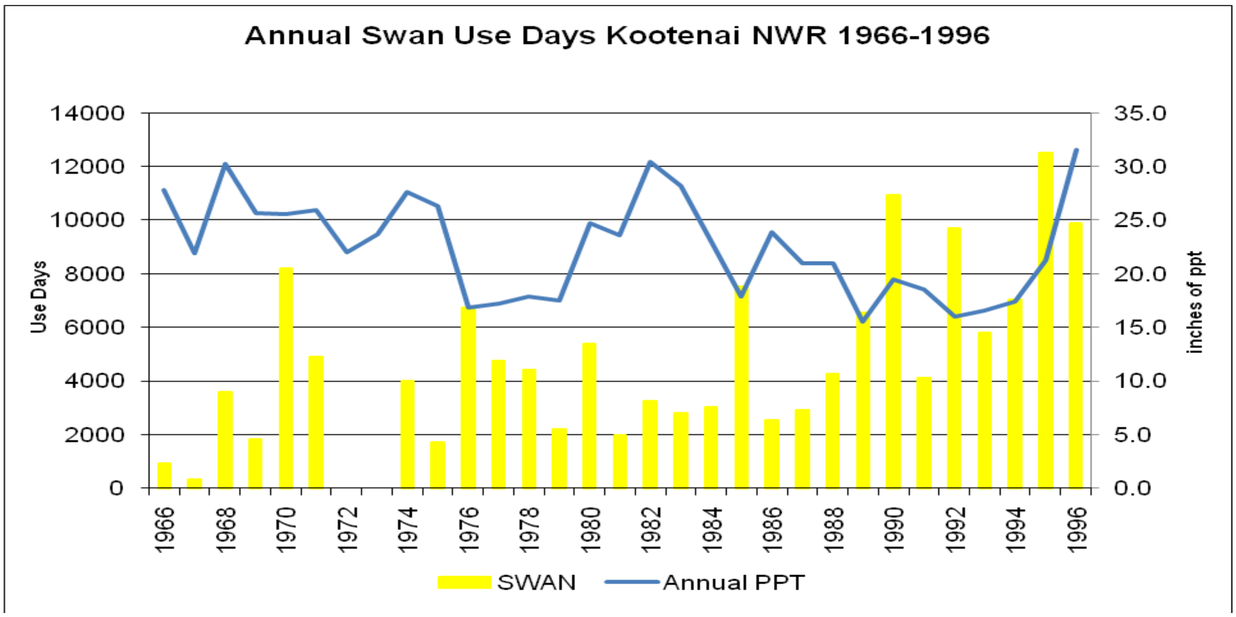


Figure 4.19. Annual swan use days, 1966-1996.

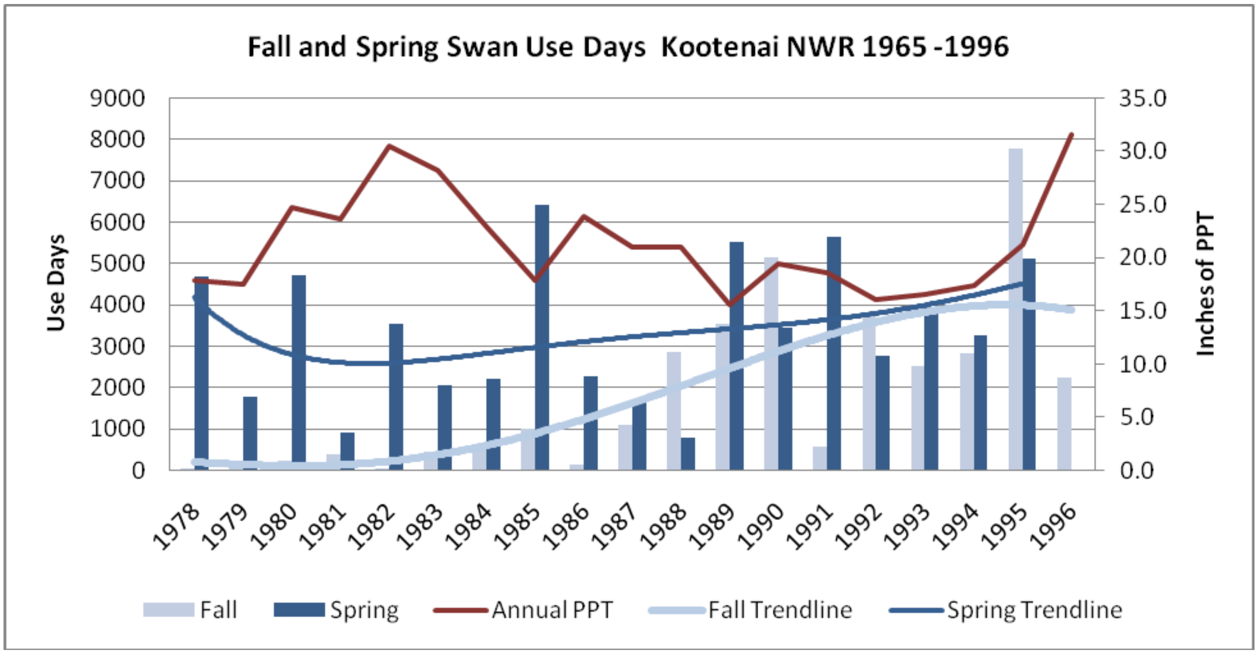


Figure 4.20. Fall and spring swan use days, 1965-1996.

The apparent reversed trend in waterfowl use relative to annual precipitation could be a result of differences in the availability of migratory bird habitat on the Refuge relative to the surrounding area. During wet years high tributary flows and elevated groundwater in the Kootenai River flood plain could result in more fall-flooded habitat outside the Refuge reducing the reliance of waterfowl on refuge wetlands. In drought years, this off-refuge habitat is greatly reduced and the Refuge's application of water through pumping from a regulated river provides some of the only fall habitat in the Valley. In spring, refuge wetland availability is much more susceptible to trends in precipitation as the primary water source is the diversion on Myrtle Creek and pumping is typically not done during this time period. In dry years, low flows in Myrtle Creek, require prioritizing water delivery resulting in a reduction in wetland acres flooded. In wet years, the opposite is true.

The observed increase in fall use of the Refuge during drought years emphasizes its importance to fall migrating waterfowl, especially dabblers. As more wetland areas are developed increasing the overall availability of habitat, this reversed trend may be less noticeable.

Contribution to Flyway Management Plans: Kootenai NWR contributes to several waterfowl management plans developed by the Pacific Flyway Council (see Chapter 1). The 2004 Strategic Guidance (North American Waterfowl Management Plan, Plan Committee 2004), a 15 year plan, does contain species-specific populations targets as a step-down from the NAWMP and evaluations of whether the continental population is currently short or over the target. There are also flyway goals for production by species. Annually there are population reports available based on the spring breeding surveys in the northern U.S. and Canada.

4.3.3. Habitats Utilized

Wetlands. Waterfowl are a diverse group of birds with widely divergent habitat requirements throughout the year. Waterfowl use both lacustrine and palustrine wetland habitats on the Refuge.

(For detailed information on management, habitat conditions and trends of refuge wetlands, see section 4.5 of this chapter.) Generally, lacustrine habitats support invertebrates and/or submergent vegetation and are used by select diving ducks. Diving ducks can use food resources in the deeper water associated with lacustrine wetlands. Select dabblers may consume invertebrates and vegetation high in the water column within lacustrine wetlands, but these conditions are not considered optimal for foraging. With their deep open water, lacustrine wetlands offer long sight distances and are free of mammalian predators. Therefore, they provide important loafing, resting, and roosting habitats for migrant waterfowl during fall, winter, and spring.

Healthy and productive refuge palustrine wetlands host a rich diversity of emergent wetland plants including smartweeds, bulrushes, sedges, rushes, wild millet, bur-reed, cattail, and water plantain. Additionally, free-floating aquatics such as duckweed are valuable waterfowl food resources produced within palustrine wetlands. Waterfowl both directly consume wetland vegetation and selectively consume portions of plants including seeds, tubers, rhizomes, and roots. The detritus and submerged microclimates formed by seasonally flooded, emergent vegetation create an important substrate for the production of aquatic invertebrates. Consumption of invertebrates for protein and lipid content is seasonally significant to female ducks for egg development and laying (Fredrickson and Reed 1988).

Appropriate water depths are important for effective waterfowl management. Canada geese frequently forage in shallow wet meadow conditions or sheet water conditions with less than six inches of water. Management of seasonal wetlands is valuable for producing emergent wetland vegetation that is a primary food resource for wintering waterfowl. These wetlands are generally slowly drawn down through the spring and summer, with the intent of creating moist soil areas where the seeds of annual emergent plants, such as millet and smartweed, can germinate. Once these plants are mature, the basins are reflooded. Water depths of 2-10 inches are optimal for foraging by dabblers, allowing them access to seed heads. Various duck species have preferred foraging depths within this range; for example preferred water depths for mallards are 2.75-5.5 inches, while northern shovelers prefer depths of 6.3-9.5 inches (Frederickson 1991). Swans feed on aquatic tubers. For successful feeding, water depths must allow swans to reach the submerged tubers with their bills. Conversely, divers including ring-necked ducks and lesser scaup are capable of locating food resources throughout the water column, from near the surface to depths of many feet.

Managed pasture. As the foot print of croplands was reduced on the Refuge post establishment, former farm fields that were not converted to wetlands were planted with mostly non-native pasture grasses including red-top, timothy, and smooth brome. There are currently 560 acres of this habitat on the Refuge. It is managed through the use of mowing, herbicides and prescribed fire to control invasive plant species, reduce thatch build up, and maintain the vigor of existing pasture grasses. The primary purposes of these areas are big game and goose forage, waterfowl and migratory landbird nesting habitat. In recent years small efforts have been made to plant native species especially forbs and shrubs in these areas to improve species diversity and structure.

Croplands. When the FWS planned to establish Kootenai NWR, neighbors were concerned that waterfowl would feed on their crops as the Refuge increased the local waterfowl population. The major cash crops in the Kootenai Valley are winter wheat and barley, and most of the Valley is used for crop production. The FWS assured farmers that crops would be grown on the Refuge to provide feed for waterfowl and reduce the severity of crop depredation on private cropland. In testimony before the Migratory Bird Conservation Commission to justify the establishment of Kootenai NWR, the FWS said in part that the proposed Refuge would "facilitate waterfowl management techniques in crop protection." Planting grain to "accommodate waterfowl" and "lessen the threat of depredation locally and elsewhere" was stipulated in the Kootenai National Wildlife Refuge Master Plan for the purchase and development of the Refuge.

In the very early years, the Refuge managed an extensive farming, haying and grazing program. A total of approximately 1,876 acres of the Refuge was farmed, hayed, and grazed. As wetlands were developed, haying and grazing were eliminated and farming was reduced to approximately 600-650 acres. Two former landowners of refuge property were continuous cooperator farmers for the Refuge through 1995. The cooperators were allowed to harvest 60 percent of the crop and in return left 40 percent standing for waterfowl food. The Refuge share consisted primarily of 200-250 acres mostly in spring barley. In early 1996, one of the permittees retired and the remaining farmer conducted all of the cooperative farming on the Refuge. In 1997, funding was approved to begin phase-out of the cooperative farming program and convert to farming using only Service staff and equipment (force account farming). The purpose of this shift to force account farming was to produce approximately the same acres of crops, but reduce the overall footprint of agricultural lands on the Refuge. This would free up previously farmed land for wetland restoration.

Today, approximately 200 acres of cropland is managed for waterfowl and of that, 160 acres is plowed and seeded to winter wheat and barley every year on a rotational basis. All cropland management is performed by refuge staff. Grain from standing crops has continued to be an important food source for migrating waterfowl in the early spring. Rotational farming is used to break weed cycles and to allow volunteer crops to offset the cost of annual planting. However, these volunteer crops are prone to invasive plant infestations which require expense to control.

Croplands are nearly equally distributed between hunt and sanctuary portions of the Refuge. Currently all croplands are located in the portion of the Refuge north of Riverside Road.

4.3.4. Key Ecological Attributes

Table 4.3. Waterfowl and Supporting Habitat--Ecological Attributes, Indicators, and Condition Parameters.*

Key Ecological Attributes	Indicators	Desired Conditions
Species Abundance and Diversity	• 5-year average fall populations for declining species, e.g., northern pintail, American wigeon, and scaup. • Population available for viewing and waterfowl hunting • 5-year average fall populations for	• Stable or increasing • Large concentrations Increasing

Key Ecological Attributes	Indicators	Desired Conditions
	desirable hunted species (e.g., mallard, wigeon)	
Upland Food Availability (Improved pasture and Croplands)	• Crops • Improved pasture	• Mix of spring barley, winter wheat, millet, green manure crop; normal planting, harvest, and post-harvest manipulation. • A diverse mix of desirable sedges, bunch- and sod-forming grasses, and forbs (native species are preferred but desirable non-natives may be necessary); mosaic of vegetation heights ranging from 6-36 inches; <5% cover of invasive plants (e.g., Canada thistle, yellow toadflax, spotted knapweed, common mullein, houndstongue); No hawkweed, teasel, poison hemlock
Water depth and hydroperiod	• Variety of water depths to accommodate swans, dabblers and divers during nesting season and fall migration	• Water depths in wet meadow, moist soil to 6 inches March-April • Water depths in managed seasonal wetlands 4-6 inches during initial floodup in September; 24 inches late Jan to May; achieve drawdown by mid June but no later than July 1. • Water levels in semi-perm wetlands 24-30 inches by April 1 and not less than 18 inches through July 30. Water depths in permanent wetlands 24-36 inches with potentially increased depths in spring due to snowmelt.
Vegetation Diversity, Structure	• Managed seasonal wetland (moist soil) vegetation • Vegetation and cover in semi-permanent wetlands • Vegetation and cover in permanent wetlands	• >60% cover of desirable and/or native wetland plants including moist-soil annuals (e.g., smartweeds, wild millet, water plantain); <20% cover of native emergent species (e.g., cattail, hardstem bulrush) that are >5 ft tall; <30% cover of undesirable/invasive plants including reed canarygrass • 30%-70% cover of native emergent species (e.g., cattail, hardstem bulrush, bur-reed) that are >5 ft tall; mosaic of open water and emergent cover; 30%-70% cover of desirable and native wetland plants including moist-soil annuals (e.g., smartweeds, wild millet, water plantain) and submergent plants (e.g., pondweeds); 30%-50% cover of open water with submergent plants (e.g., pondweeds); <20% cover of undesirable/invasive plants including reed canarygrass. • >75% cover of open water with native submergent vegetation (e.g., sago pondweed) covering wetland basins during peak water elevations; <25% cover of desirable and native emergent (e.g., hardstem bulrush, cattails) and other wetland plants (e.g., annual moist-soil plants); <10% cover of invasive plants (e.g., reed canarygrass).

Key Ecological Attributes	Indicators	Desired Conditions
Invertebrate diversity	• Macroinvertebrate abundance and diversity preferably high; invertebrate diversity will partially be determined by hydroperiod.	
Invasive plants	• In general not a critical concern; however, limit or exclude habitat-altering species, e.g., purple loosestrife and Eurasian milfoil. • Limit or exclude exotic vegetation (e.g., common reed and reed canarygrass) that form persistent monocultures.	
Human Disturbance	• Minimize disturbance to preferred waterfowl feeding, roosting, and nesting areas; provide waterfowl sanctuary area during hunt season	

Sources: Planning Team, Frederickson 1991, Fredrickson and Drobney 1979, Fredrickson and Reed 1988, Kilbride and Paveglio 1999.

4.3.5. Threats

Threats to waterfowl and their associated habitats within the Kootenai River Floodplain include:

- Lack of overbank flows which historically created thousands of acres of off-channel wetlands, due to dikes and levees on Kootenai River main stem;
- Lack of spring flooding and scouring, reduced flood depth/duration, and limited options for using gravity to drawdown and flood refuge wetlands to meet the breeding and migration chronology of waterfowl, due to damming and manipulated river hydrology, and a deteriorating and inefficient water delivery system on the Refuge;
- Loss of habitat due to development within the floodplain; and
- Degraded and/or simplified habitat structure due to invasive species such as reed canarygrass and Eurasian milfoil; and
- Climate change, which may favor invasion by non-native plant and animal species, alter composition of plant communities, alter timing of food availability, and alter hydrologic regimes (e.g., decreased snowpack, increased flooding due to rain on snow events (see Chapter 3).

In addition to habitat threats, threats to waterfowl include human disturbance, lack of sanctuary area, and disease.

4.4 Native Grasslands

4.4.1 Description and Location

Due to changes caused by conversion to agriculture (logging, diking, draining, and logging of bottomlands; soil disturbance; grazing; and introduction of exotic grasses), grasslands on the Refuge are highly altered from presettlement conditions. There are no native grasslands or native wet meadows remaining on any part of Kootenai NWR.

Reconstructing the species composition of the Refuge's historic grassland and prairie habitats is difficult due to their early conversion to agriculture. Since most of the Refuge lies on a floodplain, it was covered by a mosaic of floodplain forest, wetlands, and wet meadow before Euro-American settlement. Upland (dry) prairie likely occurred only in small patches of well drained soils; it is a more common habitat type in upland benches elevated above the floodplain. General Land Office survey notes from 1893 reported extensive areas of "wet prairie or meadow" habitat on the Kootenai River flood plain corridor (Bureau of Land Management 2011; see section 4.1). It is likely that smartweed and *Bidens* were common, since seeds of these plants are still present in floodplain soils and germinate when the right conditions are present. Some areas of the floodplain produced what was called "rush hay" (Scot Soults and Norm Merz, KTOI, pers. comm.), which farmers harvested after spring floodwaters had receded, and the area had dried out enough to provide access. This was not as palatable or as high in nutritional value for livestock as upland hay. Settlers also planted reed canarygrass since this species grew well in waterlogged soil, providing pasture early in the season and hay later on. Soults and Merz also found that the species of reed canarygrass planted by settlers was not the same as the hybridized, problematic reed canarygrass cultivar that dominates the margins of many wetlands today.

When the Refuge was established, all of the original riparian forest (except for remnant stringers along the dikes) and wetland had been converted to pastures, hayfields, and croplands. Many wetlands were restored on the Refuge, but agricultural lands continued to be managed as such. In the 1980s and 1990s, as the area of cropland decreased, old farm fields were planted to non-native legumes and grasses such as alsike clover, yellow sweet clover, annual ryegrass, fescues, redtop, reed canarygrass, Grimm alfalfa, buck wheat, tall and intermediate wheatgrass, and sainfoin. Today, most of these uplands are managed as non-native grasslands, dominated by introduced "tame" pasture grasses such as brome, orchard, perennial rye, and timothy. None of these acreages are currently managed to provide short browse for Canada geese, although mowed service roads and winter wheat fields provide some forage. Management emphasis has been to maintain these tame grass areas and to eliminate invasive weeds through application of herbicides, mowing, and hand-pulling/digging. Deer use these areas year-round for browse and cover. Elk browse these grasslands as well as the riparian areas during the winter months. Ecological attributes, indicators, and condition parameters for non-native grasslands and croplands are discussed in Section 4.3 (Waterfowl).

4.4.2 Condition and Trends

Throughout the Kootenai River valley including the Refuge, native grassland plant communities were eliminated. Upland grassland has increased as a habitat type compared to historic conditions due to human modifications of the habitat after refuge establishment (diking, draining, introduction of non-native pasture grasses, and cropping). Currently there are about 516 acres of agricultural grassland habitat on the Refuge. The Refuge currently manages these lands as non-native grasslands with most areas left unmowed as nesting cover for waterfowl and as habitat for grassland-nesting birds such as western meadowlark and savannah sparrow (Table 4.5). However, recent observations indicate that there is limited use by grassland-dependent birds and no use by many grassland species. The present management regime of no or limited "natural" disturbance to these habitats either by mowing or burning, as well as extensive herbicide use for removal of all broad-leafed plants, has left many of these areas lacking in plant, insect and bird diversity. Fescue, big basin wild rye, and tall and intermediate wheatgrass have been successfully established in limited areas but more observations are necessary to evaluate species use. There are two or three small areas of sedge meadows, likely a common habitat type on the Refuge historically, but these have been almost completely replaced by non-native reed canarygrass.

In select areas, habitat conditions may favor restoration of native grassland. Such habitat restoration is expensive and difficult, limiting the size of restored areas. Maintaining small patches of native grassland in a "sea" of non-native grasses is problematic. Approximately 10 acres of non-native grass areas were planted in the fall of 2010 with native grasses including Idaho fescue (*Festuca idahoensis*), big bluegrass (*Poa secunda*), western wheatgrass (*Pascopyrum smithii*), slender wheatgrass (*Elymus trachycaulus*), beardless or bluebunch wheatgrass (*Pseudoroegneria spicata*), and mountain brome (*Bromus marginatus*). Establishing the native grasses was part of a five-year rotation. The rotation by year is as follows: Year 1—summer fallow and fall plant to winter wheat; Year 2—all wheat to mature; Year 3—volunteer wheat; Year 4—barley. In Year 5 (2010) the fields were treated with glyphosate herbicide, tilled in late September using moldboard plowing, disking, cultivating very lightly, packing field twice before planting and possibly again after planting to get good seed to mineral soil contact without burying the seed too deeply; followed by seeding in the dormant stage in early November with an end wheel drill with press wheels (which distributes seed through the small seed box on the drill).

4.4.3 Associated Wildlife

Birds. Based on range maps and web site summaries, about 25 bird species may occur in grassland habitats in northern Idaho (Kaufman 1996, Sibley 2003, www.IdahoBirds.net). Of these, 15 species are grassland dependent breeders. Examples of obligate grassland species include western meadowlark, savannah sparrow, grasshopper sparrow, vesper sparrow, lark sparrow, common nighthawk, western and mountain bluebirds, lazuli bunting, bobolink, horned lark, northern harrier, short-eared owl, long-billed curlew, and killdeer. Many of these species have shown declining trends for decades. However, the savannah sparrow population has shown a recent increasing trend in the Central Rocky Mountain Physiographic Region (Altman 2000) but is declining in many areas of Idaho (Sauer et al. 2008). Many other birds occur in grasslands but are not dependent on this habitat, including predatory birds attracted by rodents (red-tailed hawk, Cooper's hawk, American kestrel, great blue heron, and in winter, rough-legged hawk, and northern shrike); edge species such as song sparrow, eastern kingbird, clay-colored sparrow and open-country aerial foragers including barn swallow, cliff swallow, and tree swallow.

Grassland-associated birds known to occur on the Refuge and use non-native grasslands are western meadowlark, savannah sparrow, vesper sparrow, song sparrow, common nighthawk, mountain bluebird, western bluebird, killdeer, northern harrier, red-tailed hawk, American kestrel, great blue heron, eastern kingbird, barn swallow, cliff swallow, and tree swallow. Of these, only western meadowlark, savannah sparrow, song sparrow, eastern kingbird, northern harrier, red-tailed hawk, barn, cliff, and tree swallow, and killdeer are common breeding species. Although western meadowlark and savannah sparrow breed on the Refuge they are present in relatively low numbers. The swallow species, eastern kingbird, killdeer, and great blue heron are abundant.

Vesper sparrows have been observed on the Refuge and are likely breeding here, but only in very low numbers; they are abundant in nearby Kootenai and Bonner counties. Grasshopper sparrows are present in Sandpoint, Idaho (Bonner County), in Moscow, Idaho (Latah County), and in a few counties in southern Idaho as reported during 2009 and 2010 County Big Year tallies (www.IdahoBirds.net) but are thought to be declining. In 2008 one grasshopper sparrow was observed on Ball Creek Ranch by a Forest Service employee. In 2005 five individuals were observed on the Refuge during a bird survey conducted by the Kootenai Tribe, but none have recently been detected. Breeding of clay-colored sparrows (2-4 pairs) was document in 2008 and 2009 on Ball Creek Ranch (Durbin, pers. comm.). Small breeding populations of bobolink are found in Bonner County in at least four locations. Despite what appears to be suitable habitat, they have rarely been seen on Kootenai NWR. Lazuli buntings are found in Boundary County but very few observations have been reported on the Refuge in recent years: two in 2006, two in 2008, and one in 2010. Western and mountain bluebirds are seen on the Refuge in early spring during migration but no breeding has been observed in recent years (2008-2010) although breeding is recorded in Boundary County. Both short-eared owl and long-billed curlew breed in Boundary County; they are rare and local. Both were breeding on Kootenai NWR historically. Short-eared owls are in serious decline over much of their grassland-dominated range including breeding and wintering habitats (www.pwrc.usgs.gov/BBS, 2010; www.web4.audubon.org/bird/stateofthebirds/grasslands, 2010). One pair of northern harriers was observed in 2008 with three fledglings, and again in 2009 and 2010 with one fledgling. Northern harriers require territories of about 200-600 acres (Limas 2001). In 2009 and 2010 one American kestrel nest was observed. Lark sparrow and horned lark are occasional to rare, and breeding has not been confirmed in either Boundary or Bonner counties.

Mammals. Vagrant shrew (*Sorex vagrans*) and masked shrew (*Sorex cinereus*) have been incidentally captured by Kootenai Tribal biologists in their invertebrate pitfall traps. Field guide range maps indicate that the following species may be present on the Refuge but have not been documented - water shrew, deer mouse, western jumping mouse, meadow vole, montane vole, long-tailed vole, and Richardson's water vole. Specific data on their occurrence are lacking and further work is needed to gather baseline data on small mammals. House mouse, bushy-tailed wood rat, northern pocket gopher, striped skunk, short-tailed and long-tailed weasel, mink, badger, and coyote have all been observed on the Refuge's grassland habitats. Coyotes regularly hunt in the planted grain fields as well as in the non-native grasslands. Non-native grasslands are also used by several ungulates including white-tailed deer, elk, and to a lesser extent mule deer and moose. A large (200+ animals) elk herd grazes in various areas of the Refuge from October through May.

4.4.4 Key Ecological Attributes

Tables 4.4a, b and 4.5 describe key ecological attributes of grasslands and associated indicators. For each indicator, the conditions that would represent "good" or better are shown.

Table 4.4a. Upland (Dry) Prairie Ecological Attributes, Indicators, and Condition Parameters.

Key Ecological Attributes	Indicators	Desired Conditions
Vegetation structure	• Average grass/forb heights • Percent grass/forb cover • Percent woody vegetation cover	• Variable grass heights 6-30 in tall • More than 50% but variable, with areas of bare or sparsely vegetated ground and areas of dense (e.g., more than 80%) grass cover (western meadowlark) • Shrub-tree cover less than 5% • Natural perches 2'-4' tall for singing out territory claims of grassland nesting birds
Native plant composition	• High prevalence of native forbs (asters, cinquefoil, vetch, goldenrod, lupine,	• More than 50% cover

Key Ecological Attributes	Indicators	Desired Conditions
	western blue flag, sticky geranium, prairie smoke) and native grasses such as Canada bluegrass, big bluegrass, western wheatgrass, slender wheatgrass, bluebunch wheatgrass, mountain brome, Idaho fescue	
Invasive species	• Low prevalence of invasive/undesirable non-native grasses (e.g., reed canarygrass), forbs (e.g., Canada thistle, common mullein, houndstongue), and shrubs	• Less than 5% cover
Soils	• Well drained soils	
Disturbance Events	• Fire intensity • Fire return interval • Grazing, mowing • Human disturbance; planned mowing of grasslands to simulate disturbance	• Low • Frequent (2-5 years), after August 1; fire is the preferred tool to maintain this habitat where feasible • No grazing; delay mowing until after August 1 or conduct mowing either in fall or very early spring • Minimize management and recreational activities during the breeding season, April 15-August 1
Patch Size/Connectivity	• Patch size • Contiguous grasslands	• Larger than 25 ac (bobolink, and western meadowlark, savannah sparrow) • Larger than 200-640 ac (western meadowlark, grasshopper sparrow, northern harrier, short-eared owl). Maintain grasslands in greater than 400 acre blocks farther than a quarter mile from human disturbance or recreational activities. Where this is not possible, create the largest contiguous acreage of similar habitat as is possible.

Sources: Dechant et al. 1998, Wiens 1973, Limas 2001.

Table 4.4b. Bottomland (Wet) Prairie Ecological Attributes, Indicators, and Condition Parameters.

Key Ecological Attributes	Indicators	Desired Conditions
Vegetation Structure	• Average grass/forb heights • Percent grass/forb cover • Percent woody vegetation cover	• Short to medium (6-24 inches); mosaic of vegetation heights • More than 50% but variable, with areas of bare or sparsely vegetated ground and areas of dense (more than 80%) grass cover • Less than 5% of shrub-tree cover
Native plant composition	• Native grass and forb species • Native shrub/tree species	• Mix of grasses and forbs including [some sedges, smartweed, largeleaf pondweed) • Scattered shrub component (e.g., snowberry, rose, hawthorn, dogwood, serviceberry, wolf and Scouler's willows, scrub birch, swamp birch, mountain and Sitka alders, pink spiraea, and hemp dogbane)
Invasive species	• Low prevalence of shrubs, dense emergent vegetation (e.g., cattail), and invasive/undesirable non-native grasses (e.g., reed canarygrass) and forbs (e.g., Canada thistle)	• Less than 20% cover
Soils/ Hydrology	• Poorly drained (hydric) soils • Seasonal flooding; water depths range from moist soil to over 39 inches from February/March through at least June	
Disturbance Events	• Fire intensity • Fire return interval • Mowing • Human disturbance	• Low, recommend periodic early spring burning or fall burning/mowing; one disturbance per area every 3-5 years • No mowing in order to protect nests of all ground-nesting species from trampling from April 15-August 1 • Minimize or avoid agricultural field operations, including spraying, mowing, and recreational activities during breeding season; April 15-August 1. Delay mowing/haying until after August 1. • Provide a no activity buffer of more than 400 feet around northern harrier nests
Patch Size/ Connectivity	• Patch size • Contiguity with wetland, wet meadow and grassland	• 200 ac (northern harrier, short-eared owl) • Convert the mosaic of wetland, wet meadow, and grasslands into greater than 200 acre blocks farther than a quarter mile from human disturbance or recreational activities. Where this is not possible, create the largest contiguous acreage of similar habitat possible.

Sources: Bent, A.C. 1968; Dechant, J.A. et al. 1998 (revised 2003) Grasslands. Available URL: http://web4.audubon.org/bird/stateofthebirds/grasslands Accessed on September 14, 2010; Limas, B. 2001; Wiens, J.A. 1973

Table 4.5. Grassland Ecological Attributes, Indicators, and Condition Parameters.

Key Ecological Attributes	Indicators	Desired Conditions
Vegetation structure	• Average grass/forb heights • Shrub cover • Grass/forb cover • Unmanipulated residual cover	• 6-24 inches, mosaic of vegetation heights • Less than 5% • More than 70%, with some areas 90% • More than 60% remaining annually (residual duff is preferred for nesting habitat as long as there is some bare ground providing "runways" to and from nest and as escape routes, as well as providing backdrop for the birds' natural camouflage) • Perches 2'-4' ht. throughout the area
Plant species composition	• High prevalence of desirable native and/or non-native grasses (e.g., species) and native forbs (e.g., milkvetch, lupines, bee balm, campanula) providing diversity of seeds and insect populations	• More than 70% cover
Invasive species	• Low prevalence of invasive species (e.g., Canada thistle, tansy, houndstongue, knapweed, teasel, poison hemlock)	• Less than 5% combined cover
Disturbance Events	• Fire intensity • Fire return interval • Mowing • Human disturbance	• Infrequent • 2-5 years • May be used as management tool after nesting season; no mowing before August 1. • Minimize or avoid agricultural field operations (mowing, tilling, spraying) and recreational activities during breeding season; April 15-August 1.
Patch Size/ Connectivity	• Minimum Patch Size • Connectivity • Contiguity with wetland or native grassland habitat	• 25 - 200 ac, preferably larger • Within or adjacent to croplands or wetlands • Within 200 acre contiguous mosaic of native and non-native grasslands

Sources: Bent, A.C. 1968; Dechant, J.A. et al. 1998 (revised 2003) Grasslands. Available URL: http://web4.audubon.org/bird/stateofthebirds/grasslands Accessed on September 14, 2010. Limas, B. 2001; Ruth, J.M. 2006. Partners in flight–US. Division of Migratory Bird Management Needs Database by KRUSEK. Available URL: http://www.partnersinflight.org Accessed in May 2010; Wiens, J.A. 1973.

4.4.5 Threats

The following threats to grassland habitat are (summarized from Altman and Holmes, 2000):

- Direct habitat loss due to urban, residential, and agricultural development.
- Encroachment by woody plants, thatch accumulation, and increased prevalence of exotic plant species, due to altered fire regimes and intensities.
- Degraded and/or simplified habitat structure due to invasive plant species, which compete with or exclude native plants and alter vegetation structure (e.g., percent cover, vegetation height).
- Loss and/or fragmentation of habitat due to Conversion of agricultural grasslands (e.g., fields dominated by exotic grasses and usually managed for a crop or for grazing) to less suitable or unsuitable agricultural habitats.
- High densities of nest parasites (brown-headed cowbird), exotic nest competitors (European starling), predators (raccoons, coyotes, ravens, crows), and non-native predators (cats), and high levels of human disturbance, due to proximity to agricultural and residential areas. Both brown-headed cowbird and starlings are found on the Refuge; and
- Climate change, which may favor invasion by non-native plant species, alter plant phenology and/or composition of plant communities, alter timing of food availability for nesting and migrating birds, and alter hydrologic and fire regimes.

4.5 Wetlands and Deepwater Habitats

For the purposes of the CCP, wetlands are defined according to the classification system (Cowardin et al. 1979) used by the National Wetlands Inventory (NWI), but the wetlands and deepwater habitat conservation target excludes all riparian habitats which might be included under this classification, that is, those areas dominated by woody perennial shrubs or trees. According to Cowardin et al. (1979) wetlands are 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 for part of most years. A positive indicator of wetland status requires the following: a) hydrophytic plants; b) hydric soils; and c) saturated or flooded soils during part of the growing season. Deepwater habitats are permanently flooded lands lying below the deepwater boundary of wetlands.

The key divisions of the NWI classification relevant to the Refuge include the lacustrine, palustrine, and riverine systems. Lacustrine wetlands are generally permanently flooded and are identified as those areas lacking trees, shrubs, or emergent vegetation with greater than 30 percent coverage and measuring greater than 20 acres. Lacustrine wetlands are broken into 2 sub-systems limnetic and littoral. All refuge lacustrine habitat is littoral which extends from the shoreward boundary of the system to a depth of 2 m (6.6 feet) below low water or to the maximum extent of nonpersistent emergents, if these grow at depths greater than 2 m. Smaller areas can be defined as lacustrine if the water depth in the deepest part of the basin exceeds 6.6 feet at low water. Palustrine areas may or may not be permanently flooded, but they are typically recognized by the presence of trees, shrubs, or herbaceous emergent vegetation.

Under the NWI classification, palustrine wetlands on Kootenai NWR consist of the following classes and water regimes:

Class = Aquatic bed (water regime modifier = permanently flooded)
Class = Aquatic bed (water regime modifier = semipermanently flooded)
Class = Emergent wetland (water regime modifier = semipermanently flooded)
Class = Emergent wetland (water regime modifier = seasonally flooded)
Class = Emergent wetland (water regime modifier = temporarily flooded)

Aquatic bed wetlands are wetlands that are dominated by vegetation that is floating and/or submerged and can be either palustrine or lacustrine; however the Refuge contains only the palustrine type. Emergent wetlands on the Refuge are all palustrine and are dominated by herbaceous emergent vegetation (cattail, bulrush, spikerushes, etc.).

Riverine wetlands consist of all wetlands and deepwater habitats contained within a channel, with the exceptions of wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. Riverine wetlands on the Refuge are all classified in the Upper Perennial subsystem. Upper perennial riverine wetlands are described as high gradient where water velocity is fast and there is little floodplain development.

See the glossary for a complete definition of these three system types according to the NWI.

Wetland units on the Refuge are classified as either permanent, semi-permanent or seasonal depending on the capability to flood, maintain water depths and the ability to drawdown. Active management of water and the creation of pond units on the Refuge have resulted in the distribution and quantities of NWI types on the Refuge. For example, wetland units which have been managed as permanent wetlands typically have >50 percent of its area in lacustrine or permanent palustrine wetlands.

4.5.1. Description and Location

Riverine wetlands

There are 63.8 acres of wetlands classified as riverine. All of this wetland habitat is considered upper perennial with an unconsolidated bottom that is permanently flooded. This wetland type occurs within the channel of Myrtle Creek and Deep Creek. These systems are highly modified by diking and backflow from the Kootenai River.

Permanent Wetlands

Lacustrine wetlands. There are approximately 384 acres of wetlands on the Refuge classified as lacustrine. All are littoral, permanently flooded aquatic bed of either rooted or floating vascular plants. Lacustrine habitats are located within Myrtle Pond, New Pond, Center Pond, Dave's Pond, and Cottonwood Pond. These pond units are managed as permanent wetlands.

Palustrine wetlands. Forty acres of palustrine wetlands are classified as permanent with an aquatic bed of rooted or floating vascular plants wetlands. Pond units with significant acreage of this wetland type include South Pond, Little and Big Blowout, Cascade, and Moose Ponds.

Semi-permanent Wetlands

Palustrine wetlands. There are over 220 acres of semi-permanently flooded emergent wetlands within the Refuge. Nearly all pond units on the Refuge have some area of this emergent wetland type within the impoundment. Ponds with large areas of semi-permanent emergent marsh include Island, Dave's, and Myrtle Pond and Greenhead Marsh. Wetlands with smaller proportions of this NWI type include Snipe, Waterline, and Redhead Ponds and Mallard Marsh, all of which have been managed as semi-permanent wetlands.

Seasonal Wetlands

Palustrine wetlands. There are approximately 500 acres of seasonally or temporarily flooded palustrine emergent wetland within the Refuge. Most of this wetland type occurs in Snipe, Waterline and Redhead Ponds, the West and East Hunt Units, Greenhead and Mallard Marshes, and the southern portion of the Refuge excluding Island Pond. Seasonal wetlands include pond units that have been actively managed for seasonally flooded moist soil habitat and those that have the water depths and basin topography that create conditions for these NWI wetland types. Pond units that have been actively managed for seasonal wetland habitat include Teal, North and South Heron, Wigeon Ponds and Greenhead Marsh and portions of the East and West Hunt Unit.

4.5.2. Condition and Trends

Most of Idaho's 386,000 acres of wetlands are in floodplains and riparian areas along streams and other water bodies. Since about 1860, wetland acreage has decreased by 56 percent as a result of urban and commercial development, agricultural conversion, drainage, and flooding by reservoirs. This has had a significant impact on breeding and migrating waterfowl and other wetlands dependent species throughout the State. The Refuge is situated in the floodplain of Kootenai River Valley which at one time was one of the largest complexes of riverine wetlands in the Pacific Northwest containing over 55,000 of acres of sedge meadows, seasonal, semi-permanent, and permanent wetlands, and willow cottonwood stands. Beginning in the 1920s, approximately 80 miles of levees were constructed on both sides of the Kootenai River from just above the town of Bonners Ferry to the mouth of the River in Kootenay Lake in British Columbia. Between 1920 and 1947, 16 drainage districts were formed and drainage pumps were installed throughout the valley (see section 4.1 of this chapter).

Construction of dams and levees caused several significant changes in wetland habitats along the Kootenai River. Natural fluvial processes that occurred along the river were lost, such as seasonal flooding and scouring that helped maintain river-associated wetlands by setting back succession. The timing of seasonal flows were also severely altered, which prior to the dams, included high water flows during spring and summer and low flows during fall and winter (see chapter 3 and section 4.1 of this chapter). The 20,000 acres of dynamic seasonal and emergent marshes that historically occurred in this broad valley corridor were for the most past replaced by agricultural lands.

The establishment of Kootenai National Wildlife Refuge in 1964 and the development of over 1,200 acres of wetlands restored a portion of this once great wetland resource. With the exception of the 1,200 acre MacArthur Lake established on Deep Creek in 1942 by the Idaho Department of Fish and Game, Kootenai NWR was the only area managed specifically for wetland dependent wildlife in

Kootenai Valley until the 17,000 acre Creston Valley Wildlife Management Area was established in Canada where the Kootenai River enters Kootenay Lake. By the 1970s, over 10,000 acres of wetland habitat were being managed for waterfowl and other wetland dependent species there. More recently (2002) the Nature Conservancy has purchased 2,300 acres of the Kootenai River floodplain just north of the Refuge and has restored 500 acres of wetlands. In 1999, The Idaho Department of Fish and Game purchased the 1,405 acre Boundary Creek Wildlife Management Area and restored 526 acres of wetlands that have been actively managed for wildlife since 2002. These 5 areas now protect over 12,000 acres of wetland habitat.

At the time of establishment there were very few wetlands on the Refuge. Over 90 percent of the floodplain portion of the Refuge was in cropland. Over the next 10 years, through the construction of water delivery ditches, cross diking, water control structures and the placement of pumps in Deep Creek and the Kootenai River, several pond units were created and managed for seasonal, semi-permanent, and permanent wetland habitat (see Chapter 3 and 5 for detailed descriptions of hydrology and the water management system).

Much of this system is beyond its life expectancy and in need of replacement or repair. This has had an impact on the ability to maintain optimum wetland conditions on the Refuge. In addition, the design of the system limits certain management strategies requiring the independent flooding and draining of ponds to manage encroaching emergents and provide moist soil habitat.

4.5.3. Associated Wildlife

Birds. Thousands of waterfowl representing more than 29 species use the Refuge as a stopover site during spring and fall migrations, and to a lesser degree as wintering habitat. Mallards are the principal waterfowl species using the Refuge during these seasons. The bulk of this use occurs on croplands and shallow flooded wetlands primarily in the northern portion of the Refuge. The deeper permanent and semi-permanent wetlands on the west side of Center Ditch and north of Riverside Road are used as foraging and roosting sites for migrating tundra swans and diving ducks. Fifteen species of waterfowl breed on the Refuge. Seasonal and semi-permanent wetlands receive the greatest use by dabbling ducks for pairing and brood rearing. The permanent and semi-permanent wetlands of the Refuge such as Myrtle, Center, New and Dave's Pond are important diving duck pairing and nesting habitat and brood rearing habitat for most of the breeding waterfowl species (For detailed information on waterfowl use of wetlands, see section 4.3 of this chapter).

Refuge wetlands provide both nesting and foraging habitat for a variety of marsh birds such as red-necked and pied-billed grebe, American bittern, American coot, Wilson's snipe, Virginia rail, and sora. Common songbirds breeding in refuge wetlands include marsh wren, common yellowthroat, red-winged blackbird, and yellow-headed blackbird. Refuge wetlands get moderate use by migrating shorebirds most of which occurs form August to September (dunlin, solitary, pectoral, Baird's, western, and least sandpipers; yellowlegs; and long-billed dowitcher). Killdeer, spotted sandpiper, common snipe, and Wilson's phalarope are known breeders on the Refuge. Other common waterbird species that use refuge wetlands primarily for foraging and/or resting include double crested cormorant, great blue heron, American white pelican, ring-billed gull, California gull, and Forster's, common, and black terns. Black terns are also breeders on the Refuge with colonies as large as 50 pairs nesting in refuge wetlands.

Fish. A number of non-native warm-water fish are present in the Refuge's permanent wetlands. Common introduced fishes include largemouth bass (*Micropterus salmoides*), brown bullhead (*Ameiurus nebulosus*), mosquito fish (*Gambusia holbrooki*), pumpkinseed (*Lepomis gibbosus*), and yellow perch (*Perca flavescens*). These fish provide food resources for piscivorous species such as American white pelicans, cormorants, great blue herons, and red-necked grebes as well as mink and river otters. They do, however, forage on invertebrate species, putting them in direct competition with native wildlife. The extent and population size of these species is currently unknown.

Mammals. American beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), mink (*Mustela vison*), and river otter (*Lutra canadensis*) inhabit wetlands on the Refuge. Moose also commonly forage in the wetlands of the Refuge.

Reptiles and amphibians. Species known to occur in suitable habitat include the Columbia spotted frog (*Rana luteiventris*), pacific chorus frog (*Pseudacris regilla*), Western boreal toad (*Bufo boreas*), blotched tiger salamander (*Ambystoma tigrinum*), the long-toed salamander (*Ambystoma macrodactylum*), and the western painted turtle (*Chrysemys picta*). Two other species, the northern leopard frog (*Rana pipiens*) and wood frog (*Rana sylvatica*), are potential breeders based on their range and habitat requirements. There was one report of a wood frog collected in 1972; no other reports of this species have been made. The northern leopard frog was reported as a breeder on the Refuge in early narrative reports, but no recent accounts have been reported. The American bullfrog was also reported on the Refuge periodically up to 1979. From that time forward there have been no reported observations.

Plants. There is a great diversity of plant species found in refuge wetlands. These plants occur in different vegetation zones that are dictated by water depth and the length of time a portion of a wetland basin is flooded. The four major wetland zones are wet meadow, seasonal shallow marsh, semi-permanent emergent marsh, and permanent open water.

Vegetation zones contain unique plant species adapted to the water depths and duration and timing of flooding within each zone (Table 4.6).

Good quantified information on many wetland plant species, but especially submerged plants, is lacking.

Table 4.6. Common Plant Species of the Four Wetland Vegetation Zones of Kootenai NWR Wetlands.

Zone	Plant Species
Wet Meadow	*Carex* spp. (sedges) *Juncus* spp.(rushes) *Phalaris arundinacea* (reed canarygrass) *Echinochloa crus-galli* (barnyard grass)
Seasonal/Shallow Marsh	*Eleocharis* spp. (spike rushes) *Sparganium* sp. (burreeds) *Phalaris arundinacea* (Reed canarygrass) *Beckmannia syzigachne* (American sloughgrass) *Alisma* sp. (waterplantains) *Polygonum* spp. (knotweeds) *Sagittaria* spp. (arrowheads)
Semi-permanent emergent marsh	*Scirpus acutus* (hardstem bulrush) *Typha latifolia* (common cattail) *Ranunculus* sp. (white-water buttercup) *Hippuris vulgaris* (common mare's-tail) *Lemna* spp. (duckweeds)
Permanent open water	*Myriophyllum* spp. (water-milfoils) *Potamogeton* spp. (pondweeds) *Ceratophyllum demersum* (coontail) *Zannichellia palustris* (horned pond weed)

4.5.4. Key Ecological Attributes

Table 4.7. Wetland and Deepwater Ecological Attributes, Indicators, and Condition Parameters.

Key Ecological Attributes	Indicators	Desired Conditions
Water depth and hydroperiod	• Seasonal Wetlands • Semi-permanent Wetlands • Permanent Wetlands	• Water depths in wet meadow, moist soil to 6 inches March-April • Water depths from saturated soil to 12 inches • Water depths 24-30 inches by April 1 and no less than 18 inches through July 30 • Water depths in permanent wetlands 24-36 inches with potentially increased depths in spring due to snowmelt.
Vegetation Diversity, Structure	• Seasonal Wetlands • Semi-permanent Wetlands	• >60% cover of desirable and/or native wetland plants including moist-soil annuals (e.g., smartweeds, wild millet, water plantain); <20% cover of native emergent species (e.g., cattail, hardstem bulrush) that are >5 ft tall. • 30%-70% cover of native emergent species (e.g., cattail, hardstem bulrush, bur-reed) that are >5 ft tall; mosaic of open water and emergent cover; 30%-70% cover of desirable and native wetland plants including moist-soil annuals (e.g., smartweeds, wild millet, water plantain) and submergent plants (e.g., pondweeds);

Key Ecological Attributes	Indicators	Desired Conditions
	• Permanent Wetlands	30%-50% cover of open water with submergent plants (e.g., pondweeds). • >75% cover of open water with native submergent vegetation (e.g., sago pondweed) covering wetland basins during peak water elevations; <25% cover of desirable and native emergent (e.g., hardstem bulrush, cattails) and other wetland plants (e.g., annual moist-soil plants).
Invertebrate diversity	• Macroinvertebrate abundance and diversity	• High; invertebrate diversity will partially be determined by hydroperiod.
Invasive plants/animals	• Low prevalence of exotic vegetation (e.g., reed canarygrass) that forms persistent monocultures	• <30% cover of undesirable/invasive plants including reed canarygrass in seasonal wetlands • <20% cover of undesirable/invasive plants including reed canarygrass in semipermanent wetlands. • <10% cover of invasive plants (e.g., reed canarygrass) in permanent wetlands.

Sources: Conway 1990, Fredrickson 1991, Fredrickson and Reid 1988, Fredrickson and Drobney 1979, Gibbs et al. 1992, Johnson 1984, Johnson and Dinsmore 1986, Johnson and Dinsmore 1985, Krapu and Green 1978, Lokemoen 1966, Low 1945, Melvin and Gibbs 1994, Pospichal and Marshall 1954, Siegfried 1976, Stoudt 1982, Tacha 1975, Walkinshaw 1940.

4.5.5. Threats

Threats to wetland habitats within the Kootenai River floodplain include:

- Lack of overbank flows which historically created thousands of acres of off-channel wetlands, due to dikes and levees on Kootenai River main stem;
- Lack of spring flooding and scouring, reduced flood depth/duration, and limited options for using gravity to drawdown and flood refuge wetlands, due to damming and manipulated river hydrology and a deteriorating and inefficient water delivery system on the Refuge;
- Degraded and/or simplified habitat structure due to invasive species such as reed canarygrass and Eurasian milfoil; and
- Climate change, which may favor invasion by non-native plant and animal species, alter composition of plant communities, alter hydrologic regimes, and cause increased flooding due to rain on snow events (see Chapter 3). Increased flooding, in turn, threatens the Refuge's water management infrastructure.

Alteration of river hydrology and separation of the river from its natural floodplain have removed normal fluvial processes from the Refuge that acted to periodically create and rejuvenate wetlands through flooding, scouring and deposition of sediments and new plant propagules. Without these processes, the Refuge must be intensively managed to create and maintain wetlands through the application and removal of water during specific seasons, hydroperiods, and depths, as well as the mechanical treatment of wetlands, to set-back succession in monotypic stands of persistent emergent plant species.

The current design and condition of the Refuge's water management system limits management of refuge wetlands to meet desired conditions. Many of the Refuge's important water delivery infrastructures need to be replaced. Although several water control structures have been recently replaced many are well beyond their life expectancy. Several dikes that separate pond units are in need of repairs to reduce leakage of impounded water hindering the Refuge's ability to drawdown adjacent units or to main water levels in flooded ponds. Many of the Refuge's pond units cannot be independently filled or drawdown to manage for moist soil habitat or to control expanding stands of cattail, bulrush, and reed canarygrass.

Because of the altered hydrology of the river and the presence of diking separating the Refuge from the river and its tributaries, management of refuge wetlands depends on the ability to divert water from the Kootenai River and tributaries and to return water from the Refuge to these same water courses. The primary method of diversion for fall flooding is the use of electric pumps. These pumps have high operational costs that require a sustained budgetary commitment.

Reed canarygrass, which has invaded and replaced native wetland plant communities with monotypic stands, requires cyclic maintenance. The presence of other exotic wetland species that have the potential to invade the Refuge and replace diverse native communities (including Eurasian milfoil and purple loosestrife) must be monitored and rapidly controlled if located. Exotic animals such as bullfrogs do not currently reside on the Refuge; however their presence needs to be monitored. Invasion of the Refuge could have serious impacts on native amphibian populations, especially northern leopard frogs which seem particularly vulnerable.

4.6 Riparian and Floodplain Forest/Shrub

4.6.1 Description and Location

Riparian areas are one of the most important and diverse ecosystems in the Intermountain West. In addition to their high soil moisture and diversity of vegetation and wildlife, riparian areas perform important ecological functions such as maintaining streambank, channel, and shoreline stability; water temperatures; and water quality. Riparian habitat provides food, cover, water, breeding, calving, and nesting sites for a variety of wildlife species, and serves as a travel corridor for highly mobile species such as grizzly bears (Snyder 2002).

Riparian and floodplain forest habitats on the Refuge occur mainly as clumps in the northwestern corner and in the southern panhandle of the Refuge and as thin stringers along the banks of the Kootenai River, Myrtle Creek, and Deep Creek. This habitat type only composes about 213 acres of the Refuge. Black cottonwood (*Populus trichocarpa*), plains cottonwood (*Populus deltoides*), willow (*Salix* spp.), red-osier dogwood (*Cornus sericea*), alder (*Alnus* spp.), Nootka rose (*Rosa nutkana*), snowberry (*Symphoricarpos albus*), Douglas' (rose) spirea (*Spiraea douglasii*), and red elderberry (*Sambucus racemosa*) are the primary tree and shrub species. Black cottonwood is native, but plains cottonwood was introduced to the area in the early 1900s and now makes up a significant portion of the cottonwood community. Today the understory of riparian communities is dominated by introduced species, including reed canarygrass (*Phalaris arundinacea*) and Kentucky bluegrass (*Poa pratensis*).

Historically, cottonwood trees along this portion of the Kootenai River, Myrtle Creek, and Deep Creek were mixed with mountain alder, western red-cedar and a dense understory of shrubs including willow and red-osier dogwood (Polzin and Rood 2000). Typical mid elevation, low gradient meandering channels in northern Idaho are dominated by Drummond's willow (*Salix drummondiana*) with lesser amounts of Geyer's willow (*S. geyeriana*), Sitka willow (*S. sitchensis* and Bebb's willow (*S. bebbiana*) (Jankovsky-Jones 1997).

Quaking aspen (*Populus tremuloides*) is scattered in moist sites throughout the Refuge, sometimes in conjunction with cottonwood and other times associated with conifers. It is a minor but important component of the bottomland hardwood habitat on the Refuge.

In a few isolated sites where appropriate environmental conditions existed temporarily, cottonwood has sprouted from seed and is establishing new young stands. There cohorts are small, generally less than 1/4 acre. Also scattered throughout the Refuge are very small, isolated clumps of native shrubs including serviceberry and Nootka rose. A few dense thickets of introduced Siberian pea (*Caragana arborescens*) remain to mark the home sites of early settlers. Small patches of native Bebb's willow are also present (Jankovsky-Jones 1997).

The CCP team identified several blocks of riparian/floodplain forest habitat on the Refuge that merit high consideration for conservation and restoration during the life of the CCP. Criteria for consideration included adjacency to other blocks of riparian habitat; being able to establish contiguous riparian corridors; contribution to stream conditions that enhance salmonid habitat; structural condition; size or width; and/or degree of exotic invasion.

4.6.2 Condition and Trends

Prior to 1922 the Kootenai River valley floor in the proximity of the Refuge was described as "a labyrinth of cottonwood trees, lakes, mud, shallow waters, mosquitoes and numerous treed islands" (Boundary County Historical Society 1987 in Jamieson and Braatne 2000). Early accounts include river banks averaging 22 feet above the low water level, indicating natural levees occurred along the main river channel. In form and function this area was probably composed of large seasonal wetlands, sedge meadows, willow communities and cottonwood stands along the natural levees of the river and on alluvial fans of tributary streams (Jamieson and Hennan 1998 in Jamieson and Braatne 2000).

As dikes were constructed and lands drained for agricultural development, the extensive stands of black cottonwood that historically existed in the Kootenai River valley were cleared. Starting in the 1970s, flood control at Libby Dam dramatically altered the annual flow regime of the Kootenai River. River discharge is greatly reduced from historic levels during the spring/summer period of maximum snowmelt runoff, as water is stored in the reservoir for flood control. Discharge is greater than historic levels during the fall/winter/early spring period as stored water is released from the dam (US Army Corps of Engineers 2007). Riparian vegetation such as cottonwood and willow plant communities is dependent upon normal flows and a spring freshet in order to provide the conditions necessary for recruitment. Cottonwood recruitment requires new mineral soil deposited by flooding events for the seeds to germinate and establish themselves (Jamieson and Braatne 2001). From 1975 to 1990, regulated flows at the dam resulted in little cottonwood recruitment in downstream reaches. In addition, fluctuating water levels in the river create alternating aerobic and anaerobic soil conditions in the dikes, leading to heavy erosion, slumping, and undercutting (Snyder 2002). Corps of Engineers recommendations that tree growth on or near levees should be prevented (US Army COE 2006) limits the potential for major riparian restoration along the diked portions of the Kootenai River. An exception to this general trend of low cottonwood recruitment occurred from 1991 to 2000, when spring flow releases focused on promoting the spawning of white sturgeon allowed some new cottonwood stands to establish (Jamieson and Braatne 2001). However, only fragments of the former stands still exist in the lower Kootenai River valley, and most are in a state of senescence and decline due to regulated flows (Snyder 2002). Only scattered remnants of cottonwood remain on the Refuge.

A study examining riparian cottonwood ecosystems in the Kootenai sub-basin (Jamison and Braatne 2001) used aerial photo interpretation to compare the land uses in 1934, 1968 and 1991 along the Kootenai River, including the Deep Creek to Shorty's Island Reach, part of which is adjacent to most of the Refuge. They documented major changes in land uses, primarily a widespread conversion of sedge meadows to cultivated fields, including on what would become the Kootenai NWR. This was made possible by the construction of a diking system along the banks of the Kootenai River by the 1940s, disengaging the historic flood plain from the river and its seasonal inundation of the bottom lands. However, between 1934 and 1968 distribution of cottonwoods on the Refuge was only slightly changed, with trees found mostly along the Kootenai River levee on the north end of the Refuge and the confluence of Myrtle Creek and the Kootenai River. By 1991 the Refuge had been established and much of the cultivated lands converted to wetlands. Cottonwoods still existed in relatively the same areas and number. What is significant is the paucity of immature cottonwoods shown on the 1991 cottonwood distribution maps, indicating very little cottonwood reproduction which is necessary to replace old trees as they die. Nine mature trees were cored during this study and ages ranged from 22 to 55 years (average 33.1) (Jamieson and Braatne 2001).

Most cottonwood stands on the Refuge are second growth following clearing. Cottonwoods on the Refuge exhibit poor sexual reproduction due to the dike and upstream dam operations moderating the dynamic changes that occur in natural fluvial systems and reducing or eliminated disturbances like seasonal flooding. As a result, cottonwoods on the Refuge exist mainly as older, even-aged stands, many that predate the construction of Libby Dam. The exceptions are those rare scattered young cohorts that have established themselves through some circumstance providing a suitable seed bed at the correct time for seed establishment. These opportunities were probably the result of serendipitous timing of agriculture tilling coincident with cottonwood seed dispersal. However, mature cottonwoods can be stimulated to produce by asexual means including suckering. For example, cottonwoods can be recruited following a soil disturbance like disking associated with a wetland restoration project.

The Refuge has undertaken a number of riparian restoration projects over the last 10 years. The purposes of these projects have included stream bank stabilization, increased woody riparian cover, and plant species diversification. Sapling-sized aspen trees were planted in both upland and riparian areas. Many of the trees were damaged or killed by ungulate rubbing and browsing before they were protected with fencing. Some of these trees are still alive but fail to thrive. Aspen trees and native shrubs were planted along the lower portions of Myrtle Creek, but spring and summer flooding by the Kootenai River backing up the creek killed them through inundation. An attempt to stabilize about 1000 feet along Deep Creek by re-grading the banks, installing soil stabilization materials, and planting with native shrubs, resulted in limited success. Most recently, cohorts of seedling and sapling sized volunteer cottonwoods have been protected from ungulate browsing using plastic fencing fabric. The protected saplings exhibit more growth and vigor than the unprotected saplings, so this technique may be useful in similar situations.

4.6.3 Associated Wildlife

"Riparian zones are the 'hotspots' of biological diversity" (Johnson and O'Neil 2001), and form "…the bridge between the aquatic environment and the upland habitats" (Knutson and Naef 1997). Aspen and cottonwood are an important component of the forest environment both as pure stands interspersed throughout the landscape and as individual or small groups of trees within coniferous forests (Jamieson et. 2001). Hardwood stands have several attributes important to wildlife, including:

- Exceptionally high biomass production in the early years of stand development that is used as forage by ungulates and other browsers;
- A relatively short life span, providing vertical structure, cavity sites, snags, and down wood more quickly than conifers;
- Greater susceptibility to heartwood rot at a younger age than conifers, and thus providing for earlier cavity creation;
- More cavity creation in live trees compared to conifers;
- Greater susceptibility to insect herbivory, thus supporting larger insect populations than conifers;
- Greater palatability than conifers, and are used by a range of herbivorous insects and mammalian browsers; and
- A more productive shrub layer and herb layer than generally occurs under conifers, thus increasing the complexity and diversity of wildlife habitat provided.

As a result, hardwoods are used by or benefit a wide range of wildlife species (Jamieson et al. 2001).

Shrub habitat, whether associated with a riparian zone, under the canopy cover of taller trees, or existing in a meadow providing vertical structure and concealment, provides essential food and cover for a wide variety of aquatic and terrestrial wildlife.

Birds. Riparian areas are disproportionately important to bird species (Johnson and O'Neil 2001). The Idaho Partners in Flight Bird Conservation Plan (IPFBCP) identified 114 bird species using riparian habitat in Idaho, with 61 species using it as primary habitat, of which 13 are high priority species (Ritter 2000). Riparian habitat is a high priority for management for other reasons including the total number of species that rely on this habitat, the naturally small amount of the habitat that occurs in Idaho and the West, losses of riparian habitat in both quantity and quality, and current and future threats (Ritter 2000). Cottonwood forests provide multiple vegetation layers, and ideally include various seral stages resulting from natural disturbances such as floods. These systems will support species that nest in the canopy, cavities, young tree layer, and understory shrubs and on the ground. Several species are canopy feeders, some forage on bark and branches, and others forage in the shrubs, grasses, or bare ground. Some species require large patches of forest while others prefer edges or small patches.

Although over 30 bird species breed in aspen forests in Idaho, no bird species occurs only in aspen. However, some species are greatly attracted to aspen for at least part of the year. Aspen provides a deciduous component within a predominately coniferous forest type, increasing plant and animal diversity. They are especially important for cavity nesters due to their susceptibility to heart rot, and 13 species listed in the IPFBCP associated with aspen are cavity nesters.

Riparian shrub habitat tends to have higher avian density than the surrounding uplands. Shrubs supply structural support for nests, territorial singing perches, large invertebrate populations for insectivorous birds, flowers for humming birds and willow sap for sapsuckers and other species (Ritter 2000).

The following 10 species are considered by Ritter (2000) and Altman (2000) to be focal species (those species highly associated with important attributes within each habitat and used to represent highly functioning ecosystems) for riparian woodland and shrub habitat in Idaho and Washington (Table 4.8).

Table 4.8. Focal Species for Riparian Woodland and Shrub Habitat in Idaho.

Habitat Type	Habitat Attribute	Species
Riparian Shrub	large patches of dense shrubs	Willow flycatcher
	dense shrub layer, proximity to flowering plants	Calliope hummingbird
	dense shrub layer	Yellow Warbler
Riparian Woodland	deciduous forest with dense understory	Veery
	open tree canopy, dense shrubs, grass understory	Song sparrow
	mature cottonwoods or aspen, snags, berry producing shrubs	Red-naped sapsucker
	large cottonwoods, high canopy closure	Red-eyed vireo
	large cottonwood snags, dense shrub cover	Lewis' woodpecker
	large trees with cavities, near water	Wood duck
	aspen	Ruffed grouse

Bird use of this habitat type is not documented for the Refuge. The following birds were heard or observed during a survey conducted on July 11, 2008 in riparian shrub habitat adjacent to Deep Creek. This habitat is representative of that found throughout the Refuge.

Song sparrow	Willow flycatcher	Red-eyed vireo
Northern flicker	Cedar waxwing	Mourning dove
Spotted sandpiper	Gray catbird	Ring-neck pheasant
Canada goose	Great blue heron	Common yellowthroat
Hairy woodpecker	Chipping sparrow	Eastern kingbird
Swainson's thrush	Yellow warbler	Tree swallow
American kestrel	American robin	

The Refuge lacks bird survey data associated with the riparian woodland habitat type represented by the cottonwood groves.

Mammals. Many mammals use cottonwood and aspen forests and riparian shrubs during at least part of their lives. The presence of water and abundance of food, moist microclimate, abundant edge habit, and dense cover provide resources to support a high abundance and diversity of small mammals (Knutson and Naef 1997). With the exception of the beaver, relatively few are obligate inhabitants of either riparian shrub land or flood plain forest, but several derive at least a part of their existence in these habitats.

Riparian areas are of primary importance to bats. Riparian and aquatic habitat provides an essential source of drinking water and abundant insect populations that attract bats. Riparian habitat also supports the large deciduous trees often used as roosting sites.

River otter and mink are closely associated with riparian habitat, while other carnivores like raccoon, bobcats, and weasels exhibit some preference for riparian areas. Carnivore presence in riparian areas is largely due to the abundance of prey, but because most carnivores are also omnivorous, plant material including berries and other fruits produced by riparian shrubs complement their diet.

Riparian habitat provides essential habitat for most ungulates. Deer, elk, and moose use riparian areas for food, cover, travel routes, and water to varying degrees depending on the season. They also use the cottonwood groves for browse and summer thermal cover.

Reptiles, amphibians, and fish. Riparian areas, especially hardwood stands, support increased amphibian and reptile richness. These areas are also important to fish by modifying water temperatures and providing a source for terrestrial invertebrates as food. The large cottonwoods the fall into streams provide fish cover and can influence river flow to develop pools.

4.6.4 Key Ecological Attributes

Table 4.9. Riparian Scrub/Shrub Ecological Attributes, Indicators, and Condition Parameters.

Key Ecological Attributes	Indicators	Desired Conditions
Vegetation structure and cover	• Tree canopy closure • Shrub layer cover • Openings • Patch size	• Less than 30% • 40%-80%, >3 feet high • Scattered openings with herbaceous vegetation • Great than 35 ft^2
Native plant composition	• Trees • Shrubs • Herbaceous vegetation	• Less than 30% cottonwood canopy cover • 40%-80% shrub layer cover of red-osier dogwood, willow, snowberry, rose (Douglas') spirea, serviceberry, red elderberry, Indian-plum, cascara, rose • Native species with abundant flowering plants
Disturbance Events	• Parasitism, fire, flood	• Maintain cowbird parasitism below 10% by providing habitat >0.6 mi for residences and >3 miles from high-use cowbird area
Patch Size	• Patch size	• >5 acres but preferably >20 acres

Source: Altman 2000, Ritter 2000.

Table 4.10. Floodplain Forest Canopy and Understory Ecological Attributes, Indicators, and Condition Parameters.

Key Ecological Attributes	Indicators	Desired Conditions
Vegetation	• Canopy closure	• >60% (red-eyed vireo); 10%-40% (Lewis'

Key Ecological Attributes	Indicators	Desired Conditions
structure and cover	• Understory (shrub layer) cover • Snags • Age classes	woodpecker) • >10% should be young cottonwoods (red-eyed vireo); 30%-80% (Lewis' woodpecker); dense contiguous understory of native vegetation with >40% shrub cover (veery) • >0.8/acre >16 in dbh (Lewis' woodpecker) • >0.8/acre >21 inches dbh; especially cottonwood trees (Lewis' woodpecker); mature forest or a mix of early successional and older forest; distinct open canopy, mature trees, recruitment trees, and some snags
Disturbance Events	• Public use • Parasitism	• Prohibit public use in key areas (e.g., heron rookeries, raptor nests) during breeding season • Maintain cowbird parasitism below 10% by providing habitat >0.6 mi for residences and >3 miles from high-use cowbird area
Patch Size/ Connectivity	• Patch size	• Riparian zone of mature deciduous trees >160 feet wide (red-eyed vireo); riparian zone >100 feet wide with unbroken tracts >1/8 mile long (veery)

Source: Altman 2000, Ritter 2000.

Table 4.11. Aspen Forest Ecological Attributes, Indicators, and Condition Parameters.

Key Ecological Attributes	Indicators	Desired Conditions
Vegetation structure and cover	• Mean canopy closure • Dominant tree heights • Age classes • Snags • Vertical structural complexity	• 30%-70% • >1.5 trees/acre >39 feet tall and 10 inches dbh • >10% cover of saplings for replacement • >1.5/acre and 10 inches dbh • Adequate representation of younger seral stages
Disturbance Events	• Management activities	• Where ecologically appropriate at the landscape level, initiate actions in to maintain or provide some areas with natural (e.g., fire) or mechanical disturbance to ensure proper successional development
Patch Size/ Connectivity	• Contiguity	• Either clumped with patches and openings or relatively evenly spaced

Source: Altman 2000

4.6.5 Threats

The primary threats to riparian and floodplain forests are a nonfunctioning floodplain, combined with intensive development of the floodplain. Historically, flooding was the primary natural disturbance regime in Kootenai River bottomlands. Overbank flooding occurred annually in spring, and major spring floods occurred at longer intervals. Floodwaters scoured some areas, creating bare soil suitable for recruitment of black cottonwood, and deposited sediment in other areas. This dynamic system created a patchy mosaic of late- and early successional shrub and forest habitat. Hydropower operations have changed the hydrograph of the Kootenai River so that major spring floods no longer occur, and dikes and levees have nearly eliminated overbank flows. Other threats include grazing, invasive species that compete with native plants and bind soil, habitat fragmentation, and proximity to sources of predators and nest competitors. The following threats to riparian and floodplain forest are adapted from Altman 2000 and Ritter 2000:

- Direct habitat loss due to clearing for farmland and urban development;
- Habitat alteration from (1) hydrological diversions and control of natural flooding regimes (e.g., dams) resulting in reduction of overall area of riparian habitat, loss of vertical stratification in riparian vegetation, and lack of recruitment of young cottonwoods, willows, etc.; and (2) stream bank stabilization (e.g., riprap) which narrows stream channel, reduces the flood zone, and reduces extent of riparian vegetation habitat;
- Invasive exotic plants such as reed canarygrass which compete with or completely exclude native understory plants and reduce recruitment of canopy tree saplings;
- Habitat degradation from overgrazing which can widen channels, raise water temperatures, reduce understory cover, and lead to exotic species replacing native understory vegetation;
- Fragmentation and loss of large tracts necessary for area-sensitive species such as yellow-billed cuckoo;
- Reductions in riparian corridor width which decreases suitability of the habitat for some species and may increase encroachment of nest predators and nest parasites to the interior of the stand;
- Proximity to agricultural and residential areas, may have high density of nest parasites (brown-headed cowbird), exotic nest competitors (European starling), and domestic predators (cats), and be subject to high levels of human disturbance;
- Recreational disturbances, particularly during nesting season of sensitive species such as great blue herons and some raptors; and
- Increased use of pesticides and herbicides associated with agricultural practices, which may reduce insect food base for many landbirds; and
- Climate change, which may favor invasion by non-native plant species, alter plant phenology and/or composition of plant communities, alter timing of food availability for nesting and migrating birds, and alter hydrologic and fire regimes.

4.7 Coniferous Forests

4.7.1. Description and Location

About 418 acres of coniferous forest habitat lay along the western edge of the Refuge. There are two discrete parcels. The narrow, linear north parcel is about 2 miles long, extending from the edge of the county road up the steep slope westward for an average of about 500 feet. Cascade Creek earns its epithet as it races down this wooded slope on its journey to Myrtle Creek.

The southern tract is an irregular rectangle bounded on the east by Lions Den Road and extending westward to the Forest Service boundary about 2000 feet west, gaining about 400 feet of elevation.

This parcel includes an intermittent creek and several northeast running toe slopes. Coniferous forest types by acreage are shown in Table 4.12.

Table 4.12. Coniferous forest types on Kootenai NWR.
(Source: LANDFIRE database.)

		Acres	Existing Vegetation (NVCS)	SAF_SRM
Mesic				
		53.8	Middle Rocky Mountain Montane Douglas-fir Forest and Woodland	SAF 210: Interior Douglas-Fir
		146.5	Pseudotsuga menziesii Forest Alliance	SAF 210: Interior Douglas-Fir
		159.2	Northern Rocky Mountain Mesic Montane Mixed Conifer Forest	SAF 213: Grand Fir
	Total	359.5		
Dry		13.3	Northern Rocky Mountain Ponderosa Pine Woodland and Savanna	SAF 237: Interior Ponderosa Pine
		45.3	Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest	SAF 210: Interior Douglas-Fir
	Total	58.6		

The majority of the conifer forest is of the mesic (moderate moisture) ecological type dominated by Douglas-fir. The remaining 14 percent of the forest was classified as dry forest, characterized by the presence of ponderosa pine along with Douglas-fir and a mix of other conifers. This is a relatively small, but ecological important, component of the Refuge's forested habitat.

A reconnaissance with limited sampling indicated a forested area fairly typical of North Idaho mixed mesic type in a cove situation. It is a very well developed stand of second growth timber as evidenced by the stumps and partially brushed in roads. It displays distinct mature, old growth forest characteristics such as a high closed canopy with a mostly clear understory, many large decadent stems, and a wide variety of species dominated by Douglas-fir and ponderosa pine. The "corduroy" terrain found on the southern parcel creates a series of aspects that vary from relatively dry, open areas with ponderosa pine to coves of colder, wetter sites dominated by western red cedar (Fowler pers. comm.).

Douglas-fir is the most common species found in both the dry and moist sites. The Douglas-fir tends to wetter sites, and is liberally associated with birch, western red cedar, and grand fir. Some firs have reached impressive size with one cored sample being 76 years old, 28" dbh, and 97' tall. Western larch, western hemlock, and grand fir are common in these stands. Ponderosa pine dominates the drier ridges and aspects with flat or southerly exposures. It was the second most common species enumerated on the reconnaissance; encountered about 50 percent less often than Douglas-fir did in sample plots. Sizes varied, with a large specimen sampled being 101 years old, 26" dbh and 116' tall.

Large cottonwoods are found along the streams in the lower elevations along with some aspen. Shrubs include mountain maple, snowberry, ocean spray and nine bark. A few lodgepole pine and western white pine were also encountered during the field reconnaissance.

Because of the high canopy, mostly clear understory, and large trees with varying degrees of rot, breakage, fire scars, and other decadent characteristics, both forest types provide good diversity and high appeal for wildlife of all types from insects to birds and amphibians to mammals.

4.7.2. Condition and Trends

Fire and logging are the two greatest impacts on the coniferous forest habitat found on the Refuge. Fire regime information was gleaned from the USDA Forest Service publication Fire Ecology of the Forest Habitat Types of Northern Idaho (Smith and Fischer 1997). This publication classifies habitat and community types into "fire groups." A fire group is a cluster of habitat types within a given geographical area; all habitat types in a fire group have similar presettlement fire regimes, similar response of dominant tree species to fire and similar successional patterns. Portions of the Refuge's coniferous forest seem to fit three different Fire Groups.

Fire Group One is characterized by warm, dry Douglas-fir and ponderosa pine habitat types. Proportionally this is a small component of the Refuge's coniferous habitat, probably accounting for less than 5 percent. Mature stands are dominated by large, old ponderosa pine, as can be found on the Refuge. Grasses and low shrubs dominate the understory, so fuel loadings are light. In the past these forest types were characterized by frequent underburns that controlled tree regeneration, thinned young stands, and perpetuated open stands dominated by ponderosa pine. Mean fire interval was about 15 years. However these parameters may not hold true in the small stands this forest type occupies in this area. Fire exclusion has altered this fire regime, resulting in conditions favoring denser stands favoring Douglas-fir. Prescribed fire might be used to help restore the dry ponderosa pine characteristics, but would be difficult to execute do to the topography and the limited size of these stands.

Fire Group Two: warm, dry to moderate Douglas-fir, grand fir and ponderous pine habitat types, often supporting dense layer of tall shrubs, while canopy layers can often exceed 50 percent. This type is often found on southeast or southwest slopes, evident on the Refuge. Fuel loadings tend to be higher than in fire group one types and fires of low or mixed severity occurred at relatively short intervals of less than 25 years.

Fire Group Seven: moderate and moist grand fir habitat types. It covers large areas in northern Idaho and is ecologically and floristically rich. Grand fir is the climax species, with Douglas-fir the most important seral species. Quaking aspen, paper birch, and black cottonwood are seral on some sites. This is the forest type found in the moist, north facing coves found on the area. Ponderosa pine is a minor seral tree, but can influence stand structure and composition for several centuries due to its longevity.

Fire group seven stands are some of the most productive forest in northern Idaho, and also tend to produce heavy fuels as well. The fire group also displays the most variable fire regime in northern Idaho; average intervals between stand replacement fires range from about 120 to 200 years. Fire can be used in this forest type to reduce fuel loadings and continuity, enhance wildlife habitat and favor seral trees.

In 2003 a lightning strike ignited the 3000 acre Myrtle Creek fire on USDA Forest Service property adjacent to the Refuge. About 20 acres of the Refuge were involved in the fire. The results of this fire demonstrate the potential effect of a similar fire on Refuge's coniferous forest habitat.

Past logging activity is evidenced by the presence of old stumps and traces of logging roads traversing the slope. When logging occurred is not known, but it was several decades in the past. Regrowth has produced merchantable timber on this parcel.

4.7.3. Associated Wildlife

Breeding bird inventories were conducted in the Refuge's coniferous forest habitat in 2008 and 2010; results are displayed in the following table.

Table 4.13. Bird Species Heard or Observed in Coniferous Forest Habitat on the Kootenai NWR in July 2008 and June and July 2010.

Cooper's Hawk	Winter wren	Yellow-rumped warbler
Ruffed grouse	Golden-crowned kinglet	Townsend's warbler
Hairy wood pecker	Townsend's solitaire	MacGillivray's warbler
Dusky flycatcher	Swainson's thrush	Western tanager
Cassin's vireo	American robin	Chipping sparrow
Common raven	Orange-crowned warbler	Dark-eyed junco
Black-capped chickadee	Nashville warbler	Red crossbill
Red-breasted nuthatch	Yellow warbler	

While not a totally inclusive list of all the potential avian species expected to be found in that habitat type, the list indicates a diversity of species occurring on the Refuge's coniferous forest.

Large mammals observed in the area include white-tailed deer, elk, moose, black bear, and cougar.

No small mammal, reptile, amphibian, or invertebrate surveys have been conducted on this portion of the Refuge. The Idaho GAP analysis predicts which species will occur in this part of Idaho. The information is compiled in Appendix E, Potential Resources of Concern table.

The Partners in Flight Conservation Strategy for Landbirds in the Northern Rocky Mountains of Eastern Oregon and Washington (Altman 2000) describes specific habitat attributes useful for describing the structure and condition of habitat in these broad forest types. Although it does not specifically address northern Idaho, this conservation strategy was used instead the Idaho Partners in Flight Idaho Bird Conservation Plan (Ritter 2000) because the Eastern Washington and Oregon plan described the same physiographic area containing the Kootenai National Wildlife Refuge and the same habitat types as those found in northern Idaho. The eastern Oregon and Washington plan provided specific desired habitat descriptions useful for this document.

4.7.4. Key Ecological Attributes

The desired condition of the mesic mixed conifer (late-successional) forest is a multi-layered old forest with a diversity of structural elements (for example snags, dense shrub patches, high canopy closure) in patches across the landscape.

Table 4.14. Mixed Moist Forest Ecological Attributes, Indicators, and Condition Parameters.

Key Ecological Attributes	Indicators	Desired Conditions
Vegetation structure	• Canopy cover • Subcanopy cover • Snags • Age classes • Vertical structural complexity	• Greater than 50% • Greater than 25% cover deciduous vegetative cover for a dense leaf litter cover • Snags >27" dbh and >80 feet tall and in different stages of decay. • Mix of mature forest and openings/edges in earlier successional stages • Multi-layered forests; well developed understory of shrubs and small trees
Native plant composition	• Canopy tree species • Shrub species	• Mixed conifers, e.g., Douglas-fir, ponderosa pine, grand fir, western larch. • Native species including ocean-spray, ninebark, mountain maple, snowberry
Patch Size	• Patch size	• >100 ac
Disturbance Events	• Fire • Public use Grazing • Management activities	• Infrequent. In event of, maintain >40% of post-fire landscape as unsalvaged; in salvage, remove <50% of dead and down; retain all trees and snags >20" dbh and >40% 12"-20" dbh. • Low impact recreational activities that are not likely to adversely affect wildlife • None • No thinning/brush removal during nesting season

Source: Altman 2000.

The desired condition in dry forest is a large tree, single-layers canopy with an open, park-like understory dominated by herbaceous cover with scatted shrub cover and pine regeneration (Altman 2000).

Table 4.15. Dry Forest Ecological Attributes, Indicators, and Condition Parameters.

Key Ecological Attributes	Indicators	Desired Conditions
Vegetation structure	• Canopy cover • Snags • Age classes • Vertical structural complexity	• 10%-40% • 10 snags/100 ac >12" dbh and >6 ft tall: >8 trees/ac >21" dbh • 10 trees/ac of ponderosa pine. Trees should be as large a dbh as possible, preferably >21", yet maintain a range of diameters to allow for replacement. • Single layer forest with park-like understory

Key Ecological Attributes	Indicators	Desired Conditions
Native plant composition	• Canopy tree species • Subcanopy tree species • Shrub species • Ground cover species	• 10%-40% canopy cover of ponderosa pine with some Douglas-fir • Limited pine regeneration • Ceanothus, ninebark, snowberry • Pine grass, Idaho fescue, and blue bunch wheat grass
Patch Size	• Patch size	• >35 acres
Disturbance Events	• Fire • Public use • Grazing • Management activities	• Potentially frequent. In event of fire, maintain >50% of post-fire landscape as unsalvaged: in salvage, retain all trees/snags >20" dbh and >50% of those 12"-20"; salvage <50% of dead and down; in old forest, >13% shrub cover and ~24 snags/ac >9" dbh • Low impact recreational activities that are not likely to adversely affect wildlife • None • No thinning/brush removal during nesting season

Source: Altman 2000.

4.7.5. Threats

Mixed mesic conifer forest. There is an estimated 6 million acres of this habitat type in Idaho (Ritter 2000). It is well represented on other public lands surrounding the Refuge. However, much low-elevation coniferous forest in the Idaho panhandle has been lost or greatly altered due to extensive logging. Forest practices that truncated succession at rotation age (40-70 years) have resulted in a landscape dominated by early and mid-successional forests, with limited amounts of late-successional forests containing older, large diameter trees and snags. Fragmentation of remaining tracts negatively impacts species with large habitat requirements (Altman 2000).

There is a high risk of losing the remaining older mixed mesic conifer overstories to stand replacing fires due to high fuel loads in densely stocked understories. Also, the invasion of exotic plants has altered understory conditions and resulted in increase fuel loads.

Dry forest. The most significant threat to dry forest (Ponderosa pine) communities is habitat loss and degradation due to a significant change in historical fire regime (Ritter 2000). Dry forests were formerly maintained by fires of various frequencies which maintained open canopy conditions, and increased establishment and survival of ponderosa pine saplings. Over the past 100 years, fire suppression has led to increased canopy closure and reduced ponderosa recruitment. Fire suppression has created conditions where fires are more severe when they do occur. Fire suppression has also caused declines in characteristic herbaceous and shrub under stories from increased density of small shade-tolerant trees. This increases the risk of loss of the remaining ponderosa pine overstory from stand-replacing fires due to high fuel loads in densely stocked understories.

Other perturbations including logging have contributed to the loss of old forest stages and large diameter trees and snags. The invasion of exotic plants has also contributed to the alteration of understory conditions and an increase in fuel loadings.

Current estimates indicate greater than 75 percent of the historical old growth ponderosa pine ecosystems have been lost across the Interior Columbia River Basin landscape (USFS and USBLM 1997 *in* Ritter 2000). How much of this loss has in occurred in Idaho is unknown, but dry ponderosa pine forests in Idaho represent a significant amount of that existing worldwide (Ritter 2000).

Climate change is exacerbating risk of stand-replacing fires throughout the western United States in all forest types, but the risk is particularly severe in dry forest types. Earlier timing of snowmelt has been associated with increased frequency of wildfire in western forests since the mid-1980s. An earlier melt results in areas drying earlier and prolongs the fire season (Westerling et al. 2006). Higher summer temperatures and earlier spring snowmelt are expected to further increase the risk of forest fires in the Pacific Northwest by increasing summer moisture deficits (Karl et al. 2009). A warming climate, combined with a history of fire suppression and other forest management practices that have increased fuel loads over the past century, point to increasing fire intensity and frequency in western forests. It is expected that global warming will cause insect outbreaks to become more common and widespread. Drought and hot, dry weather have already led to an increase in insect outbreaks in the Columbia Basin, especially outbreaks of mountain pine beetle (ISAB 2007) (see Chapter 3).

4.8 Instream Habitat

4.8.1 Description and Location

Surface water resources on or adjacent to the Kootenai National Wildlife Refuge include the Kootenai River, Deep Creek, Myrtle Creek, and Cascade Creek. The physical characteristics, hydrology, and water quality of these rivers and streams are described in Chapter 3; a summary follows.

The Kootenai River forms the northeastern and eastern boundaries of the Refuge for approximately 3.7 miles. The Refuge currently owns two pumps which are situated on the river and has water rights to divert water from the river for wetland management (see Chapter 3, section 3.3.3). Deep Creek flows north from McArthur Lake, which was created in 1944 via an earthen dam, and enters the Kootenai River approximately three miles downstream of Bonners Ferry (approx 14.7 river miles). The lower 2.3 miles of Deep Creek forms the Refuge's southeastern boundary.

Myrtle Creek, a tributary of the Kootenai River that originates in the Selkirk Range, enters the Refuge below Myrtle Falls, and flows approximately 4 miles through the Refuge's west side, to its confluence with the Kootenai River. Land ownership in the Myrtle Creek watershed above the falls is primarily the U.S. Forest Service and a private timber company. The upper reach extends from the base of the falls downstream for approximately 0.47 miles, just downstream from the point where the stream flows under Westside Road. This reach is relatively narrow, high gradient, with a boulder and rubble substrate, and considerable woody debris. The middle reach is wider, shallower, and lower-gradient, with a predominately smaller rubble, gravel, and coarse sand substrate and relatively little woody debris. The lower, or floodplain, reach of the stream, between Westside Road and the

Refuge's Myrtle Creek dike, runs from its confluence with the Kootenai River, upstream about 1.6 miles. This reach is heavily influenced by the Kootenai River, and is almost completely inundated during periods of high flows. The lower reach is much wider than the middle reach, with low to non-existent stream gradient, and a primarily sand and silt substrate. Due to periodic inundation, riparian vegetation is set back from the creek banks and therefore, this stretch receives little shade.

Cascade Creek is a small tributary of Myrtle Creek that flows northeasterly out of the Selkirk Mountains and into the northwestern corner of the Refuge, flowing under Westside Road via two large culverts. The upper reach of Cascade Creek occurs within the Kaniksu National Forest. As the creek flows in a southeasterly direction, it crosses onto land owned by the Bureau of Land Management and then onto private property before entering the Refuge at its western boundary.

4.8.2 Condition and Trends

Altered flows of the Kootenai River, coupled with diking that separates the river and its tributaries from their natural floodplains, have had a profound effect upon both natural processes and the natural resources of the area, particularly fisheries. These two factors have also imposed major constraints on water and habitat management on the Refuge. During the periods of high water in the Kootenai River, typically in the spring, a "backwater" effect occurs in the diked tributaries (Deep Creek and Myrtle Creek), raising water levels in the lower portions of the creeks unnaturally, and causing bank erosion and siltation. The backwaters extend approximately 1.6 miles upstream of Myrtle Creek's confluence with the Kootenai River, and 1.5 miles upstream of Deep Creek's confluence with the river, and the backwaters make it difficult to conduct drawdowns of the Refuge's wetlands.

Deep Creek

Deep Creek is 303(d) listed for both sediment and temperature (see Chapter 3). Residential development and stream bank erosion (nonpoint sources) were identified as the largest sources of sediment (DEQ 2006). The presence of McArthur Lake, created in 1944 when an earthen dam was constructed to impound Deep Creek, affects the creek's water temperatures due to increased surface area. However, loss of forest cover is considered to be the major cause of temperature impairment. The floodplain portion of Deep Creek once supported a black cottonwood gallery forest with deciduous shrubs (e.g., willow) and occasional conifers (e.g., Douglas fir). The lower portion of Deep Creek is diked and supports narrow stringers of remnant cottonwood gallery forest. Backwaters of the Kootenai River have made the channel of the bottomland reach much wider than it was historically. The bankfull width is 60 m at the mouth of Deep Creek, whereas the estimated natural channel width is 23-25 m. The periodic inundation creates a varial zone where it is impossible for riparian vegetation to become established, thereby reducing shade and increasing water temperatures (DEQ 2006). Photos of Deep Creek taken in 2010 depict the effect of high water from the Kootenai River, post–Libby Dam (Figure 4.21).

Figure 4.21. Deep Creek, May 11 2010 (left) and June 11, 2010 (right).
(Jan Rose/USFWS.)

Myrtle Creek

Myrtle Creek, from its source to its mouth, is 303(d) listed for temperature (see Chapter 3). Myrtle Creek has been negatively impacted by dike construction in the 1920s; diversion and straightening of the lower 1.6 miles of the creek after about 1940, eliminating its natural floodplain; and altered hydrology of the Kootenai River. The Myrtle Creek dike (upon which the western side of the Auto Tour Route now exists) constricts high flows coming from the upper reaches, typically during the spring snowmelt. During periods of higher flow in the Kootenai River, the river "backs up" into the Myrtle Creek channel and this section of the stream becomes almost completely inundated. As is the case with Deep Creek, backwaters create a varial zone where riparian vegetation cannot become established. The lower reach of Myrtle Creek receives heavy siltation since the tributary is incapable of carrying its bedload down to the river. Sediments now lay on top of historically prime salmonid (bull trout) spawning habitat.

After the backwater recedes, the creek attempts to correct its meander pattern. During periods of extremely low flow in the Kootenai River, sand bars form at the mouth of Myrtle Creek, creating a barrier to burbot which historically spawned at the mouth. While Canada geese tend to favor the newly exposed mudflats (pointbars) in the summer, the silted portion of the creek does not provide suitable salmonid habitat which historically existed.

Past logging, road construction, and the 2003 fire have affected this watershed. The Myrtle Creek drainage has approximately 2.6 miles of road per square mile of area and the frequency of road crossings (over the creek) was estimated to be 0.8 miles per square mile of area (Kruse 2005).

Despite the issues with the lower reach of Myrtle Creek, habitat conditions in the middle and upper reaches remain good. Turbidity measurements have dropped significantly since the early 1960s, as logging activity in the upper watershed has decreased. Following the Myrtle Creek wildfire of 2003, a heavy rain event in July 2004 resulted in an excessive amount of suspended solids and sediment moving down to the floodplain below the falls. However the effects of this event on water quality were short-lived and pH had returned to normal by December (Kruse 2005; see chapter 3).

A biological assessment of the creek in 2004-5 found a high percentage of insectivorous cyprinids (e.g., redside shiner), indicating a good quality of invertebrate food sources. The relative weights of the rainbow trout captured indicated good to excellent health conditions (Kruse 2005).

Macroinvertebrates, collected in October 2004, had higher densities in the lower floodplain zone as opposed to the upper transition zone. The taxa richness was generally higher in the transition zone, indicating the presence of an adequate habitat and food source necessary to support diverse macroinvertebrate populations. Periphyton and phytoplankton samples exhibited excellent species diversity. Diatom species richness was relatively high. "Diatom production is usually high in small tributary streams and, in the case of Myrtle Creek, can be a primary food source to the Kootenai River system" (Kruse 2005). The zooplankton taxa richness was relatively low but was considered to be normal since Myrtle Creek lacks input from lakes or slack waters which are naturally higher in zooplankton productivity. Nutrient and chlorophyll concentrations were relatively low but were comparable to those found in Trout, Parker, and Long Canyon Creeks (other westside tributaries to the Kootenai River). Nutrient and chlorophyll input could be increased by recovering kokanee spawning in Myrtle Creek since kokanee carcasses have been shown to be a dominant source of particulate organic carbon in low gradient stream reaches (Kruse 2005).

Kruse concluded that "Myrtle Creek appears to contain a moderately healthy aquatic ecosystem. The health of the ecosystem is indicated by the presence of sensitive species such as bull trout and sculpin, good quality macroinvertebrate and periphyton metrics and overall high species diversity. However, improvements can be made to the instream and riparian habitat of Myrtle Creek to further improve production and functionality of the stream."

Cascade Creek

West of Westside Road, Cascade Creek is stable as evidenced by its pristine narrow, high gradient, forested riparian habitat. On the east side of the road, a Porta-Plank system (a water-control box with interlocking aluminum "planks" driven into the ground, and the spillway bolted into place) was installed in 1966. This diversion was installed so that the marsh area in the northwest corner of the Refuge (Cottonwood Pond) could be maintained as a permanent pond (1966 Refuge Narrative Report). Unfortunately, high water events coupled with the diversion created a braided reach from the diversion down to where Cascade Creek empties into Myrtle Creek.

4.8.3 Associated Wildlife

Six native salmonid species occur in the Lower Kootenai River Subbasin: bull trout (S*alvelinus confluentus*), westslope cutthroat trout (*Oncorhynchus clarkii lewisi*), redband rainbow trout (*Oncorhynchus mykiss ssp.*), kokanee salmon (*Oncorhynchus nerka*), pygmy whitefish (*Prosopium coulterii*), and mountain whitefish (*Prosopium williamsoni*) (DEQ 2006). The Lower Subbasin is also home to the endangered Kootenai River white sturgeon (*Acipenser transmontanus*) as well as Idaho's only population of the native burbot (*Lota lota*).

A biological assessment of Myrtle Creek in 2004-5 documented nine fish species: bull trout, rainbow trout, non-native brook trout, sculpin (*Cottus* sp.), longnose dace (*Rhinichthys cataractae*), mountain whitefish, longnose sucker (*Catostomus catostomus*), redside shiner (*Richardsonius balteatus*), and westslope cutthroat x rainbow trout hybrids (Kruse 2005). A preliminary inventory and assessment of the Refuge's aquatic resources and habitats on Kootenai NWR was conducted July 6-10, 2009 by the Service's Idaho Fishery Resource Office (FRO). Due to time constraints, sampling was only conducted on Myrtle Creek, Cascade Creek, Big Blowout Pond, and Little Blowout Pond. Fish populations in Myrtle Creek were assessed by using DC backpack electro-fishing equipment in the upper and middle sections. The lower section of the creek was sampled using a 15-m fish seine and a 10-mm mesh net. While no fish were caught in the lower reach of Myrtle Creek, the upper and middle reaches did contain sculpin, longnose dace, northern pikeminnow (*Ptychocheilus oregonensis*), rainbow trout, rainbow x cutthroat hybrids, bull trout, brook trout, and a brook trout x bull trout hybrid. Since no bull trout spawning has been documented in Myrtle Creek it is likely that the hybrids originated elsewhere and were using Myrtle Creek as rearing or feeding habitat. Species found in Cascade Creek included rainbow trout and hybridized hatchery stock that included genetic markers for cutthroat and coastal rainbow trout (Matthew Campbell, personal communication).

The Idaho Department of Fish and Game stocked 2,368 cutthroat trout fry in Myrtle Creek in 1974, and approx 21,000 cutthroat and 25,000 bull trout fry in Cascade Creek in 1968 and 1971. Between 1968 and 1979, a total of approximately 60,000 catchable-size rainbow trout (origin unspecified) were stocked in Deep Creek. However, the largest single stocking event in Deep Creek was a release of 41,728 non-native brook trout fry in June 1978. 2,588 fingerling brook trout were released in 1968, 4,950 fingerling brook trout in 1969, and 3,105 cutthroat trout fry in 1972. No stocking was done between 1979 and 1988, and only a small number of catchable-size Mt. Lassen rainbow trout (originating from California) were stocked in 1988 and 1989 (1,200 total) (IDFG, Fish Stocking Information, http://fishandgame.idaho.gov/apps/stocking/).

DNA analysis of 10 rainbow trout collected in Cascade Creek in 2010 was conducted by the IDFG's Eagle Fish Genetics Lab to determine if rainbow trout in Cascade Creek were of native or hatchery origin, and if hybridization with other species had occurred. Of the 10 samples screened, 5 were identified as >F1 hybrids of rainbow and cutthroat trout. Each sample identified as a hybrid only contained one cutthroat trout allele out of the 16 alleles examined (indicative of multiple generation backcross hybrids). The remaining samples had genotypes indicative of pure O. mykiss (homozygous for rainbow trout alleles at all loci). However, "cutthroat" alleles could be present at low frequencies and missed due to sampling error. The presence of cutthroat trout alleles at low frequency suggests that the cutthroat trout planted in 1968 and 1971 crossed with the native redband trout but that further hybridization has not occurred. The samples were also screened with assays that yield diagnostic allele frequency differences between native redband trout and "coastal" hatchery rainbow trout. Although the sample size is very low, initial results indicated that trout collected in Cascade Creek exhibit allele frequencies that are more similar to native reference redband trout populations than reference hatchery rainbow trout populations (Matthew Campbell, IDFG Eagle Fish Genetics Lab, pers. comm. April 17, 2011).

Bull Trout

Bull trout, which are federally listed as threatened, have been documented in the Kootenai River, Deep Creek, and Myrtle Creek. A survey conducted in September 2004 documented the presence of bull trout in Myrtle Creek (Kruse 2005). The most recent survey, conducted on the Refuge's upper and middle reaches of Myrtle Creek in July 2009, confirmed the presence of bull trout (2 fish) in Myrtle Creek, as well as a brook x bull trout hybrid which was captured in the middle reach (USFWS, Idaho Fisheries Resource Office, 2010). Bull trout require cold water habitat and have much more specific habitat requirements than other salmonids (see section 4.8.4 for key habitat attributes).

The Columbia River population of bull trout was listed as threatened by the U.S. Fish and Wildlife Service on June 10, 1998. While the historic distribution of bull trout is relatively intact, its abundance in portions of the watershed has been reduced with the remaining populations fragmented. In 2010, the Service revised the designation of critical habitat for bull trout. Under the final rule (50 CFR Part 17) which became effective on November 17, 2010, Deep Creek and Myrtle Creek were included in the list of water bodies designated as critical habitat for bull trout. The Service defines critical habitat as the specific areas within the geographical area occupied by a federally listed species at the time it is listed, on which are found those physical or biological features essential to the conservation of the species and which may require special management considerations or protection.

According to the final rule, the "decline of the bull trout is primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, impoundments, dams, water diversions, and the introduction of non-native species" (USFWS 2010). Climate change may exacerbate some of the impacts particularly since bull trout are critically dependent upon large patches of suitably cold water habitat.

Believed to be a glacial relict, there are two distinct life-history strategies, migratory and resident, which occur throughout the bull trout's range. Stream-resident (fluvial) bull trout complete their entire life cycle in the tributaries where they spawn and rear, whereas migratory (adfluvial) bull trout spawn in tributary streams. The juveniles usually rear in natal streams from one to four years before migrating downstream to either a large river or lake where they spend their adult life, returning to the tributary to spawn. Resident and migratory forms are believed to exist together (50 CFR Part 17). Bull trout spawn from August through November. Eggs may hatch in winter or early spring but the alevins may stay in the gravel for an extended period after their yolks are absorbed. The bull trout's growth, maturation, and longevity vary with the environment but their first spawning typically occurs after age four. Bull trout may live 10 or more years (USFWS 1998).

Kokanee

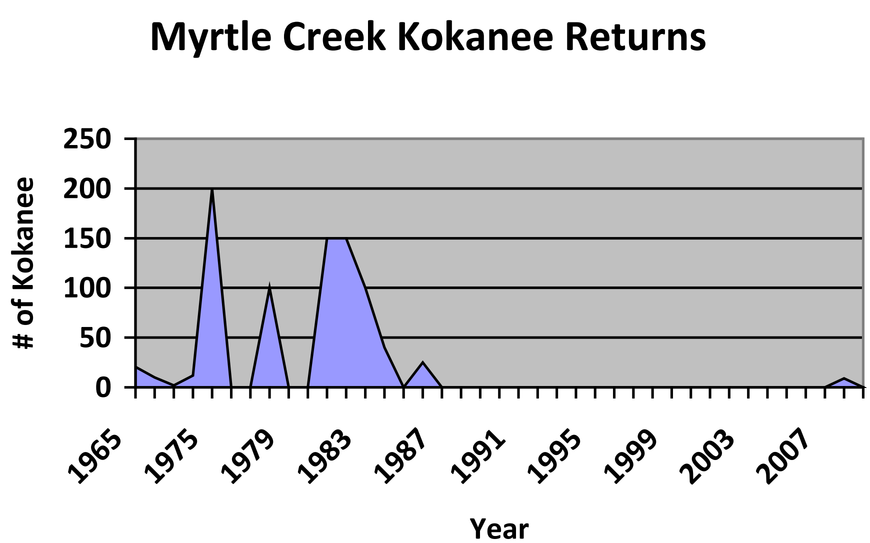
Kokanee are considered the biological engines of most lake and river ecosystems in the Pacific Northwest, and species such as sturgeon, bull trout, burbot, and rainbow trout are highly dependent upon them as forage (Ireland 2007). Kokanee runs into North Idaho tributaries of the Kootenai River which once numbered into the thousands up to the 1980s have declined so dramatically during the past several decades that they are now considered to be "functionally extinct" (Ireland 2007).

Historically, kokanee in the Kootenai River basin have been isolated for the past 10,000 years due to a natural barrier located on the lower Kootenai River approximately 20 km from its confluence with the Columbia River. Kokanee which historically spawned in Idaho's lower Kootenai River tributaries matured in the South Arm of Kootenay Lake in British Columbia (Ireland 1982). Kokanee normally become sexually mature at four years of age and prefer to spawn in gravel bars in streams but may spawn in gravel along lake shores if unsuitable stream spawning areas are unavailable (Simpson and Wallace 1982). As the time for spawning draws near, kokanee move from the deep cool areas of the lake into tributary streams. Once spawning has been completed, all adult fish die, providing nutrients to stream systems as well as food for many wildlife species.

Until the late 1980s, small spawning runs of kokanee occurred in Myrtle Creek. In most years since 1965, runs of 20-40 fish were observed. However numbers could fluctuate dramatically from year to year; for example in 1976 no kokanee were observed, while in 1975 200 fish were documented (Kootenai NWR Annual Narrative Report, 1976). During the years when kokanee returns were non-existent, it was attributed to low streamflow (drought). In 1983 the Idaho Department of Fish and Game instituted a regulation change to restrict the taking of kokanee from the river in order to protect spawning runs (Kootenai NWR Annual Narrative 1983).

In an effort to restore kokanee populations in the lower Kootenai River ecosystem, the Kootenai Tribe of Idaho (KTOI) has been collecting data in six lower Kootenai River tributaries, including Myrtle Creek. In 1997, in partnership with the BC Ministry of Environment, Land, and Parks, the Idaho Department of Fish and Game, and the U.S. Fish and Wildlife Service, KTOI began reintroducing kokanee into the westside tributaries of the Kootenai River by placing disease-free eyed kokanee eggs into westside tributaries using instream incubation techniques (Ireland 2007). Kokanee eggs were planted in Myrtle Creek in the fall of 2003, 2004, and 2005. In late August/early September of 2008, nine adult kokanee were observed in Myrtle Creek (on the Refuge) near a prime gravel bed. However, no kokanee returned in 2009 or 2010. Kokanee returns to Myrtle Creek since 1965 are shown in Table 4.16 below.

Table 4.16. Kokanee Returns to Kootenai NWR, 1965-2010.
(Source: Refuge annual narrative reports)



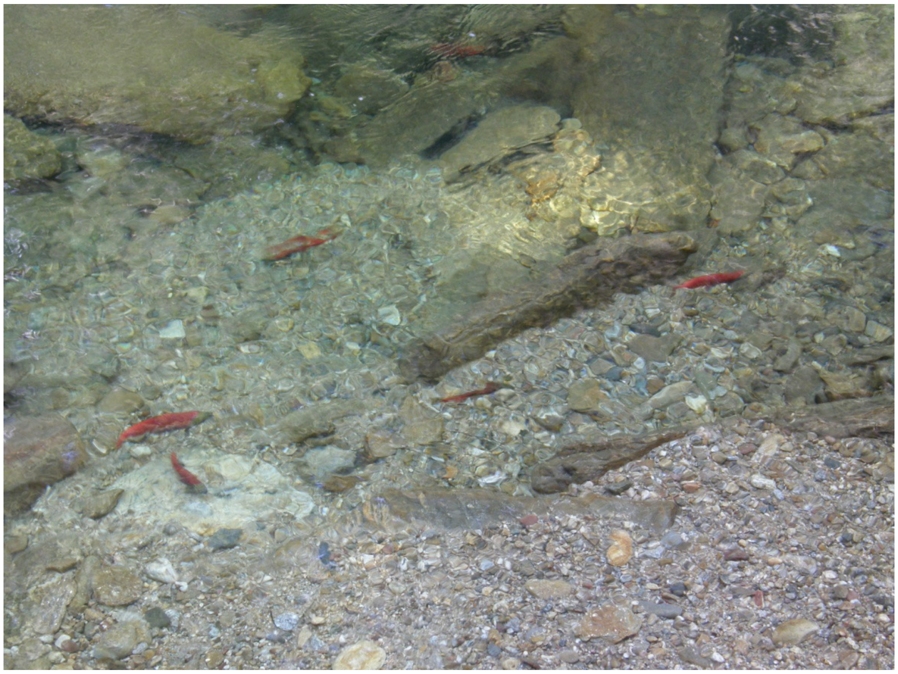


Figure 4.22. Adult kokanee preparing to spawn in Myrtle Creek just below the Refuge's bridge (Sept. 2008).
(D. Ellis/USFWS)

4.8.4 Key Ecological Attributes

Intact riparian forest and total forest cover within watersheds are the most critical factors contributing to the quality of instream habitat, both in terms of water quality and habitat structure. Research in the Pacific Northwest has shown that when forest cover declines below approximately 65 percent, watershed forming processes become degraded (Booth and Jackson 1997). These include reduced riparian shade, less delivery of woody debris to streams, increased storm water runoff, and increased fine sediment delivery. Riparian forest prevents erosion, keeping sediment loads in streams low; provides shade thereby reducing water temperatures in summer; provides a food source for aquatic invertebrates; and is a source of large woody debris. Large woody debris plays an important role in aquatic ecosystems by creating deep, low-velocity pools, providing fish cover, and trapping spawning gravel.

Key water quality attributes for fish and other aquatic life include water temperature, dissolved oxygen, sediment, pH, water hardness, and nutrients. These are discussed in detail in Chapter 3, section 3.9.1. Bull trout have much more specific habitat requirements than most other salmonids, and are critically dependent upon large patches of suitably cold water habitat. Habitat characteristics such as water temperature, stream size, substrate composition, cover, and hydraulic complexity are associated with the bull trout's distribution and abundance (USFWS 1998). Table 4.17 provides details on the habitat conditions necessary to support bull trout populations.

Table 4.17. Instream Ecological Attributes, Indicators, and Condition Parameters Necessary to Support Bull Trout Life Cycles.
(Adapted from USFWS 1998.)

Key Ecological Attributes	Desired Conditions ("adequate function" for habitat criteria, USFWS 1998)
Water Quality	
Water temperature	7 day average maximum temperature in a reach during the following life history stages: [1, 2] • incubation 2°C-5°C • rearing 4°C-12°C • spawning 4°C- 9°C also temperatures do not exceed 15°C in areas used by adults during the local spawning migration
Sediment	Similar to Chinook salmon [1]: for example (e.g.): <12% fines (<0.85 mm) in gravel[3]
Chemical contaminants/nutrients	Low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303(d) designated reaches[6]
Habitat Access	
Physical Barriers	Any man-made barriers present in watershed allow upstream and downstream fish passage at all flows.
Habitat Structure	
Large woody debris	Large woody debris: current values are being maintained at greater than 20 pieces/mile >12" diameter >35 ft length (East-side)[7]; also adequate sources of woody debris are available for both long- and short-term recruitment.
Pool Frequency, Quality	Pool frequency in a reach closely approximates [4]: Wetted width (ft) #pools/mile 0-5 39 5-10 60 10-15 48 15-20 39 20-30 23 30-35 18 35-40 10 40-65 9 65-100 4 • Also, pools have good cover and cool water[3], and only minor reduction of pool volume by fine sediment • Each reach has many large pools >1 meter deep[3]
Off-Channel Habitat	Watershed has many ponds, oxbows, backwaters, and other off-channel areas with cover; and side-channels are low energy areas[3]
Refugia	Habitats capable of supporting strong and significant populations are protected and are well distributed and connected for all life stages and forms of the species [8, 9]
Channel condition and dynamics	
Wetted Width/ Maximum Depth Ratio in scour pools in a reach	≤10[4, 5]

Key Ecological Attributes	Desired Conditions ("adequate function" for habitat criteria, USFWS 1998)
Streambank Condition	>80% of any stream reach has ≥90% stability[4]
Floodplain Connectivity	Off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation and succession
Flow/Hydrology	
Change in Peak/ Base Flows	Watershed hydrograph indicates peak flow, base flow and flow timing characteristics comparable to an undisturbed watershed of similar size, geology and geography
Increase in Drainage Network	Zero or minimum increases in active channel length correlated with human caused disturbance
Watershed conditions	
Road Density and Location	$<1 mi/mi^2$ [9]
Disturbance History	<15% ECA of entire watershed with no concentration of disturbance in unstable or potentially unstable areas, and/or refugia, and/or riparian area; and for NWFP area there is an additional criteria of ≥15% LSOG in watersheds[10]
Riparian Conservation Areas	the riparian conservation areas provide adequate shade, large woody debris recruitment, and habitat protection and connectivity in subwatersheds, and buffers or includes known refugia for sensitive aquatic species (>80% intact), and adequately buffer impacts on rangelands: percent similarity of riparian vegetation to the potential natural community/composition >50%[11]
Disturbance Regime	Environmental disturbance is short lived; predictable hydrograph, high quality habitat and watershed complexity providing refuge and rearing space for all life stages or multiple life-history forms. [1]

Sources:

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4.8.5 Threats

The most significant external factors impacting Kootenai River basin fish and wildlife resources come from the main stem Columbia River Federal hydropower operations, which profoundly influence dam operations as far upstream as headwater reservoirs. Dam operations affect environmental conditions in the reservoirs upstream and rivers downstream from Libby Dam. The abundance, productivity, and diversity of fish and wildlife species inhabiting the subbasin are dependent on their immediate environment that ebbs and flows with river management" (DEQ 2006). Dam operations control not only flow, but sediment, thermal, and nutrient regimes of the river, which in turn affects native fish and wildlife populations. Power generation requirements, flood control, or fish flows create unnaturally high flows during the summer and winter. Flow fluctuations create a wide varial zone in the river which can become biologically unproductive. The varial zone is the zone of periodically inundated waters; community structure can deviate dramatically from the structure of permanently inundated river bottom (River Continuum Concepts 2010). Flow fluctuations also lead to sediments being deposited atop river cobbles. Prior to construction of dams, these sediments typically were deposited in floodplain zones which provided seedbeds for establishment of riparian species such as willow and cottonwoods (DEQ 2006). Cottonwood stand replacement is needed to replace decadent mature stands as well as those trees lost to human and beaver activity. The presence of riparian vegetation is essential to healthy riverine ecosystems.

The ISAB's analysis of the effects of temperature increases associated with climate change suggests that 2 to 7 percent of current trout habitat in the Pacific Northwest will be unsuitable for these fishes by 2030, 5 to 20 percent by 2060 and 8 to 33 percent by 2090 (ISAB 2007). Because bull trout require cold, headwater streams for spawning, a warming climate is highly likely to disproportionately impact this species. Warming associated with climate change would probably lead to smaller and more isolated habitat patches for this species. Warming also could lead to loss of populations (i.e., local extinctions) that is disproportionate or accelerated relative to the simple loss of watershed area (Rieman et al. 2007).

In addition, local watershed activities have had negative effects on fish and wildlife habitat. Construction of levees and the conversion of the natural floodplain for farming, removal of riparian vegetation and bank armoring, past logging practices, transportation corridor construction, and backwater influence from Kootenay Lake and the Corra Linn dam (KTOI 2009) have led to:

- Forest clearing and road building, leading to flashier runoff;
- Loss of riparian vegetation due to human activities or overgrazing livestock, leading to high summer water temperatures and low dissolved oxygen;
- Land clearing, failure to adhere to best management practices (BMP) during logging activities on private land, past construction of logging roads on unstable soils (fracturing, slides, blown culverts), leading to increased sediment in streams; and
- Toxic substances (e.g., pesticides, heavy metals) from mining and agricultural activities.

Natural erosion processes known to occur in the Lower Kootenai and Moyie River Subbasins and include hillside creep, mass failure, and surface erosion due to the gently to moderately sloping glaciated land derived from granitics (DEQ 2006). Human activities can easily exacerbate erosion and sediments entering water channels. Increases in fine sediment in streams decreases the survival of salmonid eggs and alevins, reduces stream productivity and ultimately food availability, and decreases the size and depth of pools, important rearing and adult holding areas for salmonids (WDFW 2000). Other threats to instream habitat are barriers to upstream spawning and rearing habitats, reduced structural complexity of habitat (due to channel straightening and lack of large woody debris), and the presence of non-native fish.

While wildfires are normally considered to contribute to significant short-term sedimentation into streams, some USFS hydrologists and soil scientist believe that “historic, large stand replacing fires on the west side of the basin may not have greatly led to accelerated surface erosion because of the volcanic ash cap below the organic duff layer” (DEQ 2006). The porous ash cap allows rapid water infiltration into the shallow groundwater stratum whereby intense fires produce a glaze on top of the cap and create a hydrophobic condition. While this accelerates water runoff in addition to the loss of tree canopy caused by the wildfire, it does not create a pronounced surface erosion scouring effect (DEQ 2006).

Threats to specific species include:

Kokanee. Kokanee declines in North Idaho tributaries of the Kootenai River have been attributed to: altered habitat conditions in Kootenay Lake; construction of Duncan Dam in 1967 and Libby Dam in 1972 which reduced the nutrient loading to Kootenay Lake and caused a decline in phytoplankton and zooplankton which kokanee depend upon; and degraded tributary spawning habitat (Ireland 2007).

Bull trout. Libby Dam has been identified as one of the most important factors affecting bull trout populations in the Kootenai River Recovery Unit since the dam effectively severed the bull trout’s migratory corridor and altered the natural flows, water temperatures, and water quality parameters (USFWS 2002). The extensive diking for agriculture has altered the natural pattern and flow regime of the valley bottom streams. These changes to the habitat have also led to the chronic reproductive failure of the Kootenai River white sturgeon and burbot (see section 4.9 below.)

According to the Kootenai River basin’s TMDL, the instream and aerial water temperature data reflect temperatures which exceed the criteria for bull trout and salmonid spawning throughout the basin. Higher order tributaries in the basin exceed the cold water aquatic life temperature criteria as well. “The limited distribution of bull trout in the basin may reflect the insufficient availability of cold water necessary to support bull trout requisites for fall spawning and summer rearing” (DEQ 2006). Climate change is likely to further reduce the amount of suitable habitat for bull trout (Rieman et al. 2007).

The bull trout’s 2002 Draft Recovery Plan identifies forestry practices as a high risk since forestry is the dominant land use in the basin and virtually all drainages supporting bull trout in the Kootenai River are managed timberlands. While current forestry practices have improved over the years, the existing road system, mixed land ownership, lingering results of prior activities, and the inconsistent application of best management practices still occur (USFWS 2002). Other threats to bull trout populations include illegal harvest, the introduction of non-native species, an increasing number of anglers, and misidentification by anglers. The brook trout (*Salvelinus fontinalis*), which is native to the eastern United States, has been “extensively planted” in Idaho (Simpson and Wallace 1982), including Deep Creek, and occurs throughout the drainage. Brook trout not only compete with bull trout for forage and spawning habitat but also pose a threat of hybridization. Higher water temperatures increased the competitive advantage or brook trout over bull trout (McMahon et al. 2007). Angler misidentification and incidental take due to hooking mortality also pose a growing concern.

4.9 Threatened, Endangered, and Sensitive Species

4.9.1. Federally Listed Species Known to Occur on the Refuge

One goal of the Refuge System is "To conserve, restore where appropriate, and enhance all species of fish, wildlife, and plants that are endangered or threatened with becoming endangered." In the policy clarifying the mission of the Refuge System, it is stated "We protect and manage candidate and proposed species to enhance their status and help preclude the need for listing." In accordance with this policy, the CCP team considered species with Federal status, and other special status species, in the planning process. Table 4.18 lists special status species that are known to occur on, or probably historically occupied, the Refuge.

Table 4.18. Special Status Species Known to Occur or Likely to Have Historically Occurred on Kootenai National Wildlife Refuge.

Species	Federal	State	Current Occurrence on Refuge
Bald eagle (*Haliaeetus leucpcphalus*)	Delisted	Threatened	Nesting
American peregrine falcon (*Falco peregrinus*)	Delisted	Threatened	Occasional
Canada lynx (*Lynx canadensis*)	Threatened	Threatened	None
Grizzly bear (*Ursus arctos horribilis*)	Threatened	Threatened	None
Selkirk Mountain caribou (*Rangifer tarandus caribou*)	Endangered	Threatened	None
Bull trout (*Salvelinus confluentus*	Threatened	Threatened	Yes
Kootenai River white sturgeon (*Acipenser transmontanus*)	Endangered	Endangered	Adjacent
Burbot (*Lota lota*)	None	Endangered	Potential

Source: http://fishandgame.idaho.gov/cms/tech/CDC/cwcs_pdf/appendix%20b.pdf

4.9.2. Condition and Trends of Federally and State Listed Species and Habitats Utilized on the Refuge

Birds. The bald eagle was delisted from Federal threatened status by the U.S. Fish and Wildlife Service in 2007, but is still classified as threatened by the Idaho Department of Fish and Game (IDFG). Eagles have successfully nested on the Refuge for several years in large cottonwood trees. Eagles forage in the refuge wetlands, Myrtle and Deep Creeks, and the Kootenai River.

The peregrine falcon was delisted from threatened status by the U.S. Fish and Wildlife Service in 1999. It remains listed as a threatened species in by Idaho Fish and Game. Falcons have been sighted on the Refuge. The Refuge provides foraging opportunities due to abundant waterfowl populations but there are no other suitable habitat components (e.g., nest habitat) on the Refuge.

Mammals. While no Federal or State listed mammals inhabit the Refuge, the Refuge lies within the historic range of three federally listed species: grizzly bear (T), woodland caribou (E), and Canada lynx (T).

The northern Rocky Mountain population of the gray wolf (including Idaho) was delisted in 2009, and wolves in Idaho were to be managed under a State management plan as game animals. However wolves were placed back on the Endangered Species list in August 2010 as the result of legal action. In April 2011, gray wolves were removed from the Federal endangered species list through Congressional action. Wolves have been reported in the proximity but there are no confirmed sightings on the Refuge. Such a wide ranging species has the potential to occur on the Refuge for brief periods while hunting. However the relatively small area of the Refuge makes it very unlikely that wolves would spend any significant amount of time there.

The Refuge lies within the Selkirk Recovery Zone for grizzlies (U.S. Fish and Wildlife Service 1993). There have been no confirmed sightings on the Refuge, but grizzlies are a wide-ranging species and there is a slight possibility that a transient bear could wander onto the Refuge. The small area of the Refuge and the high level of human activity on and around the Refuge would probably discourage grizzlies from staying long.

Woodland caribou were sighted on the Refuge once over 20 years ago. These animals had recently been translocated and were likely wandering around trying to reorient to new surroundings. Caribou in Idaho historically occurred as far south as the Salmon River, but since the 1960s have been restricted to the Selkirk Mountains of northeastern Washington, northern Idaho and southeastern British Columbia. Their habitat requirements tend heavily toward high elevation mature to old growth forest; conditions that do not exist on the Refuge (U.S. Fish and Wildlife Service 1993).

Canada lynx are strongly associated with higher elevation boreal forest where they are closely linked with a single prey item, the snowshoe hare. The U.S. Fish and Wildlife Service have not issued a formal recovery plan for this species, but critical habitat was designated in November, 2006 and revised in February 2009 (U.S. Fish and Wildlife Service 2009). The revised document designated critical habitat in the northeastern portion of Boundary County, but did not include the Refuge. The lack of suitable habitat precludes other than the possibility of a very occasional transient lynx from occurring on the Refuge.

Fish. Bull trout occur in the main stem of the Kootenai River and in Myrtle Creek. Bull trout on the Refuge belong to the Lower Kootenai River subpopulation, downstream of Kootenai Falls through Idaho to the United States/Canada border. Adult bull trout appear to be well distributed throughout the Kootenai River in Idaho, but at very low densities (USFWS 2002). Extensive fish population sampling has found no indication of reproducing local populations of bull trout in any Idaho tributaries (PBTTAT 1998). The harvest of bull trout is no longer legal in the Kootenai River drainage in the United States. For a detailed discussion of the relationship of this species to refuge management, see section 4.8.3 above.

Kootenai River White Sturgeon

Kootenai River white sturgeon are known to migrate in the Kootenai River past the Refuge, but surveys have not indicated any use of refuge waters. The Kootenai River population of white sturgeon was listed as endangered by the U.S. Fish and Wildlife Service on September 6, 1994. The Kootenai River population, one of several land-locked populations of white sturgeon found in the Pacific Northwest, inhabits and migrates freely in the Kootenai River from Kootenai Falls in Montana downstream to the Kootenay Lake in British Columbia. The Kootenai river population became isolated from other white sturgeon in the Columbia River basin during the last glacial age, approximately 10,000 years ago. Once the population was isolated, it adapted to the predevelopment conditions which existed in the Kootenai River drainage (USFWS 1999).

Prior to development, the floodplain ecosystem of the Kootenai River was characterized by seasonal floods that promoted the exchange of nutrients and organisms in a mosaic of habitats, and thus enhanced biological productivity. Historically, spring runoff in the river between Libby Dam and Bonners Ferry peaked in May, and in early June upstream of the dam. Combined flows often exceeded 60,000 cfs and then declined to 4,000 to 8,000 cfs for the remainder of the year. The annual flushing events created a clean cobble substrate conducive to insect production and sturgeon egg incubation. The side channels and deltaic marsh lands that provided productive, low velocity backwater areas and nutrients in the river were unimpeded (USFWS 1999). One historical account of fishing for sturgeon in the Kootenai River describes how telephone wire with a huge hook was baited with large chunks of meat. Once caught, the huge fish would have to be retrieved with a team of horses or tractor (Fig. 4.24 below).

Human modification of the Kootenai River white sturgeon's habitat changed the river's biological productivity and natural hydrograph thus altering the sturgeon's spawning, egg incubation, and rearing habitats (USFWS 1999). These factors have contributed to the sturgeon's lack of recruitment since the mid-1960s.

Figure 4.23. Bill Krause with large Kootenai River white sturgeon, circa 1940.
(Photo courtesy Seymour Levy, Kootenai NWR archives.)

Burbot

The burbot (*Lota lota*), referred to as the "ling" or "ling cod" is the only freshwater member of the cod family and in Idaho can only be found in the Kootenai River system (Simpson and Wallace 1982). Burbot are known to migrate in the Kootenai River past the Refuge, but surveys have not indicated any use of refuge waters. However, up until the 1960s, burbot were harvested from the mouths of Deep Creek and Myrtle Creek as well as other westside tributaries to the Kootenai River (Anders 2005).

Burbot can weigh up to 10 pounds with females larger than males. Burbot reach sexual maturity in three to four years and can live about 15 years. Burbot prefer cold water and during the summer months, they move to the lower zone (hypolimnion) of lakes and the deep pools of rivers. Burbot feed mainly at night with adults feeding exclusively on fish while young burbot eat a variety of aquatic organisms and small fish. Burbot have a low swimming endurance and are commonly found in low flow riverine habitats; studies have documented that burbot will move downstream when water velocities increase in the Kootenai River (KVRI Burbot Committee 2005).

Burbot are most active in winter and will migrate great distances to spawn. Spawning in the Kootenai River basin occurred under ice when water temperatures were below 4° C (39° F) in water 1 to 10 feet deep or in small tributaries. Spawning only occurs during the night where the burbot would collect in a large circle with one or more females in the center surrounded by males, releasing eggs and sperm. Eggs typically hatch in about 30 days at 43°F (Simpson and Wallace 1982).

In the 1950s and 1960s, burbot was a popular winter game fish and supported a thriving commercial fishery in Bonners Ferry (Simpson and Wallace 1982). Declines in the burbot population were documented as early as 1959 in Idaho and British Columbia; however, their population was considered relatively stable. But, once Libby Dam became operational in 1972, burbot populations diminished significantly with the annual harvest of more than 26,000 burbot in 1969 dropping to 0 in 1987 (DEQ 2006). Burbot harvest was banned in Idaho in 1992. Since 1993, only 145 adults have been captured in Idaho and British Columbia (DEQ 2006). After decades of sampling and a demographic analysis of the Lower Kootenai River, Piper et al. (2004) estimated that approximately 50 fish remained in the population (KVRI Burbot Committee 2005). The main reasons for the decline are thought to be due to high winter flows during the traditional spawning period, loss of nutrients, and warmer water temperatures during the winter (DEQ 2006). The Kootenai River's flow during the winter is approximately 3 to 4 times greater than it was historically, due to Libby Dam's water releases for power production and flood control (KVRI Burbot Committee 2005). Winter water temperatures currently average 3°C to 4°C, whereas prior to 1972, they averaged 1°C or less. The river historically froze over during the wintertime, but has been ice-free since 1974 (KVRI Burbot Committee 2005).

Due to the low population abundance and failing recruitment, Kootenai River burbot in Idaho's portion of the Kootenai River Subbasin were petitioned as threatened under the Endangered Species Act. But the Service's 12-month finding reported "After reviewing the best available scientific and commercial information, we find that the petitioned action [listing] is not warranted, because the petitioned entity is not a distinct population segment (DPS) and, therefore, is not a listable entity" (KVRI Burbot Committee 2005). In response to this finding, in 2005 the Kootenai Valley Resource Initiative (KVRI) developed a conservation strategy for burbot in the Kootenai River/Kootenay Lake system. The strategy recognized Kootenai River burbot as an imperiled population and delineated reasonable actions that were believed necessary to protect, rehabilitate, and maintain the population (KVRI Burbot Committee 2005).

4.9.3. Key Ecological Attributes and Threats

Management of threatened and endangered species in the Kootenai NWR focuses on instream and adjacent riparian habitat management. Key ecological attributes contributing the recovery bull trout are described in section 4.8 of this chapter. Threats to bull trout include siltation at the mouth of Myrtle Creek inhibiting movement of fish upstream from the Kootenai River, possible problems with design of the water diversions on Myrtle Creek, and the lack of good riparian cover along the creek banks needed to stabilize the banks, moderate water temperatures and provide habitat for invertebrates. Sport fishing may be having a significant impact on bull trout survival through increased mortality from fish hook injuries, rough handling during release, and harvest due to misidentification (Jones and Faler 2010).

4.10 Wildlife and Habitat Research and Monitoring Efforts

A number of research and monitoring projects have been conducted at Kootenai NWR since the Refuge was established. Many are collaborative efforts between the Refuge and other Fish and Wildlife Service programs, other agencies, NGOs, and universities.

4.10.1. Waterfowl Surveys

Weekly waterfowl surveys. From 1966 to 1996 the Refuge was surveyed on a weekly basis providing information on daily waterfowl populations, and annual and seasonal use days for most species of waterfowl. A recent search of files found the weekly data available for the years 1966-1971 and 1978-1996. Annual use-day data summarized for ducks, geese, swans and coots were found for the entire time span of this survey in refuge narratives. Only scattered data are available for seasonal waterfowl populations from 1997 to the present. Waterfowl breeding pairs were estimated from survey data from 1978-1997. Data for the years 1986 to 1989 could not be located in refuge files. Waterfowl pair surveys were conducted in 2009 and 2010 for comparison to historic figures.

Mid-winter waterfowl surveys. The Idaho Department of Fish and Game has conducted mid-winter Waterfowl Surveys every year since 1995. These surveys count waterfowl populations using the Refuge and surrounding area on a single day in January. Data from the annual surveys go to the MBMO, which calculates a flyway population total. The flyway totals do not provide a picture of local trends. However, the midwinter waterfowl data set contains considerable detail about distribution of birds at various scales, from a specific refuge unit to overall region. Although the data generated from these surveys represent a snapshot of the numbers of waterfowl using the Refuge on the particular day of survey, not total refuge wintering populations, the cumulative data taken over the years may provide an index to the numbers of waterfowl on the Refuge and their trend over time.

Waterfowl breeding pair surveys. Up until 2002, waterfowl breeding populations were estimated from surveys conducted in May along permanent walking and driving transect in 3 management units. From 1978 through 1981 breeding pairs were estimated from one survey. From 1982 through 2002 breeding pairs were estimated from either 2 or 3 surveys to cover early, mid and late season nesters. Sample results were expanded to refuge-wide estimates by a correction factor determined by dividing total pair habitat in a unit by the estimated acres observed. The protocol used and the transect locations were located in refuge files. Annual breeding total refuge pair estimates were found for the years 1978-1985 and 1990-1997. Only annual estimates for Canada goose and the three most common duck species (mallard, wood ducks and redheads) were reported in narratives for the years 1986 to 1989. Raw data for waterfowl pair surveys and unit summaries were located only for the years 1994 to 1997. Waterfowl pair surveys were recently conducted in 2009 and 2010 along newly established transects for comparison to historic figures.

Waterfowl brood surveys. References to waterfowl brood surveys being conducted annually from 1978-2002 were found in refuge annual narratives. A protocol was located that indicated that n surveys were conducted weekly through the breeding season to estimate IA brood Sizes, only data for the years 1994-1997 were located in refuge files.

Waterfowl nest box survey. Reference to nest box surveys were found in annual narratives from 1978-1998 along with some data summaries. Data from these surveys were used to estimate nest success for cavity using wildlife species when estimating annual production (number of young fledged). Maps of box locations were located but raw data could not be located in refuge files.

Goose nest surveys. Goose nest surveys were conducted in 1979, 1981, and 1984-1986. Results are presented in the 1985 and 1986 annual narrative. Reference was made to nesting success in goose nesting structures in subsequent narratives, but no data were provided.

Upland and overwater waterfowl nest surveys. References to these surveys were found in the 1985 and 1986 annual narratives. Sample sizes were very small (n= 24 in 1985 and n=23 in 1986). Raw data or a written protocol could not be located in refuge files.

4.10.2. Surveys for Listed Species and Other Species of Management Concern

Midwinter bald eagle surveys. Every January, numerous volunteers take part in the Midwinter Bald Eagle survey to monitor the status of wintering populations in the contiguous United States by estimating national and regional count trends. The annual midwinter survey represents a unique source of long-term, baseline data. Unlike nesting surveys, it provides information on both breeding and nonbreeding segments of the population at a potentially limiting time of year and also provides an opportunity to monitor modifications or threats to habitat at important wintering areas. Nationwide counts of eagles were coordinated by the National Wildlife Federation from 1979 until 1992, when the Raptor Research and Technical Assistance Center (now SRFS) assumed responsibility for overseeing the count. The U.S. Army Corps of Engineers began coordinating the survey in 2008 and in 2007 the USGS established a partnership with USACE to maintain the long-term coordination of the survey, data analysis, and reporting.

A survey route was established on Kootenai NWR's Auto Tour Route as part of the Kootenai River Valley and refuge staff has taken part in the survey since 1987. Summary information from the 1986-2005 trend analysis can be found at: http://ocid.nacse.org/nbii/eagles/

Bald eagle nest survey. For a number of years, the Refuge has participated in the bald eagle nest survey in coordination with the Idaho Department of Fish and Game. The survey is an ongoing effort to document bald eagle nests and nest success (# of fledglings) across the State. The Refuge has documented bald and golden eagles using the Refuge since 1965.

Marshbird call response surveys. These surveys were set up by the Idaho Department of Fish and Game in 2008. This sampling project was initiated as part of the Idaho Bird Inventory and Survey (IBIS) plan to monitor all birds (waterbirds, shorebirds, waterfowl, and landbirds) throughout the State in a coordinated, standardized manner. Phase I of the IBIS Program emphasizes monitoring of aquatic species and habitats. Points were established on the Refuge and were visited 3 times during spring 2008. Protocol follows the National Marshbird Survey Methodology (Conway 2005). Recordings of territorial calls of five species (sora, Virginia rail, American bittern, pied billed grebe, and Wilson's snipe) are played and responses are recorded. This survey was conducted by IDFG in 2008 - 2009 and by refuge staff in 2010. It will continue to be conducted annually

In addition to the marshbird survey a general aquatic bird survey was conducted along an established transect. All aquatic birds were recorded by a single observer and a recorder walking and driving the transect.

A report of the statewide 2008 sampling effort and raw marshbird refuge data was received (Moulton 2009).

Black tern survey. In June of 2010, a representative of IDFG conducted a black tern survey to count nests, pairs, and single black terns on the Refuge. The survey, part of a statewide survey of colonial waterbirds of concern, documented five pairs of black terns with five active nests.

Grassland and forest birds. In 2009 and 2010 Grassland and forest birds surveys were conducted by the Refuge to determine the presence and relative abundance of bird species. Two morning surveys were conducted—one in June and one in July. Six survey locations were established and bird detections recorded for 10-minute periods.

4.10.3. Vegetation Surveys and Monitoring

Grassland. Monitoring native grass and forb plantings in cropland and managed pastures has been conducted.

Refuge wetland bathymetry. Light Detection and Ranging (LIDAR) data for the Kootenai Valley were obtained from the Kootenai Tribe in 2010. These data were used to create 1-foot contours of the entire refuge area. Because of the presence of water in refuge wetlands that prevented radar penetration, elevation and contour data are not available below 1,757 feet. During spring and summer of 2010, additional data points were collected in refuge pond units using GPS and measurement of water depths to estimate pond bottom elevations for mass point conversion of LIDAR. Surveys focused on emergent open water edges and open water areas. This work will continue in 2011 in order to provide more accurate bathymetry of refuge wetlands.

4.10.4. Baseline Inventories of Major Fish and Wildlife Groups

The Kootenai Tribe of Idaho (KTOI) conducted birds and invertebrate abundance on the Refuge from 2005 - 2010. The data collection activities are in conjunction of the KTOI's Operational Loss Assessment Project funded through Bonneville Power Administration. This project is designed to define and quantify the ecological impacts associated with the operation of the Libby Dam.

Bird sampling took place at between 13-16 locations on 3 different mornings. A fixed radius point count survey protocol was used with bird detections recorded for 10 minutes. Sampling pits were distributed in coniferous forest, riparian and wetland habitats. Whether the bird was detected in the first 3, 5 or 10 minute intervals were recorded. Summary data have been provided to the Refuge. Invertebrate abundance was recorded by using 9 pitfall traps at the sampling locations. Data summaries have been provided to the Refuge.

4.10.5. Experimental Reintroductions

In 1997, the Kootenai Tribe of Idaho in cooperation with the BC ministry of Environment, Land, and Parks, IDFG, and FWS began a kokanee re-introduction program in the westside tributaries of the Kootenai River. Disease-free eyed kokanee eggs were introduced in man-made redds in Myrtle Creek in the fall of 2003, 2004, 2005, and 2007 (few eggs were available for reintroduction in 2006). No returning kokanees have been documented in Myrtle Creek to date.

4.10.6. Other Research/Surveys

Cottonwood stands. In 2001, a cooperative international study was undertaken to determine the status of cottonwood habitat on the Kootenai River (Jamieson and Braatne 2002). They collected data on land use changes, river flows, and riparian vegetation in three study reaches; one above and two below the Libby dam. Four vegetation transects were established on the Refuge. They found that major impacts from diking and agricultural development of the floodplain had occurred in the downstream reaches including the Refuge. They found very little recruitment to cottonwood stands due to regulated flows (high and irregular winter flows and a lack of spring freshet) below Libby Dam from 1975 to 1990. They did find that spring releases from 1991 to 2000, aimed at promoting spawning for white sturgeon, resulted in conditions in some years that resulted in the establishment of new cottonwood in 1996 or 1997. These transects were re-measured by Stewart Rood in 2009 under contract to KTOI as part of their Operational Loss Assessment Project funded through Bonneville Power Administration.

Myrtle Creek biological assessment. Gretchen Kruse of Free Run Aquatic Research completed the "Myrtle Creek Biological Assessment: 2004 Phase II Final Report" which summarized one year, September 2004 to June 2005, of in-depth biological and physical monitoring on the lower reach of the creek. Kruse's report indicated that Myrtle Creek is a moderately healthy stream but that it could benefit extensively from habitat and vegetation restoration. In-depth discussion of the Myrtle Creek assessment is discussed in Section 4.8.2 Condition and Trends, subheading "Myrtle Creek."

Preliminary inventory and assessment of aquatic resources. The Service's Idaho Fisheries Resource Office (FRO) conducted a preliminary inventory and assessment of the various aquatic resources on the Refuge during the week of July 6-10, 2009. Fish sampling was conducted on Myrtle

Creek, Cascade Creek, Big Blowout Pond, and Little Blowout Pond using DC backpack electro-fishing equipment and a standard 15 m fish seine with a 10 mm mesh net. Fish collected during the sampling period were identified; their lengths measured, and then were returned to their respective water body. A summary of the FRO's fieldwork including management issues and recommendations was provided in "A Preliminary Inventory and Assessment of Aquatic Resources and Associated Management Issues on the Kootenai National Wildlife Refuge" dated August 2010, revised January 2011.

4.10.7. Contaminants Studies

Frog malformation surveys were conducted on the Refuge in 2001 and 2004. Only fully metamorphosed adults were captured representing three species: Pacific chorus frogs, western toad, and Columbia spotted frogs. Columbia spotted frogs made up over 80 percent of the sample. No malformations were noted. The Refuge has report for the two sampling efforts.

4.10.8. Other Monitoring

Kootenai River levee inspection. In June 2006, the City of Bonners Ferry and Boundary County requested the Seattle District of the U.S. Army Corps of Engineers to consider the inclusion of the diking districts and the dikes in the Corps Public Law 84-99, Rehabilitation and Inspection Program (RIP). A Seattle District team inspected the levees in October and November of 2007 in accordance with the criteria pursuant to RIP. While Kootenai NWR was considered to be an ineligible Federal landowner, the Seattle District team did inspect the Refuge's dike as a courtesy to the U.S. Fish and Wildlife Service. The majority of the deficiencies in the valley were related to erosion and excessive vegetation. On the Refuge's portion of the river dike, five areas of severe erosion were identified along with numerous large and small trees, and significant brush and weeds occupying the levee prism on the riverward side of the levee. This initial inspection resulted in an overall project rating of the Refuge's dike as "unacceptable" (USCOE 2007).

Mosquito monitoring. As part of the Boundary County mosquito monitoring program for diseases, trapping was conducted on the Refuge. In 2010, 16 Centers for Disease Control (CDC) traps were set out on the Refuge and collected over 21,000 mosquitos (Allegretti 2010). The samples were frozen, packed, and sent to the Idaho Department of Epidemiology in Boise where they were counted and sorted. Twelve species were trapped on the Refuge including: *Culex tarsalis, Culiseta incidens, Coquillettedia petrrubens, Aedes cinereus, A. vexans, Anopheles punctipennis, A. freeborni, A. earlei, Ochlerotatus sticticus, O. sierriensis, O. fitchii,* and *O. increptus*. Of these only the *Culex* species was tested for arbovirus. All samples tested negative.

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Chapter 5 Refuge Facilities and Public Use Programs

Wildlife observation on Kootenai National Wildlife Refuge
USFWS

Chapter 5. Refuge Facilities and Public Use Programs

5.1 Infrastructure and Administrative Facilities

The infrastructure and facilities discussed in this section consist of boundary markers, entrances, roads, trails, administrative buildings, easements and rights of way, and water-related structures.

5.1.1 Boundary Fences and Markers

The Kootenai National Wildlife Refuge encompasses 2,774 acres. Its boundary is marked with Service boundary signs. Generally, the Refuge's perimeter is bordered by the Kootenai River on the north and east; Deep Creek on the southeast, and lies on both sides of Westside Road and Lions Den Road. Myrtle Creek and Cascade Creek enter the Refuge from its western boundary. It is the intent to accurately post the Refuge's boundary; however, in select locations the boundary may be posted slightly inside the actual property line on high ground or dikes to avoid the potential loss of a sign due to flooding and bank erosion. The Refuge's western boundary was surveyed and signed in 2006-2007. Boundaries are signed with standard Service boundary signs. Most signs were replaced recently and only a handful of signs are weathered or damaged and in need of replacement. There are no boundary fences.

Entrances and access points. There are four official entrances to the Refuge. Boating of navigable water surrounding the Refuge is common; however, accessing the Refuge from these waters is not allowed and constitutes trespass beyond the refuge boundary. Since Myrtle Creek is surrounded entirely by refuge property, no boats are allowed. However, Deep Creek only flows through a small portion of the refuge boundary, therefore boats are allowed, but people may not trespass onto the surrounding refuge property. Three of the four entrances are on county roads including the primary entrance which is about five miles west of Bonners Ferry on Riverside Road, the south entrance on Lions Den Road, and the northwest entrance on Westside Road. A secondary entrance off of Westside Road, Myrtle Creek Road, is maintained by the Forest Service. The county maintained roads are open 24 hours per day, seven days per week year round but Myrtle Creek Road is not maintained during winter.

Each entrance is posted with a standard refuge entrance sign.

Roads and parking areas. The Refuge has a graveled 4.5-mile, refuge-maintained auto tour route open to the general public year-round. A 1.7-mile county-maintained segment of Riverside Road connects to this route for a total tour loop length of 6.2 miles. The Auto Tour Route is open to vehicles, walking and bicycling when weather/road conditions permit. After-hours access is controlled by automatic gates at each end of the tour route. The gates are scheduled to provide access from about one half to one hour before sunrise and after sunset. The route is not plowed in winter and is passable to passenger vehicles from March to early December. When the road is impassable due to snow, it remains open to use by cross-country skiers and snowshoers. Snowmobiles are not allowed (except for Service vehicles). ATVs are allowed on county roads in Idaho and on the auto tour route as long as they are street-legal under Idaho regulations.

A traffic counter was on the auto tour route for 14 years; however, it was prone to malfunction (especially in very cold weather) and false readings. All traffic counters were removed and put into storage in November 2006. During 2009, a Diamond Traffic Counter, model Tally 41, (an inductive loop counter) was installed on the auto tour route but it counts only vehicles not pedestrians.

Three pullouts bordered by cedar split-rail fences along the auto tour route allow vehicles to pass as visitors stop to observe wildlife. The first pullout offers elevated views of wetlands to the east and Myrtle Creek to the west. The second pullout is at the eagle nest overlook. The third pullout is on the east side of Dave's Pond and was installed in 2006 by refuge employees and the Youth Conservation Corps (YCC) crew.

Several county roads cross the Refuge including Riverside, Westside, and Lions Den Roads. Riverside Road enters the Refuge at the mouth of Deep Creek, bisects the Refuge for 1.7 miles, and becomes Westside Road at the intersection with Lions Den. Westside Road then passes the refuge headquarters and continues north; 2.4 miles of its length pass through the Refuge. Roughly 1.4 miles of the graveled Lions Den Road cross the southern part of the Refuge. Myrtle Creek Road, constructed in the early 1950s by the U.S. Forest Service (USFS), begins on the Refuge south of where Cascade Creek crosses under Westside Road, and climbs the Selkirk Mountains to the west; approximately one mile of its length crosses the Refuge. On March 16, 1972, the Regional Director of the U.S. Fish and Wildlife Service (formerly named the Bureau of Sport Fisheries and Wildlife) granted the Department of Agriculture's USFS an easement for a 66-foot road right-of-way for a 50-year period in accordance with applicable authorities and regulations published December 19, 1969, 50 CFR Part 29.21. The grantee agreed to be subject to the following conditions:

> The granting of this permit does not in any way prohibit the free use of this road by employees of the United States, State of Idaho, or instrumentalities thereof, nor of the general public for ingress and egress over, upon, and across lands of the United States.

Commonly referred to as the Myrtle Creek Road, No. 633, it is an unimproved dirt road and is not a year-round maintained road, nor has it ever been maintained by the Refuge. By letter dated October 31, 1974, the Service approved the assignment of the Myrtle Creek Road right-of-way from the USFS to the Pack River Company, now the Forest Capital Partners, LLC.

Off of the Auto Tour Route are two gravel hunter parking lots, the North ADA Hunter Parking Lot (1,177 square feet) and the Interior Hunter Parking Lot (4,343 square feet). These lots are surrounded by split rail fence and have hunt information signs. Along Riverside Road are two parking lots, East Parking Lot (gravel, 6,891 square feet) and Center Parking Lot (gravel, 20,126 square feet with two ADA asphalt parking pads); both of these lots are surrounded by split rail fencing. Near the primary refuge entrance at the East parking lot is an illustrated welcome sign, orientation map, and kiosk with up-to-date information. Center Parking Lot also has an information kiosk and elevated life-sized mallard silhouettes spaced at 0, 20, 30, and 40 yards with an informational sign to assist waterfowl hunters in gauging distances of ducks in flight.

There are four asphalt parking lots near headquarters: the West HQ Visitor Parking Lot (2,522 square feet); South HQ Visitor Parking Lot (4,937 square feet); Myrtle Falls Trailhead Parking Lot (13,465 square feet); and the Environmental Education Center Lot (EEC) (26,888 square feet). There is also an 8,408-square-foot gravel parking area at the Maintenance and Storage Area. There are two gravel lots on the southern portion of the Refuge: one is the Ole Humpback Trailhead (1,412 square feet), and the other is South Parking Lot (4,443 square feet). The South ADA Hunt Blind Parking Area is 600-square-foot gravel lot. Along Lions Den Road the Refuge maintains two public use vehicle pullouts with split rail fencing that overlook Island Pond. A graveled parking overlook is also provided for Cascade Pond.

Several short one-lane gravel service roads totaling about 15 linear miles provide access to ditches, dikes, and other structures throughout the Refuge. Some of these service roads date from the 1930s when the Refuge was privately owned. Myrtle Creek Dam Road, a service road from Westside Road to the City of Bonners Ferry domestic water supply diversion dam passes through the Refuge for 0.5 mile.

The Refuge has well-maintained directional signs at intersections and along roads to guide visitors.

Cascade Pond Overlook off of Westside Road has a small gravel parking area and short trail leading to a covered gazebo that is used for wildlife observation and photography.

Trails. Refuge trails include the Deep Creek Trail (on dike top, 2.2 miles), the Island Pond Trail (on dike top, 1.5 miles), the Myrtle Falls Trail (¼ mile), the Ole Humpback Trail (steep, wooded, 1 mile), and the Chickadee Trail (concrete, 1,000 feet). Trails are shown on Map 11. The Refuge offers two fully accessible trails with hard surfaces; the concrete 300 yard Chickadee Trail and the asphalt paved Myrtle Falls Trail (accessible to the bridge). Chickadee Trail has 10 interpretive signs as well as a welcome panel. The other trails are dirt, gravel, or mowed paths (Island Pond, photo blind, and portions of Deep Creek). The Upper Dike trail was closed in 2005 due to wildlife disturbance and safety issues. The trails are open to walking, jogging, dog walking (on leash only), snowshoeing, and cross-country skiing. The Auto Tour Route is open to walking and bicycling when weather/road conditions permit. The road is not plowed in winter and is open to cross-country skiing and snowshoeing.

The Myrtle Falls Trail (.25 mile) is fully accessible up to and including the bridge over Myrtle Creek (installed in 2003), and becomes a primitive trail past the bridge. A small primitive trail below the bridge (unsigned) is used to access Myrtle Creek for fishing. There is a sign at the end of the bridge warning hikers that the trail is not maintained past this point and "if you choose to continue you do so at your own risk." The primitive trail is steep and switch-backed, but well maintained by YCC crews. The trail continues onto Forest Service land that was recently acquired from Forest Capital Partners. The refuge boundary is signed, but the Forest Service land is not.

Administrative facilities. The Refuge's headquarters is located adjacent to Westside Road on the west side of the Refuge, 7 miles west of Bonners Ferry. The headquarters building (964 square feet) currently consists of two offices and a reception area accommodating between two and four staff members and occasional volunteers. Adjacent to the headquarters is a covered kiosk with interpretive panels and a spotting scope, and a renovated historical barn (2,919 square feet, dating from 1938) that serves as an environmental education and meeting facility. The barn is furnished with taxidermy mounts, specimens, computers, and microscopes and serves environmental education programming for the Refuge. It can also be reserved by community groups for meetings under the manager's discretion. Behind the barn is a wooden amphitheater deck with benches for group assembly and programs. A government-owned residence (1,638 square feet, built in 2005) provides temporary quarters for staff and volunteers. A 720-square-foot trailer with a snow protection roof also provides temporary housing. Nearby is a gravel RV pad with electric, water, and septic hookup for residential volunteers. Recently the old manager's residence, built in 1938, was demolished but the separate 2-car garage (927 square feet) is still standing and used for storage. The administrative area also includes an Idaho Fish and Game (IDFG) field station, used primarily for fisheries research with a State-owned double-wide trailer and storage unit for boats. IDFG pays rent to the Refuge for use of this space.

Refuge maintenance facilities include the shop, a 7,352-square-foot metal building built in 2000; a fully enclosed equipment storage building (2,273 square feet) that includes the fire engine bay and small cache; a 120-square-foot well pump house; and a concrete vaulted above-ground fueling station. A dilapidated storage building is scheduled for replacement in the near future.

Easements and rights-of-way. Several utility lines and roads, dating from the 1950s, cross the Refuge. Many of the road rights of way were issued to the county by property owners prior to refuge establishment and exist as restrictions in property deeds for a 50-foot width for the length of the road. Bonners Ferry has a right of way dating from 1974 for the Myrtle Creek Dam Road. Underground and overhead power lines, maintained by Northern Lights, Inc. bisect the Refuge in several locations. An overhead power line runs the west side length of the Refuge at the base of the Selkirk Mountains adjacent to Westside and Lions Den Roads, operated by Northern Lights, Inc. An aboveground power line approximately 200 yards long runs from this primary power line to the refuge headquarters servicing the administrative complex (1979 right of way with Northern Lights, Inc.). Another underground line from the primary line near Cascade Creek crosses Myrtle Creek to the MC Pump Station and is protected with a right of way dating from 1987. In 2009 Northern Lights installed an underground line to service the Deep Creek Pump. The City of Bonners Ferry has an underground power line from the exit of the auto tour road running north along the Kootenai River dike to service the Kootenai River pump site. This power line had been installed above ground, but it was buried underground in the 1990s.

An underground telephone cable adjacent to Riverside Road runs along Westside Road to the northern refuge border, crossing the Refuge for approximately 4.1 miles. This right of way was recorded as a restriction in property deeds prior to refuge establishment and is only accessed for upgrades and repairs.

A water line from Myrtle Creek to Bonners Ferry was established in the 1940s and continues to provide the domestic water supply for most city residents. Approximately 1.5 miles of the 16-inch water line is buried across the Refuge from headquarters to the mouth of Deep Creek. This water line is protected by both a recorded right of way in property deeds and through a 1979 Cooperative Agreement between Bonners Ferry and the U.S. Fish and Wildlife Service.

Dikes, irrigation, and water control structures. The Refuge is nearly flat, with the exception of the western edge which ascends to 2,310 feet into the Selkirk Mountain foothills, and slightly sloping from south to north. Water from five sources is used to fill refuge wetlands including three stream diversions on the west side: Upper Myrtle Creek, Lower Myrtle Creek, and Cascade Creek, and from three pump locations: two pumps on the Kootenai River (7 and 10 cfs capacity) and one pump on Deep Creek (10 cfs capacity). A complex series of dikes, ditches, water control structures, and culverts provide the infrastructure for water management. Refer to Chapter 3. Physical Environment, Section 3.3 Hydrology, Part B Wetland Hydrology, as well as unpublished report, Process for Developing Water Management and Water Budget for Kootenai (Rule 2010).

The wetland system on the Rivers Bend Unit, on the north end of the Refuge, was largely redesigned in 2002. New wetlands were created, and select wetland basins were expanded and recontoured to reclaim historic flood plain habitats. Additional improvements were made to the water delivery and control systems in the new meander channels to facilitate riparian restoration efforts and to add independent water control of the new north end wetland unit. At full capacity, the Refuge could manage nearly 175 acres of seasonal wetlands on the unit. This restoration work was made possible through partnership efforts with Ducks Unlimited, who administered a $1,000,000 NAWCA Grant for the Kootenai Valley. Realistically, the Kootenai River's water level, seasonal rainfall, and soil characteristics of wetland basins dictate the overall acreage of managed wetlands. Active irrigation of wetlands on this unit is reserved for select wetlands with proven water retention capabilities.

5.2 Recreation Overview

5.2.1 Open and Closed Areas

Open areas. Portions of the Refuge are open year-round during daylight hours for wildlife-dependent recreation. County roads traversing the Refuge are open 24 hours per day. The auto tour route is open to vehicles year-round, weather and road conditions permitting, during daylight hours for wildlife observation and photography. Hiking, jogging, dog walking (on leash), bicycling, cross-country skiing, and snowshoeing are also allowed on the auto tour route. All horseback riding is prohibited on the Refuge. Off of the Westside Road, the observation blind at the Cascade Pond Overlook is open year-round for pedestrian access from the parking lot to the blind. The Deep Creek Trail, Ole Humpback Trail, and Myrtle Falls Trail are open year-round. The Deep Creek and Ole Humpback trails can be accessed from parking areas along Lions Den Road. Visitors can also access Deep Creek Trail from Riverside Road near the East Parking Lot. The Myrtle Falls Trail can be accessed across from the refuge headquarters. The photography blind located on Greenwing Pond may be accessed via the marked trail from the EEC parking lot.

Seasonally open areas. The Island Pond Trail is closed on waterfowl hunt days since it is located within the waterfowl hunt area. Forty-six percent of the Refuge is open to hunting during State seasons: 740 acres (27 percent) of the Refuge is open to waterfowl hunting, and 295 acres (11 percent) is open to big game and upland game hunting. The waterfowl hunting and big game hunting areas do not overlap (see Map 11). Hunting is allowed in these areas in accordance with State seasons and regulations. The waterfowl hunt runs from early October to mid-January in most years, with a weekend in late September for youth waterfowl hunting. No permits or check-in are required for waterfowl hunting. Spaced blinds (all box blinds) are available on a first-come, first-served basis. Hunters are allowed to add material (vegetation or camouflage cloth) to the blinds. Both blind and free-roam hunting is allowed in the hunt areas and occurs concurrently. Hunter numbers are limited only by availability of parking spaces and blinds. Two ADA accessible blinds are available and must be reserved in advance.

Big game and upland game hunting are allowed west of Westside Road and west of Lions Den Road in accordance with State regulations. The 295-acre big game hunting area is mostly steep, forested terrain. Big game hunters access the hunt area from county roads, the Ole Humpback Trail parking lot, and South Pond parking lot located near the Refuge's southern boundary, both are located on Lions Den Road. There is a half-mile safety zone around refuge headquarters which is posted and is shown on refuge maps and brochures.

Closed areas. The area west of Westside Road and Lions Den Road, the Auto Tour Route, the banks of Myrtle Creek (for fishing), and refuge trails are open to the public year round. All other areas are closed to the public except the waterfowl hunt area which is open to waterfowl hunters with a valid hunting license who are engaged in waterfowl hunting during the waterfowl hunting season.

5.2.2 Annual Recreation Visitors

During the 2010 fiscal year, the Refuge had an estimated 40,235 visitors. Early refuge narrative reports indicate that the average annual visitation in the 1960s was just over 900 visitors growing to a 3,450 visitor average in the 1970s. Visitation in the 1980s had grown to 6,230 visitors annually. Visitor numbers grew dramatically in the early 1990s increasing from 9,775 visitors in 1991 to 15,475 in 1992. Refuge reports attribute these increases to additions of new refuge directional signs on U.S. Highway 95 in Bonners Ferry and distribution of refuge leaflets at the Bonners Ferry Chamber of Commerce. Numbers reached the 20,000 visitor milestone in 1997 and continue to grow. The average number of visitors annually from 2000 to 2010 has grown from just over 21,000 in 2002 to an estimated 42,000 in 2008. A combination of factors contribute to recent increasing visitation including active promotion of the Refuge through the Chamber and through the International Selkirk Loop, a 280-mile scenic drive encircling the Selkirk Mountains in northeast Washington, northern Idaho and southeast British Columbia. The International Selkirk Loop recently started promoting birding, eco-tourism, and bicycling with recommended loop tours including a Two Nation Birding Vacation. Frequently many of these visitors end up at Kootenai NWR. Additionally, the International Selkirk Loop was highlighted in Rand McNally's 2009 road atlas as one of the five "Best of the Road" trips.

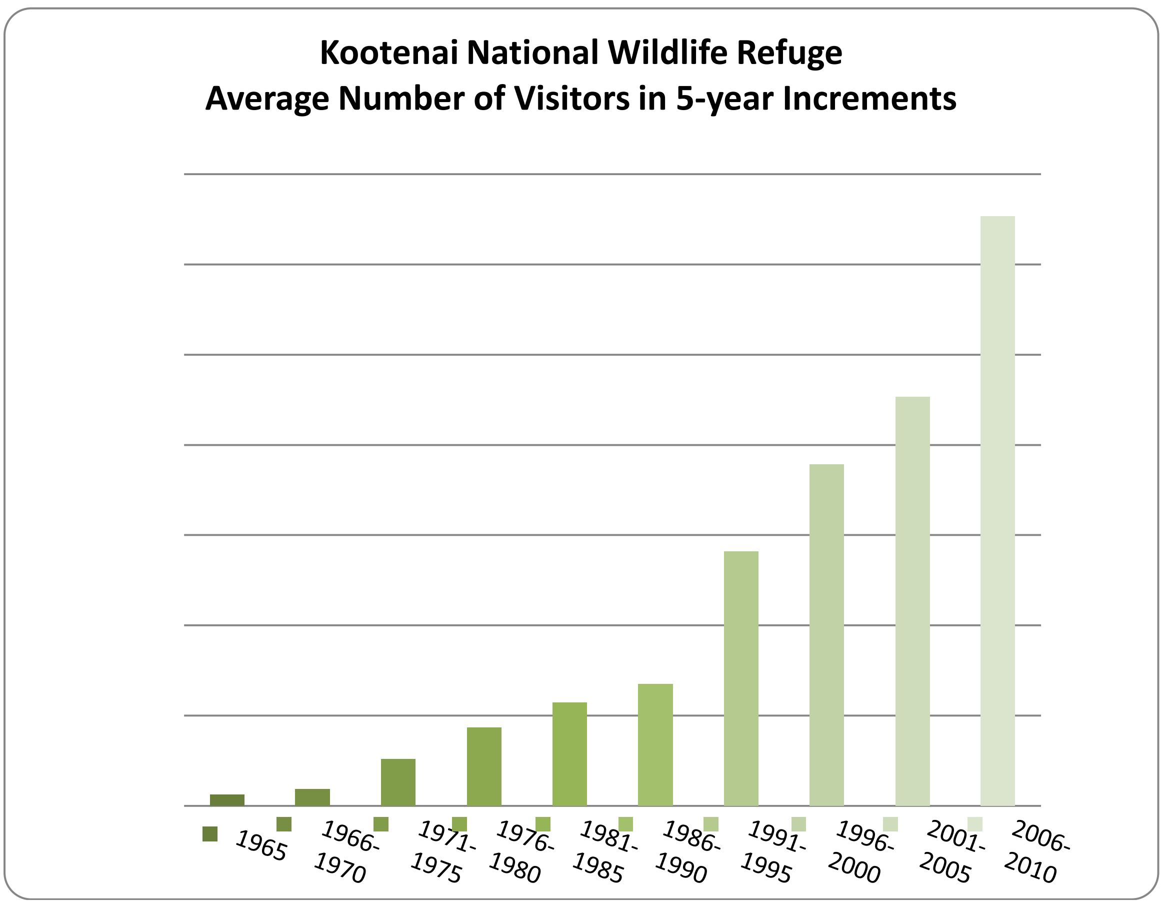


Figure 5.1. Average Annual Visitation at Kootenai NWR, 1965-2010.

Consistently the highest visitor use at Kootenai occurs between April and October with the largest increase noted during June, July, and August when travelling tourists visit northern Idaho. From the

1992 Refuge Narrative Report, "During these peak summer months it is sometimes impossible to accomplish any work, as a constant stream of visitors come into the office to chat."

5.2.3 Annual Recreation Visits

Recreational visits differ from overall annual visitors. A visitor is a member of the public coming to the Refuge to participate in an activity. In most instances, a visitor may engage in multiple activities. For example, one visitor may watch birds along the Deep Creek Trail, have lunch at the refuge headquarters, and drive the auto tour route on their trip. In this example, the visitor actually visited three distinct locations. The activities of the visitor are considered visits. One visitor can register multiple visits in one trip and the annual sum of visits is always more than the number of visitors. Visits are measured by a variety of direct and indirect methods. In the past, trail and vehicular visits have been measured by counters installed along these routes. Educational and special event visits are directly counted by staff or volunteers conducting these activities. Other visit numbers, for example, hunt visits, may be estimated by staff and volunteers via informal observations of the frequency of an activity. Past public use activities were greatest in wildlife recreation with non-consumptive use (Table 5.1). Since 2001 Kootenai staff cutbacks resulted in a reduction in time spent estimating and tracking refuge visitation as well as serving visitors through special programs and events. The overall Kootenai NWR visit trends for Fiscal Year 2010 are exhibited in Figure 5.2.

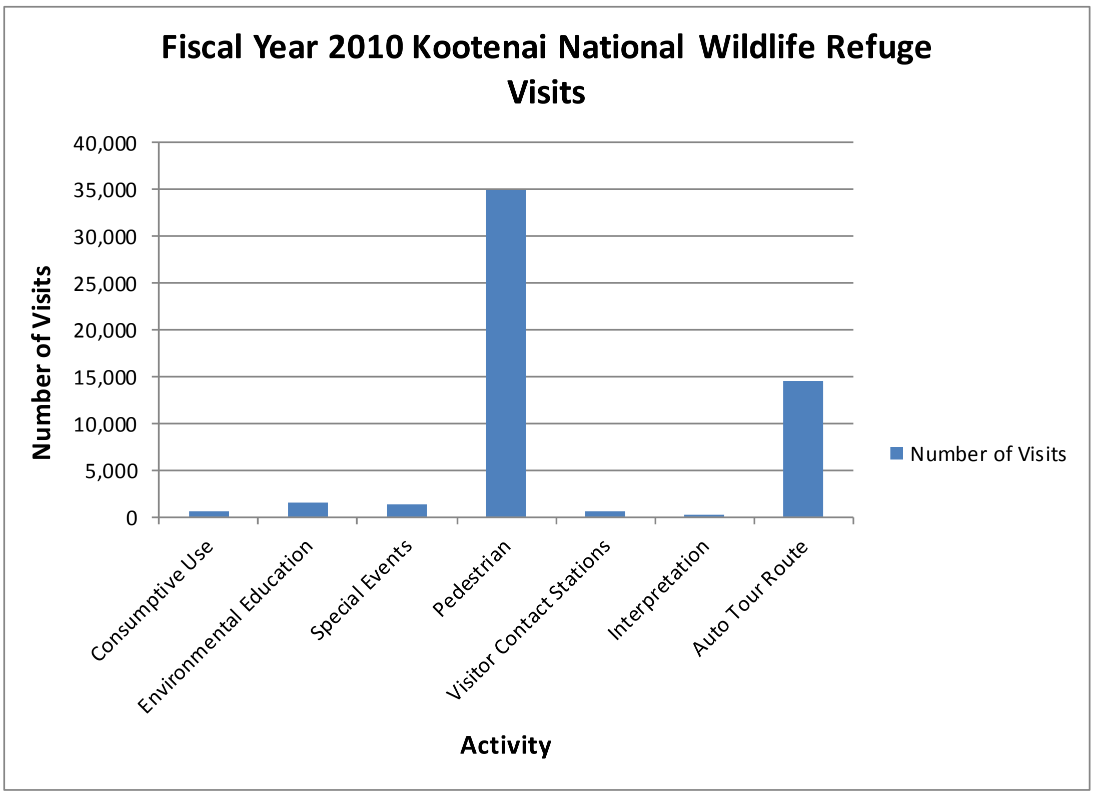


Figure 5.2. Recreational visits to Kootenai NWR in fiscal year 2010, by type of visit. (Source: RAPP Report 2010).

Table 5.1. Kootenai NWR Public Use Activity from 1984 through 1996.
(Source: refuge annual narrative reports).

Year	1969	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	2002
Interpretation	163	121	142	186	202	262	444	674	917	674	585	804	796	552	
Environmental Education	0	199	152	182	201	274	198	160	214	160	180	75	475	350	641
+ **Wildlife Recreation, Consumptive**	831	1,291	1,240	1,278	1,188	774	919	1,031	1,181	1,031	874	754	917	705	
# **Wildlife Recreation, Non-consumptive**	190	2,601	3,013	3,350	4,883	5,226	7,497	9,787	9,547	9,787	13,387	16,058	19,016	22,210	
***Nonwildlife Recreation**	300	195	240	100	280	200	140	120	175	120	290	645	382	345	
Total Activity Visits	1,216	4,407	4,779	6,096	6,754	6,736	9,198	11,772	12,034	11,772	15,316	18,336	22,960	20,952	
Total Visitors		3,916	4,379	4,350	5,665	5,945	7,980	9,775	9,776	9,775	12,875	15,095			21,309

+ hunting and fishing, #wildlife observation (foot, auto), *picnicking and ice skating

5.2.4 Recreation and Entrance Fee Program

The Refuge does not charge entrance fees or other recreation fees.

5.2.5 Accessibility of Recreation Sites and Programs for People with Disabilities

The Refuge contains facilities that are accessible to persons with disabilities. Some of the facilities are for persons with permanent disabilities who qualify under Idaho Code 36-406 (g). A brief description of accessible facilities follows.

Hunt program accessibility. Two ADA accessible blinds are available for waterfowl hunters at South Pond and the North Hunt unit. The blinds must be reserved in advance but are made available on a first-come, first-served basis to the general waterfowl-hunting public if they are not reserved.

Accessibility of wildlife observation and photography. Public use facilities on the Refuge have been designed for accessibility. The auto tour route is designed for wildlife observation from the comfort and safety of one's personal vehicle. The refuge headquarters and restrooms, and the environmental education center, are of modern accessible design with paved approaches and ramps to the facilities. The parking lot at the headquarters is paved with sidewalks connecting to the accessible Chickadee Trail and to the Myrtle Falls Trail, which is accessible to and including a bridge that offers excellent views of Myrtle Creek. The Cascade Pond overlook is also ADA accessible.

5.2.6 Law Enforcement

The Refuge receives intermittent law enforcement coverage from a Service Zone Officer. Zone Officers are assigned to multiple refuges and large geographic regions. They enforce special refuge regulations, protect resources, and maintain public safety via periodic patrols of refuge lands. However, without a law enforcement officer stationed on the Refuge, there are limited field patrols and officer presence. In fall 2010 the Inland Northwest National Wildlife Refuge Complex hired a full time officer to cover Kootenai as well as Turnbull and Little Pend Oreille refuges.

The most common law enforcement issues encountered are violations of refuge closures (trespass into closed areas, presence on the Refuge after hours, shed hunting), off leash dogs, big game hunting violations (pursuit of big game into closed areas), waterfowl hunting violations (early entry into waterfowl hunt area, retrieval of waterfowl in closed areas), illegal trapping of furbearers (e.g., otter in Deep Creek), vandalism (defaced signs and the gazebo), riding bikes on Deep Creek Trail, and canoe/kayak trespass from the Kootenai River into Myrtle Creek.

5.3 Waterfowl Hunting

The National Wildlife Refuge System Improvement Act, passed by Congress in 1997, identified hunting as a wildlife-dependent, priority public use for the National Wildlife Refuge System. At the Refuge the waterfowl hunting program is operated in a manner that is consistent and compatible with the Refuge's purposes and goals, and provides a quality experience for the hunter. This program contributes to the continuation of America's traditions and heritage in wildlife conservation and outdoor recreation.

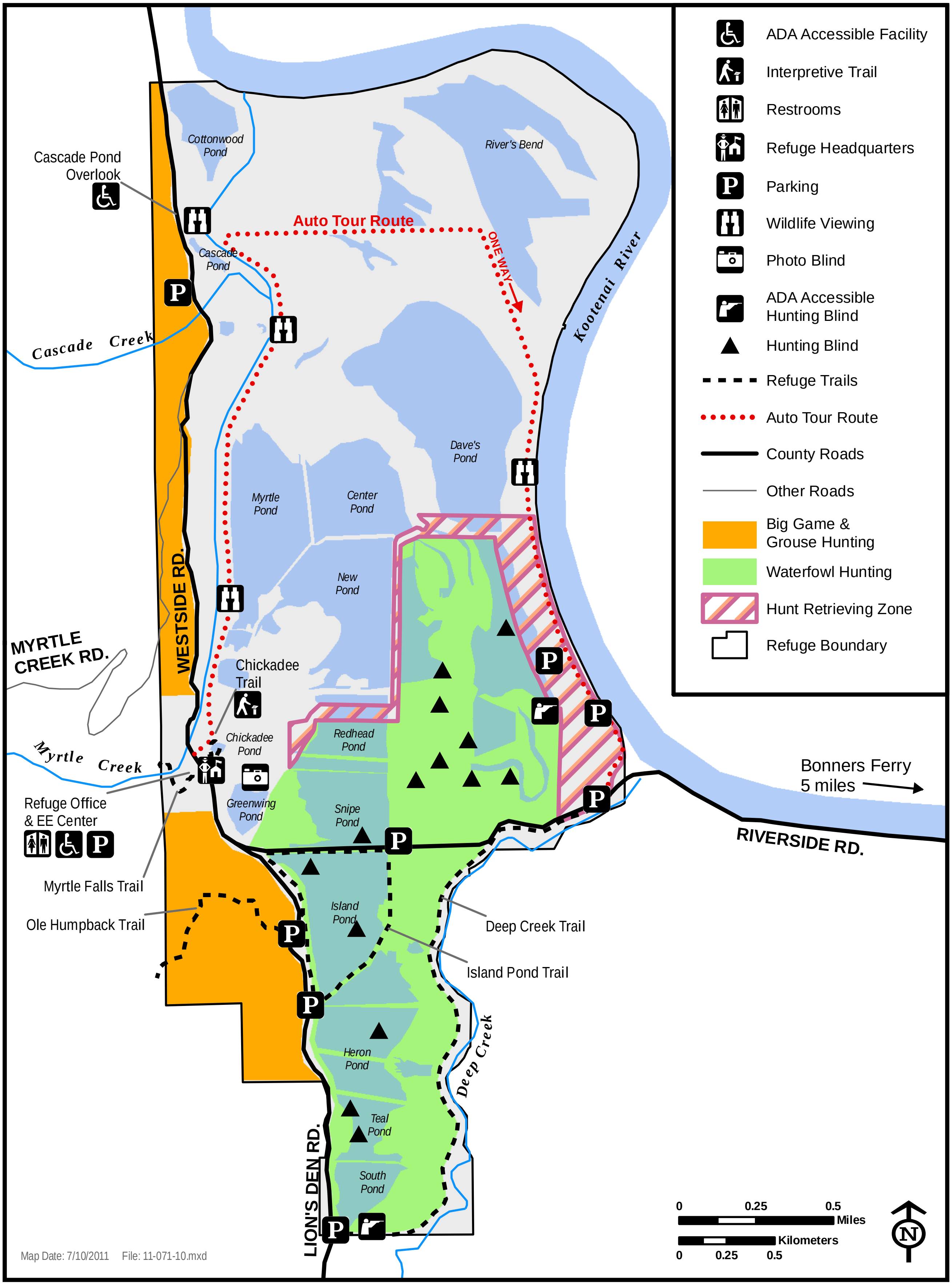
The Refuge has provided a public waterfowl hunting area since it was established. The Refuge's waterfowl hunting program represents one of a limited number of public waterfowl hunting opportunities in northern Idaho. Other public hunting is available at Idaho Fish and Game (IDFG) wildlife management areas (McArthur Lake WMA, Boundary-Smith Creeks WMA, and Pend Oreille WMA) as well as The Nature Conservancy's Ball Creek Ranch. Currently, the Refuge's waterfowl hunting program permits the hunting of ducks, geese, and coot on approximately 740 acres. Eighteen spaced blinds are provided; free-roam hunting is also allowed in the hunt area. Two blinds are ADA accessible and must be reserved in advance. Staff takes reservations for the two ADA blinds, unlocks the gate on the road to the blinds, and puts up reserved signs adjacent to the gated road and on the wheelchair accessible path to the hunt blind. No advance notice is required to reserve an ADA blind, but it is preferred to call by noon on the day before requested reservation. All other blinds are occupied on a first-come, first-served basis. Refuge staff conducts annual maintenance on the hunt blinds, including repairing the structures, mowing in areas surrounding the blinds to create open water, and managing water to flood the hunt area.

Supporting access to the hunting blinds are eight parking areas and a network of seasonally mowed trails, covering approximately 1.26 miles, but could be more if the southern hunt blinds become more active or more northern blinds are accessible before higher water levels. These trails are mowed by refuge staff to provide waterfowl hunters access to designated hunting blinds. Secondary maintenance roads and internal dikes are used to reduce annual trail maintenance efforts. The Island Pond Trail is also used by hunters to access the hunt area and/or blinds. Waterfowl hunters are allowed to use nonmotorized boats, launched from Center Ditch at Center Parking Lot, to access the hunt areas.

Hunt program history. Migratory bird hunting began in 1965 on Kootenai and was allowed daily through 1969. As its popularity grew, the small hunt area could not sustain the daily hunt pressure and hunt quality suffered. In 1970, waterfowl hunting was restricted to three days per week: Saturday, Sunday, and Wednesday. In 1974, the number of hunt days was increased to the current four days per week: Saturday, Sunday, Tuesday, and Thursday. In the early 1990s the waterfowl hunt area consisted of 926 acres, approximately one-third of the total Refuge. Public waterfowl hunting areas were limited in northern Idaho during the first 30 years of refuge establishment. During the 1990s about half of Kootenai hunters came from the Sandpoint area and 25 percent from Coeur d'Alene, 40 and 90 miles distant, respectively.

In 1974, the Refuge initiated an experimental steel shot program that continued until 1977 and was the only steel shot program in Idaho. In 1978, there was growing acceptance by hunters for steel shot but the Stevens Amendment to the Fish and Wildlife Service appropriations bill for that year required State agency agreement for steel shot program implementation. IDFG chose not to support the use of steel shot until 1986 when national pressure made use of nontoxic shot mandatory. In the early 1980s several changes were made to the hunt program to reduce crippling loss and disperse hunters. A retrieval zone was established in 1981 between the hunting and closed areas where downed birds could be retrieved and establishment of a 25-shell limit per hunter per day. In 1982, volunteers built and placed 18 hunting blinds available to hunters on a first-come, first-served basis. The first youth waterfowl hunt day began in 1996 and averaged between 6 and 20 participants.

Map 11 — *Current Public Use Facilities*



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Beginning in the mid-1990s several wetland acquisition and enhancement projects increased waterfowl habitat in the Kootenai Valley. These included improvements to IDFG McArthur Lake Wildlife Management Area (1,207 acres, 13 miles south of Bonners Ferry), establishment of Boundary Creek Wetland Management Areas in 1999 (1405 acres north of Bonners Ferry near the Canadian border), and The Nature Conservancy's Ball Creek Ranch (2300 acres including 4 miles of Kootenai River frontage 12 miles north of Bonners Ferry). Wetland restoration and upland improvements in these locations have enhanced waterfowl habitats and provided new public hunting access. As a result, birds and hunters have dispersed, reducing hunting pressure on the Refuge.

After 1999, the Refuge changed from a co-op farming program to the current force account program. During the co-op farming, 600 to 700 acres were farmed on the Refuge, with 60 percent being harvested and 40 percent left standing for wildlife. All of the grain on the north end was harvested, which included the closed hunt area, forcing some waterfowl to use the standing grain in the hunt areas. In addition, winter wheat was never left standing, but the waterfowl found some benefit from the harvested fields by gleaning spilled grain. Today, winter wheat and all the other crops are not harvested and all of the acreage is left standing for waterfowl and other wildlife.

Most of the co-op program fields are still in agricultural use today as grassland or part of a grain field/fallow field rotation. In earlier years, wetlands were drawn down and planted to barley (spring planted grain) in the west hunt unit and in a few fields south of the county road. Today the force account program maintains about 200 or more acres of food crops for wildlife through the seeding of winter wheat, spring barley, Proso and Japanese millet, and volunteer winter wheat. None of the grains are harvested or disturbed and we depend on the volunteer wheat every year as part of our base food acres. Crops are planted in the hunt and non-hunt areas, 50 percent in each, providing food in areas open to recreation, but also allowing waterfowl to feed and rest in undisturbed areas.

As the Refuge increased its wetland footprint, the feasibility of co-operative farming became obsolete.

Number of hunters and harvest statistics. Between 1965 and 1969 the number of waterfowl hunters using the Refuge ranged from a low of 35 in 1965 to a high or 504 in 1969. Between 1976 and 1987 hunters per season ranged between one and two thousand (with a high in 1980 of 2,273 hunters) but decreased starting in 1988, exceeding 1000 only in 1991. Since 2005 annual waterfowl hunter numbers ranged between 217 and 500 (RAPP summary). In the 1990s hunting quality was described as good with hunter success exceeding 2 birds per hunter.

Currently, the number of annual waterfowl hunter visits to the Refuge is approximately 500. This level of visitation includes a waterfowl hunt season of about 60 days (only 4 days/week during regular season), a typical hunting party of 2 persons, selecting from up to 18 blinds.

Table 5.2 also shows a declining number of hunting visits to the Refuge's waterfowl hunting program over time, despite increasing participation in waterfowl hunting statewide since the late 1980s (IDFG 2009). Some of this decline may be explained by increased public hunting opportunities and bird dispersal. See Section 5.12.2 of this chapter for trends in participation in waterfowl hunting. A 1999 projection for future participation in outdoor recreation in the Rocky Mountain region, including Idaho, projected a 12 percent increase in the number of participants in hunting activities between 1999 and 2020 (Idaho Department of Parks and Recreation 2007).

Table 5.2. Waterfowl Hunting Summary for 1987 through 1997.

Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
# hunter visits/season	1,088	689	901	936	1021	946	785	536	775	593	554
Peak # per day	67	54	61	90	66	59	63	39	60	43	53
Daily Duck Limit	5	4	4	4	4	4	4	4	6	7	7
Season's average daily bag	2.45	2.14	1.97	1.94	1.97	1.50	1.41	1.56	1.80	2.50	1.75
% of Total Kill Wounded or Lost	21.2	25.4	18.3	20.8	17.3	21.0	21.60	15.70	22.30	20.20	15.40

Harvest information. Review of annual refuge narrative reports and hunting reports show harvest trends for the Refuge's waterfowl program between 1987 and 1997 (Table 5.2). Data were not collected consistently after 1998; therefore harvest information after that time consists of anecdotal observations by refuge staff. While the harvest trends may suggest patterns, many complex variables may be governing the annual harvest of waterfowl. The harvest trends do not account for variability in Flyway populations, daily bag limits, seasonal closures, weather patterns, migration patterns, cropping regimes, and changes in hunt program and/or refuge management. These variables individually, or in tandem, may profoundly change the harvest trends over time. As an example, the daily bag limits for ducks has ranged from 4 to 7 since 1988 (IDFG 2009). During this period, annual waterfowl harvest was largely governed by annual hunting regulations, rather than the abundance or distribution of ducks. The information reported in this section is used to estimate the size, scope, and nature of the refuge hunt program. Only simple data computations have been completed to show simple trend, user, and harvest statistics. Hunting statistics over the years have been gathered and reported in various formats. Incomplete data sets or breaks in the data reported have been omitted from the graphs.

Over the years, the annual harvest of waterfowl has been recorded as birds harvested (ducks and geese) per hunter visit. Data on annual harvest are available for 1965 to 1998 (Figure 5.3). The Refuge's average harvest between 1965 and 1998 was 1.97 birds per hunter.

The annual duck harvest has ranged from 1500 to 2500 birds per year. Generally, the waterfowl harvest has been decreasing since the mid-1990s. Recently, the program averaged 593 birds per year since the 2000 season, but this result is based on very few hunter harvest reports. The refuge waterfowl hunt program harvests a variety of species. Most of the waterfowl harvested from the Refuge are dabbling ducks. Mallard, northern pintail, American wigeon, and green-winged teal are the most commonly harvested species (Figure 5.4). Mallards have comprised roughly 80 percent of waterfowl harvested. A limited number of geese, usually less than 20 (mostly Canada geese) are harvested. In the mid-1980s reduced seasons and bag limits were implemented to protect ducks from overharvest. As populations rebounded, seasons and bag limits were increased in the mid-1990s. Changes in these annual regulations have an influence on the overall annual harvest of these species.

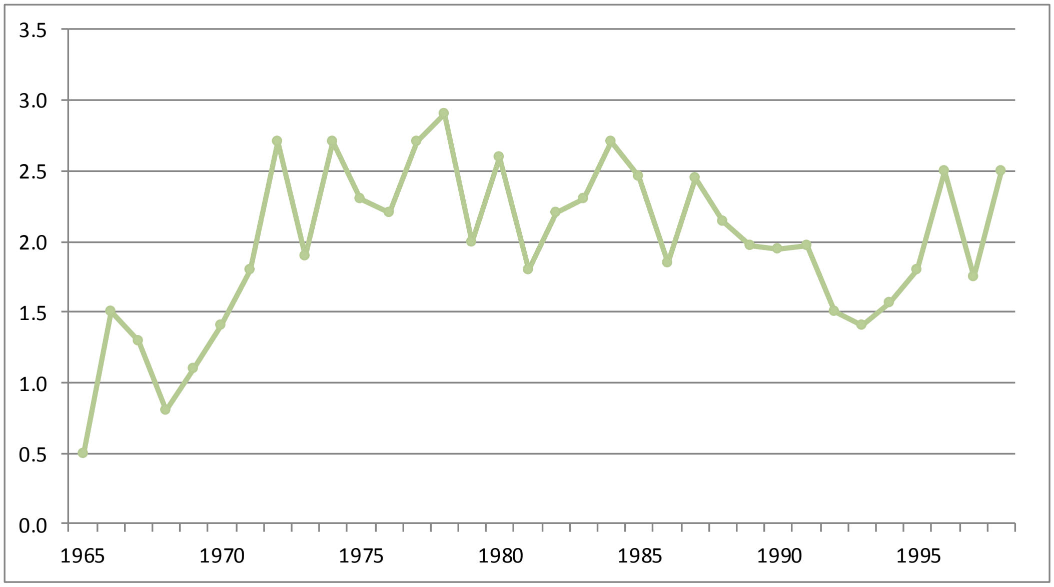

Figure 5.3. Annual harvest of waterfowl per hunter at Kootenai NWR, 1965-1998.

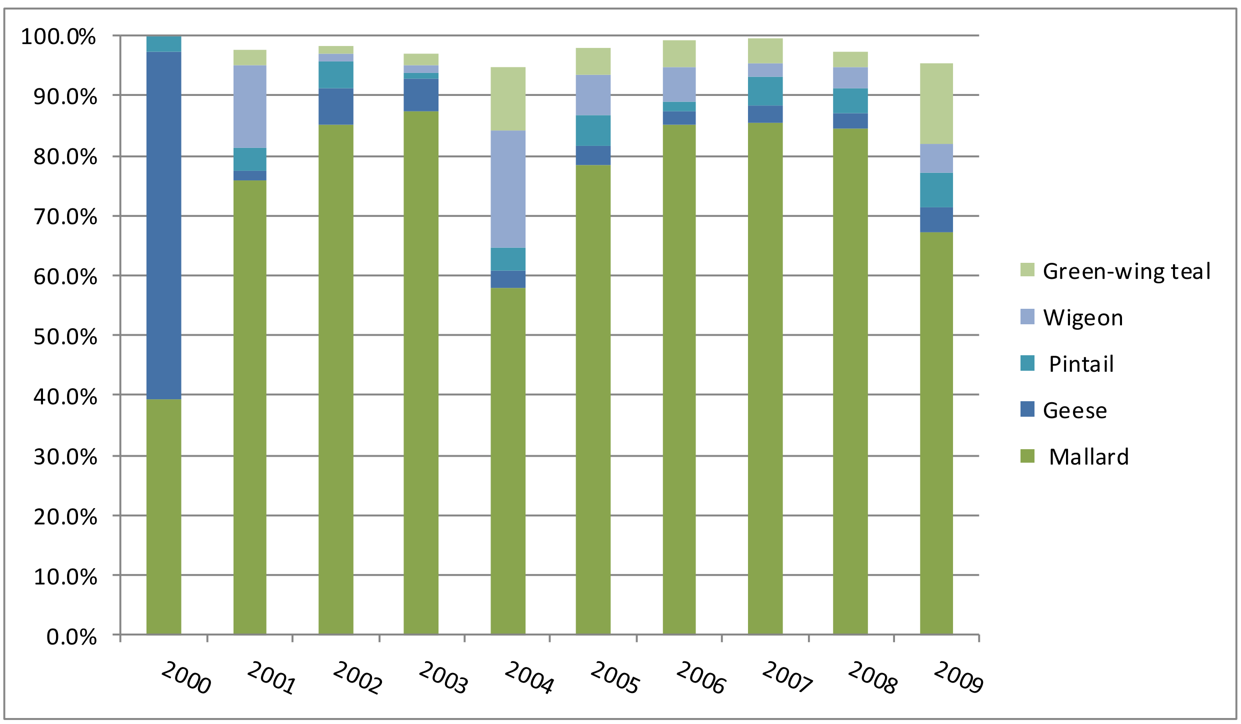

Figure 5.4. Estimated number of waterfowl species harvested at Kootenai NWR (2000-2009).

Current hunt program. Waterfowl hunting (ducks, geese, and coots) is permitted on approximately 740 acres of the Refuge in accordance with Idaho, Federal, and special refuge regulations. Hunting is allowed on Tuesday, Thursday, Saturday, and Sunday during the regular State waterfowl season.

Refuge-specific regulations. The Refuge imposes regulations specific to its hunt program with the intent of maintaining program quality, safety, and equality. These regulations are posted at the refuge headquarters, printed on hunting brochures, and maintained on the refuge website. No permits or fees are required other than a valid State hunting license and a Federal duck stamp. Waterfowl hunters are not allowed to enter the waterfowl hunt area until 3:00 am on a waterfowl hunt day.

Youth waterfowl hunt. Since the 1999-2000 seasons, the USFWS has offered all states the option of holding a two-day youth waterfowl hunt. Pacific Flyway states choosing the option were required to reduce their regular seasons by two days so as not to exceed the 107-day maximum length for migratory bird seasons. States were permitted to hold the hunt outside the regular season framework and regular-season limits applied. The Commission chose to take the option and selected September 30-October 1 for the hunt that was open to youth 12-15 years of age; it also chose full duck (including merganser), coot, and goose limits. In 2006-2007, IDFG estimated that 897 youth hunters participated in this two-day hunt, or about 25 percent of the total number of youth hunters. A youth waterfowl hunt is offered two days a year at the Refuge and usually occurs on the last weekend in September. A total of 18 youth participated in the program in 2002. No application or reservation systems are necessary. Youth must be accompanied by a licensed adult hunter. Retrieving dogs are encouraged to reduce the number of lost birds.

5.4 Big Game Hunting and Upland Game Hunting

The Refuge has allowed big game hunting and upland game hunting since it was established. These were envisioned as relatively small programs getting limited use, since the Refuge had limited areas where these types of hunting could occur, and much larger areas of public lands adjacent to the Refuge are also open to these uses. Compared to hunting opportunities in the local area, the Refuge offers only limited opportunities to hunt big game and upland game.

Facilities. Various parking areas and pullouts on the west side of the Refuge are available for use by big game and upland game hunters. Parking lots include South Pond Parking Lot and the Ole Humpback Trail Parking Lot. Hunters may access the Refuge’s hunt area or to enter adjacent Forest Service lands.

Hunt program history. Hunting programs for resident game were established in 1965. This included local big game species as well as ring-necked pheasants and forest grouse. Hunting was allowed on the entire Refuge including the waterfowl hunt area until 1978. Big game hunting was eliminated in the waterfowl hunt area to prevent serious safety hazards to waterfowl hunters. In 1973, Idaho closed Boundary County to pheasant hunting including Kootenai. While the State has since reopened the county to pheasant hunting, it has not been allowed on the Refuge. Since 1979 these resident hunts have remained the same.

Northern Idaho is featured in national hunting magazines as “the” place to hunt for big game due in part to its abundant public lands. This may explain some of the increased hunting pressure on the Refuge from out of area hunters.

Number of hunters and harvest statistics. Idaho reports high rates of participation in big game hunting (Idaho Department of Parks and Recreation 2007). A 1999 projection for future participation in outdoor recreation in the Rocky Mountain region, including Idaho, projected a 12 percent increase in the number of participants in hunting activities between 1999 and 2020 (Idaho Department of Parks and Recreation 2007). However, little data are available on big game hunting participation on the Refuge. Currently, the number of annual big game and upland game hunter visits to the Refuge is estimated at 300 annually. (RAPP reports between 2005 and 2009 estimate between 250 and 720 days of use by big game hunters.)

Harvest information. Big game hunter use is low and in the mid-1990s included annual visits as follows: approximately 40 for deer, 10 for elk, and 5 for grouse. During that period success was estimated at 3 to 4 deer and 2 to 3 grouse per year. The 2002 narrative estimated use at 25 deer and elk hunters annually.

Current hunt program. Big game hunting for deer, elk, black bear, mountain lion, and moose and upland game hunting for ruffed, blue and spruce grouse are allowed on approximately 295 acres (11 percent) of the Refuge west of the Westside Road and Lions Den Road in accordance with Idaho, Federal, and special refuge regulations. Hunting is allowed during all days of the regular State seasons. There is a half-mile "no shooting zone" near refuge headquarters to protect visitors and employees. Use of nontoxic shot is required for forest grouse hunting.

5.5 Fishing

Fishing is allowed from the banks of Myrtle Creek only, consistent with State fishing regulations. Angling opportunities include rainbow trout (which may be native redband or redband-cutthroat hybrids), whitefish, and non-native brook trout. The federally threatened bull trout also occur in this stream but must be released if caught. Recently, a small number of kokanee have returned to Myrtle Creek as a result of egg planting. The stretch of Myrtle Creek below the county road is degraded due to backwaters of the Kootenai River and probably does not offer good fishing opportunities. The portion above the road is shaded and has good water quality, substrate, and structure (e.g., boulders, large woody debris) and likely offers better opportunities. Until 1970 Myrtle Creek was open throughout the year for fishing but was closed during the waterfowl hunting season. In 1981, the Idaho statewide fishing season for rivers and streams opened the Saturday of Memorial Day weekend and ran through November 30. In 2011, Idaho shifted away from statewide rules toward regional rules and year-round seasons and bag limits. This change reduced the number of exceptions by 33 percent and simplified the rules for the public. As a result, Myrtle Creek is now included in the "All Waters Open All Year" general fishing season (IDFG 2011). Bag limits must meet State regulations.

5.5.1 Number of Visits

Staff estimates that the Refuge has an estimated 50 fishing visits annually. Historically fishing visits rarely exceeded 200 visits per year and was estimated at less than 80 visits since 1985. Most fishing occurs in the fast-flowing upper portions of Myrtle Creek.

5.5.2 Facilities

Trout fishing is very popular in the region, and numerous opportunities to fish for trout and other coldwater species in rivers and streams exist on public lands in north Idaho. Lake fishing is also popular, and several agencies in the area have developed facilities supporting this type of angling, including boat launches, cleaning stations, docks, parking areas, restrooms, and trails within a short drive of the Refuge. The Refuge has no developed facilities specifically for fishing. A parking lot at the Myrtle Creek trailhead serves anglers. A small primitive trail below the Myrtle Creek Trail bridge (unsigned) is used to access fishing on Myrtle Creek.

5.6 Wildlife Viewing and Photography

5.6.1 Number of Visits

Many visits associated with wildlife observation and photography occur along the auto tour route. Use increased gradually with improved directional signs from the highway and local promotion and had grown to 13,600 visitors in 1992. Between August 2009 and August 2010 an estimated 17,000 people drove the auto tour and an unknown number walked, skied, or rode bicycles along the route. The Refuge's Deep Creek Trail, Myrtle Falls Trail, Chickadee Trail, and Ole Humpback Trail are open year-round for wildlife observation; while the Island Pond Trail is open year round except on waterfowl hunt days. At this time most trail use appears to be concentrated on the Chickadee, Deep Creek, and Myrtle Falls trails. Trail counters have proved unreliable recently, but in 2002 trail visits numbered approximately 21,000 for Chickadee Trail and 2,500 on Myrtle Falls Trail.

Currently, the numbers of photographic visits are fairly low. A 1996 refuge compatibility determination estimated 26 annual visits per year. Photographic visits are difficult to quantify since visitors engaged in wildlife observation, hunting, fishing, or education may additionally be taking pictures. Without extensive surveys, the number of photographic visits is a rough estimate based on staff observations. The development of digital photographic equipment may have increased wildlife photography visits on the Refuge in recent years. Visitors also carry cameras or camera phones as part of their recreational equipment. The Refuge also attracts professional or serious recreational photographers using window mounts, high-power lenses, and digital single-lens reflex camera equipment.

5.6.2 Facilities

The auto tour route, photography blind, Deep Creek Trail, Myrtle Falls Trail, Chickadee Trail, Ole Humpback Trail, and Island Pond Trail are maintained to accommodate wildlife observation and photography. The Deep Creek Trail provides opportunities to observe deer, elk, moose, otter, painted turtles, great horned owls and other raptors, and migratory songbirds depending on the time, day, and year. The bridge on the Myrtle Falls Trail offers excellent views of Myrtle Creek, and in September 2008, spawning kokanee can be seen from the bridge. Wildlife observation also occurs from the covered kiosk at refuge headquarters, which is equipped with two spotting scopes and offers good views of several ponds; and the Cascade Pond Overlook on the northwest corner of the Refuge, adjacent to the county road. The design of the overlook (with a slatted fence to break up a human's silhouette) allows visitors to view a variety of wildlife (moose, ducks, geese, and painted turtles) with little or no disturbance to the animals. The close-up views from this overlook also allow good photographic opportunities. The Greenwing Pond photography blind is available to photographers year-round from dawn until dusk and provides a close-up view of ducks, geese, and shorebirds. The trail leading to the blind is located off of the parking lot adjacent to the Environmental Education building.

5.7 Environmental Education

5.7.1 Number of Visitors

The environmental education program at Kootenai provides various programs to students and adults annually. From 2002 until 2009 the Refuge lacked dedicated staff to provide educational programs. In summer 2009, Kootenai had an AmeriCorps member, a rejuvenated Friends group, and other refuge partners who provided education and outreach assistance. Their efforts resulted in the Refuge hosting 1,318 environmental education and outreach participants who enjoyed a range of activities from school field trips, bird walks, various presentations, and hunter education classes.

5.7.2 Facilities

Educational visits are primarily served on the Refuge. Select schools will elect to drive the auto tour route en route back to school. The EE center/barn, auto tour route, trail or viewing site are the primary attractions for educational visits. Greenwing Pond, near the refuge headquarters, was developed as an environmental education study site. Other simple necessities used by educational visits include parking lots and restrooms.

5.7.3 Environmental Education Program Details

The Refuge offers an excellent opportunity for education or interpretation and has an Environmental Education facility on-site. A historic barn was restored in 2003 and is currently available free of charge to school groups and other organizations. Computers with microscopes, educational materials, and videos are available for use. The EEC includes displays of wildlife and waterfowl mounts, antlers, and other plant and animal parts for self-facilitated groups. In the past, refuge staff provided introductory talks, activities for students, and orientation to the Refuge. However, due to staff reductions these programs are limited. The Refuge's EE program is currently teacher-led and no refuge-specific curriculum exists despite increasing demand by local schools for spring visits to the Refuge.

5.8 Interpretation/Outreach

The Refuge has produced and maintains an inventory of general brochures and wildlife checklists. The Refuge's Web site (http://www.fws.gov/kootenai/) is managed by the complex visitor services manager, and maintains current refuge information. Interpretive signage is located at the refuge headquarters in the covered kiosk with spotting scopes; adjacent to the bald eagle nest displayed at headquarters, and along Chickadee Trail; otherwise interpretive signage or alternative means of self-guided interpretation are limited. The refuge manager worked with regional visitor services staff to develop interpretive signs for the new Bonners Ferry Visitor Center. Four signs were installed in 2010 and describe natural history of moose, tundra swan, cougar, and grizzly bear.

Refuge outreach includes off-site talks and presentations upon request. These are conducted by both refuge staff and volunteers. Over the years, presentations have been provided to Boundary County and Bonner County rotary clubs, the Kootenai Valley Resource Initiative committee, Sandpoint Community Hall, and others.

Other special events hosted by the Refuge and the Friends are tailored to all age groups and coincide with current wildlife activities. One of the bigger special events is a migratory bird day program held in early May. This event is especially important because it gives staff an opportunity to explain the history and reason why the Refuge was created.

5.9 Cultural Resources Interpretation

Currently there are no specific cultural or historical resources that are interpreted.

5.10 Nonwildlife-dependent Recreation

5.10.1 Bicycling, Jogging, and Dog Walking

Bicycling, jogging, and dog walking are allowed in some areas on the Refuge. Bicycling is allowed only on the county roads and auto tour route. In the early 2000s refuge staff worked with local service clubs and the county roads program to promote a bicycle route to the Refuge and on the auto tour. This project was completed and signs installed in early 2010 (Figure 5.5). Jogging and dog walking (on leash only) are allowed on the auto tour route and along refuge trails. Waterfowl hunters are encouraged to use retrievers as an effective method of recovering harvested waterfowl. Hunting dogs actively involved with waterfowl hunting during the regular waterfowl hunting season are exempt from the leash regulation, but retrieving dogs must be under their owner's control at all times.

Figure 5.5. New bike route signs installed in 2010.

5.10.2 Cross-country Skiing and Snowshoeing

During winter months the auto tour is not plowed and receives some cross-country skiing and snowshoeing use, as conditions allow. All trails are also open to cross-country skiers and snowshoers, but people must remain on the trails. The only exception is the Island Pond trail that is closed on waterfowl hunt days during the State season (Tuesday, Thursday, Saturday, and Sunday).

5.10.3 Other Nonwildlife-dependent Recreation

Historically the Refuge allowed ice skating, but this use was discontinued. Picnicking is also allowed at a few tables near headquarters.

5.11 Illegal Uses

The Refuge has been negatively affected by trespass into closed areas and waterfowl hunt areas on a non-hunt day, and by vandalism. These illegal uses may occur in any location; however, a problematic site tends to be along the western portion of the Refuge along Westside and Lions Den roads. Illegal uses persist partly because of the remoteness of the site and limited law enforcement capability.

5.12 Area Outdoor Recreational Opportunities and Trends

5.12.1 Nearby Recreational Opportunities

The Refuge, located approximately 5 miles west of Bonners Ferry, Idaho, 40 miles north of Sandpoint, Idaho, and 85 miles from Coeur d'Alene, Idaho is within a reasonable driving distance for recreational day visits. It is also close to, or on routes to and from, major recreational sites in Idaho, Washington, Montana, and Canada including the International Selkirk Loop. This 280 mile/450 km National Scenic Byway transverses portions of Idaho, Washington, and British Columbia and highlights the waterways of the Selkirk Mountains that were historically used for transportation.

There are many opportunities for residents and visitors in northern Idaho to enjoy outdoor recreation, including wildlife-dependent recreation. Nearly 75 percent of Boundary County is public land. More than 485,000 acres (60 percent) of the county is National Forest land where visitors can enjoy hiking, camping, snowmobiling and ATVing, mountain biking, horseback riding, cross-country skiing, big game and upland game hunting, and fishing. Several large lakes in North Idaho (Lake Pend Oreille at Sandpoint, Lake Coeur d'Alene, and Priest Lake near Nordman, ID) offer opportunities for fishing and water-based sports.

Public waterfowl hunting opportunities in northern Idaho are much more limited; however, the State allows waterfowl hunting 7 days per week at the Boundary-Smith Creeks Wildlife Management Area and The Nature Conservancy's Ball Creek Ranch also allows waterfowl hunting. Waterfowl hunting also occurs on private lands. Waterfowl check stations at the Boundary Creek, McArthur Lake, Pend Oreille, and Coeur d'Alene River WMAs on the opening Saturday and Sunday of the 2008 duck season recorded a total of 213 hunters harvested 339 ducks (1.59 ducks/hunter) (IDFG 2008).

5.12.2 Outdoor Recreation Rates and Trends

The Idaho Department of Parks and Recreation produces the Idaho Statewide Comprehensive Outdoor Recreation and Tourism Plan (SCORTP), under the direction of the Idaho SCORTP Task Force. The Task Force consists of representatives from public and private organizations statewide with interest in outdoor recreation. The plan, which is required by the National Park Service (NPS) in order to maintain eligibility for participation in the Federal Land and Water Conservation Fund (LWCF) program, is produced every five years. The plan includes a statewide assessment of outdoor recreation supply and demand, public involvement and a wetlands component. For the latest (2003-2007) SCORTP, the Idaho Department of Parks and Recreation surveyed Idahoans statewide to determine their participation in a wide range of recreational activities, and to get a sense of the public's priorities on issues related to outdoor recreation. In addition, staff reviewed other statewide studies related to outdoor recreation conducted during the past five years.

Trends in visitation observed by refuge staff mirror findings in the 2003-2007 Idaho Statewide Comprehensive Outdoor Recreation and Tourism Plan (SCORTP). While walking was the most popular outdoor recreation activity in both Idaho and the nation, only 64.3 percent of Idahoans walk for exercise or pleasure, compared with 83.8 percent nationally. Idahoans hiked more often,

55.3 percent compared with 33.4 percent nationally. Idahoans participate much more in wildlife-dependent recreational activities than the rest of the nation, especially when it comes to hunting. They hunt big game four times as often. Waterfowl hunting in Idaho is nearly six times as popular as it is nationally. Non-consumptive wildlife activities, such as viewing animals, were also higher than the national average. Many Idahoans share outdoor activities with their dogs. Half of walkers and hikers are accompanied by dogs. About a third of cross-country skiers and snowshoers bring dogs along with them. Not surprisingly, fewer bicyclists are accompanied by dogs, likely because much of this activity occurs on roads where a loose dog may be at risk, and because of the difficulty of controlling a dog while bicycling.

Overall the picture is of a population that retains strong rural/outdoor roots, or was attracted to live in the state because of its excellent opportunities for outdoor recreation. Even though Idaho is not in the sunbelt, from 2000 to 2007, Idaho ranked fifth in population growth due to its appeal to Americans who prefer an outdoorsy lifestyle (Geo Midpoint 2007). This population growth places additional burdens on its natural resources and the agencies tasked with conserving those resources.

In addition to SCORTP, an International Selkirk Loop (ISL) Traveler Conversion Study (Report of Results, July 2009) was conducted in 2008 to measure the effectiveness and return on investment of paid advertising placed by ISL, Inc., and to get more informed on the planning, demographics, activities and travel habits of individuals who inquired about and then visited the Selkirk Loop. Several key findings resulted from this study. The majority of visitors were U.S. citizens, employed, college-educated empty nesters from a high income bracket. Most visitors were from the Pacific NW and California. Of the 4 percent Canadian visitors, over 70 percent were from BC. The majority of visits (54 percent) to the ISL were during the months of April-June and September-October. The average number of loop places visited was 4.2 with 60 percent of visitors traveling to Bonners Ferry, Idaho. Compared to a study conducted in 2006, more visitors were engaging in outdoor activities. Twelve percent said their primary purpose was for recreation/outdoor activities, compared to 7 percent in 2006. Sightseeing, wildlife viewing, photography, and hiking were among the top activities enjoyed by most visitors. Bird watching showed a 3 percent increase from 2006.

The above two studies support findings from the 1999 Idaho Resident and Non-resident Motor Vehicle Travel Study, a comprehensive statewide study of leisure and non-leisure travel, business, convention, meetings and recreation. The 1999 study was conducted to continue the collection and analysis of data collected from the 1987 and 1993 studies on the resident and non-resident personal motor vehicle traveler in Idaho. The study, conducted by the University of Idaho and several partners, looked at 7 travel region destinations in Idaho. The Refuge is located in Region 1, the North Region of the study.

The main activity for the majority of travelers in this study was general leisure (relaxing, enjoying, get away, visiting, etc.) during the 4 seasons sampled. Hunting and fishing were among the top 5 activities (12- 6%) for all seasons. Land-based outdoor recreation activities (ATV riding, mountain biking, motor biking, hiking, riding horses, camping, golfing) were also popular (ranging from 4 to 19 percent) and among the top 5 activities for 4 out 5 seasons. Driving for pleasure (going for a drive, sightseeing, exploring, to access outdoor recreation) ranged from 1 to 4 percent with the majority of this activity occurring during the summer months.

There is a major discrepancy between the estimated number of waterfowl hunters in the 2002 Idaho Recreation Survey and numbers reported by the U.S. Fish and Wildlife Service and the Idaho Department of Fish and Game in their hunter surveys for that year. The SCORTP estimated than more than 160,000 Idaho residents participated in waterfowl hunting in 2002, while the U.S. Fish and Wildlife Service reported sales of 25,000 Ducks Stamps in Idaho that year, and the Idaho Department of Fish and Game estimated 19,000 duck hunters and 12,500 goose hunters for that year based on their telephone surveys (see below; IDFG 2009). The National Survey of Hunting and Fishing reported that the State of Idaho had 27,000 waterfowl hunters, 16 years old or older, in 2006 (the state ranks seventeenth in the nation in waterfowl hunting participation). This raises the question of whether 2002 recreation survey methodology resulted in a higher percentage of hunters being surveyed than are present in the general population, or whether estimated participation is higher than actual participation in multiple categories. The 2002 survey may have captured individuals who formerly hunted but no longer do so. Still, the study does provide a broad basis of comparison of participation in recreational activities.

Table 5.3. Activity Rankings for Selected Outdoor Recreational Activities in Idaho.

Recreation Activity	Percent of ID Adult Residents Participating (2002)	National Participation (2000)	Extrapolated Idaho Participation*
Nature Activities			
Observe wildlife other than birds, fish	51.8	41.9	633,000
Viewing fish	35.9	23.4	439,000
Bird watching	35.9	33.3	439,000
Outdoor photography	33.1	55.1	404,000
Fishing			
Fishing on a river from bank or shore	50.5	30.1	617,000
Hunting			
Hunting Waterfowl	13.1	2.3	160,000
Hunting Small Game	24.8	7.0	303,000
Hunting Big Game (rifle)	34.2	8.2	418,000
Hunting Big Game (black powder)	6.5	--	79,000
Hunting Big Game (archery)	8.1	--	99,000
Team/Individual Sports, Physical Activity			
Walking for exercise or pleasure	64.3	83.	786,000
With a dog	28.8		352,000
Hiking	55.3	33.	676,000
With a dog	25.3		309,000
Bicycling	35.1	25.3	429,000
With a dog	8.2		100.000
Running	20.2	22	247,000
With a dog	9.0		110,000
Cross-country skiing	14.4	3.9	176,000
With a dog	3.3		40,000
Snowshoeing	10.6	3.7	130,000
With a dog	3.1		38,000
Horseback riding	16.1	9.8%	197,000
With a dog	5.5		67,000

(Table includes those recreational activities which are currently allowed on the Refuge)
Source: Idaho participation rates from 2002 Idaho Recreation Survey, reported in Idaho SCORTP (2007). National participation rates from 2000 National Survey on Recreation and Environment, reported in Idaho SCORTP (2007).
*Based on 2001 census data, Idaho residents over age 5: 1,222,000.

Data from the 2000-2004 National Survey on Recreation and the Environment were used by Cordell et al. (2006) to develop tables of estimated participation in the Kaniksu National Forest area, which includes the Idaho Panhandle and adjacent areas of Washington and Montana. Data for participation in selected activities are shown in Table 5.4 below.

Table 5.4. Participation in Selected Outdoor Recreational Activities in the Kaniksu National Forest Area.

Activity	All Ages %	All Ages #
Nature-Based Land Activities		
Day hiking	52.1	418,325
Mountain biking	29.4	236,057
Hunting (any type)	22.4	179,628
Big game hunting	21.1	169,161
Horseback riding on trails	13.0	104,241
Small game hunting	12.6	101,140
Migratory bird hunting	5.8	46,713
Viewing/Learning Activities		
View/photograph natural scenery	77.0	617,756
View/photograph birds	40.9	328,032
View/photograph other wildlife	64.7	518,753
View/photograph fish	32.3	259,102
Developed-Setting Land Activities		
Walk for pleasure	86.0	689,765
Bicycling (any type)	46.8	375,397
Water-Based Activities		
Freshwater fishing	41.2	330,352
Snow/Ice-Based Activities		
Cross-country skiing	10.3	82,841

Source: Cordell et.al. 2006. Table includes those recreational activities which currently or formerly occurred on the Refuge.)
Kaniksu NF local area: 18 counties in north Idaho and adjacent Washington and Montana, 16 and older population: 802, 329 (2004 Census estimate). Percentages were rounded after the number of participants was derived.

Table 5.5. Participation in Wildlife-Dependent Recreational Activities in Idaho, 2006.

Activity	Idaho Residents	Nonresidents	Residents and Nonresidents
Observe wildlife (away from home)	175,000	265,000	441,000
Observed, photographed, fed birds	157,000	243,000	400,000
Observed, photographed, fed large land mammals	160,000	259,000	419,000
Freshwater Fishing	206,000	144,000	350,000
Rivers and Streams	132,000	107,000	240,000
Trout fishing	162,000	96,000	258,000
Photograph wildlife (away from home)	110,000	156,000	266,000
Big game hunting	108,000	52,000	160,000
Deer	--	--	119,000
Elk	--	--	103,000
Wild turkey	--	--	25,000
Small game hunting	28,000	27,000	55,000
Grouse	--	--	23,000
Migratory bird hunting	22,000	*	42,000
Waterfowl hunting	--	--	27,000

Source: 2006 National Survey of Fishing, Hunting, and Wildlife Associated Recreation-Idaho (USFWS, U.S. Census Bureau 2008); Activities are ranked by popularity, in descending order
*Sample size too small to report data reliably
--Residents/nonresidents grouped in these data sets

Forecast of future regional recreation demand and key recreation needs. Although the 2002 Idaho Outdoor Recreation Survey established baseline data for recreational activities in the state, trend data have not yet been developed. Bowker et al. developed projection models for the publication *Outdoor Recreation in American Life: A National Assessment of Demand and Supply Trends* (1999). It is the only ongoing, comprehensive assessment of outdoor recreation trends in the country. The researchers created models based on today's behavior as sampled through the National Survey on Recreation and the Environment. The following activity participation projections from that study are for the Rocky Mountain Region (state-by-state projections are not available).

Although projections should be viewed with caution, it seems likely that demand for many outdoor activities generally permitted on refuges will continue to increase over the next decade. Based on the 2002 Idaho recreation survey, walking, bicycling and recreation with dogs are increasing in popularity, and this trend is expected to continue long-term.

Table 5.6. Participation Projections for Selected Outdoor Recreation Activities in the Rocky Mountain Region.

Activity	2010	2020
Wildlife-related Activities		
Non-consumptive uses	+20%	+30%
Hunting	+5%	+12%
Fishing	+16%	+26%
Dispersed Land Activities		
Hiking	+15%	+24%
Horseback Riding	+13%	+23%
Developed Land Activities		
Walking	+18%	+28%
Biking	+17%	+26%
Picnicking	+18%	+28%
Winter Activities		
Cross-country skiing	+31%	+41%

Source: Bowker et al. 1999.

Trends in waterfowl hunting in Idaho. The number of duck hunters in Idaho declined in the 1980s, due to declines in duck populations due to low nesting success, and consequently more restrictive seasons and bag limits. As duck populations recovered, hunters returned to the sport, though not in the numbers seen in the 1960s and 1970s. Overall, number of waterfowl hunters in Idaho has increased since the late 1980s. A near doubling of the length of the duck season in 1995-1996, from 59 days in 1990 to 107 days in 1996, as well as more liberal daily bag limits (from 4 ducks in 1994 to 7 ducks from 1996 on) led to larger numbers of ducks harvested, as well as increasing numbers of participants in waterfowl hunting. Although the length of the goose season and bag limits increased only slightly in the same period (from 93 days in 1990 to 107 days in 2003, daily bag limit from 3 to 4 geese) goose harvests also rose significantly. Numbers of Duck Stamps sold in Idaho rose from approximately 17,000 in the late 1980s and early 1990s, to approximately 25,000 in the early to mid-2000s. Harvests rose from 113,000 ducks and 27,000 geese in 1988, to more than 200,000 ducks and 75,000 geese in the mid-2000s (Table 5.7, IDFG 2009).

Table 5.7. Estimated Waterfowl Harvest Numbers from USFWS's Waterfowl Hunter Survey for Idaho, 1988-2006.

Year	Duck stamps sold	Estimated adult hunters	Total geese harvested	Total ducks harvested[a]
1988	16,597	14,271	26,600	112,900
1989	16,894	14,073	30,500	119,600
1990	17,036	13,443	36,800	96,700
1991	17,151	14,144	39,500	117,880
1992	17,717	14,132	31,700	126,700
1993	21,761	17,972	45,600	153,200
1994	21,229	17,418	61,100	141,300
1995	21,097	18,395	46,900	203,400
1996	22,382	19,751	61,100	245,800
1997	23,697	22,241	40,700	248,600
1998	23,515	21,006	56,700	254,700
1999	26,709	20,795	28,500	228,300
2000	28,206	23,306	86,200	173,200
2001	26,173	12,000/14,900[b]	64,400	138,600
2002	24,937	14,500/9,900[b]	36,700	160,600
2003	24,878	18,200/15,400[b]	84,200	262,900
2004	24,320	17,100/13,300[b]	62,700	188,500
2005	23,724	18,500/16,000[b]	74,300	258,300
2006[c]	25,726	18,400/14,500[b]	77,800	278,000

Source: Idaho Department of Fish and Game 2009
a Adjusted for exaggeration memory bias and juvenile hunter density.
b The first number is estimated number of duck hunters and the second number is estimated number of goose hunters.
c Preliminary estimate July 2007.

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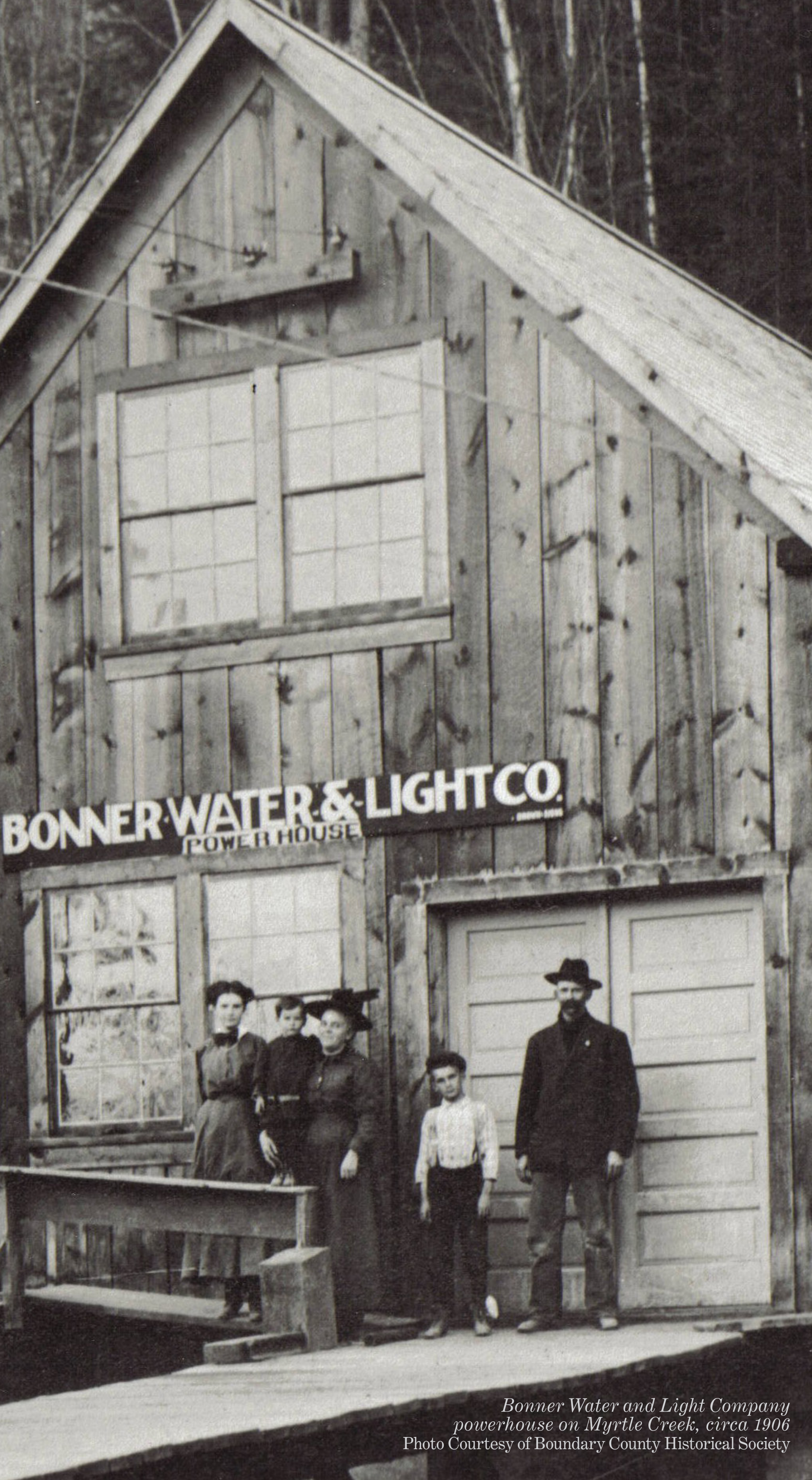

Bonner Water and Light Company powerhouse on Myrtle Creek, circa 1906
Photo Courtesy of Boundary County Historical Society

Chapter 6 Cultural Resources and Social/Economic Environment

Chapter 6. Cultural Resources and Social/Economic Environment

6.1 Archaeological and Cultural Resources

An abundance of fish and game attracted early peoples to the Lower Kootenai River valley, including the area that would eventually become the Kootenai NWR. The region later attracted early British and American explorers and traders, and eventually miners, loggers, and farmers intent on making a living—and perhaps a fortune. This section presents a brief outline of the Refuge's rich history and cultural heritage.

Archaeological and other cultural resources are important components of our nation's heritage. The Service is committed to protecting valuable evidence of plant, animal, and human interactions with each other and the landscape over time. These may include previously recorded or yet undocumented historic, cultural, archaeological, and paleontological resources as well as traditional cultural properties and the historic built environment. Protection of cultural resources is legally mandated under numerous Federal laws and regulations. Foremost among these are the National Historic Preservation Act (NHPA) as amended, the Antiquities Act, the Historic Sites Act, the Archaeological Resources Protection Act (ARPA) as amended, and the Native American Graves Protection and Repatriation Act (NAGPRA). The Service's Native American Policy (1994) articulates the general principles guiding the Service's relationships with Tribal governments in the conservation of fish and wildlife resources. Additionally, the Refuge seeks to maintain a working relationship and consult on a regular basis with the Tribes that are or were traditionally tied to lands and waters within the Refuge.

Since cultural resources encompass many elements and time periods, the following simple temporal divisions were used to distinguish and categorize this brief review of the following resources:

- Pre-recorded history
- Pre-Contact Native American traditions
- Post-Contact traditions (Native American, early British and United States)
- Recent U.S. settlement and economic development period
- Historic and prehistoric sites on the Refuge

6.1.1 Pre-recorded History

Around 15,000 B.P., lobes of the Cordilleran ice sheet extended down the Purcell Trench. The Purcell Trench was ice free by about 11,200 B.P., and near-modern river levels were attained by 9,370 B.P. (Gough 2001). Although people have probably occupied the Purcell Trench since the end of the last Ice Age, no buried PaleoIndian site with reasonably intact deposits has been discovered in the region; probably because an inadequate sample of landforms of sufficient antiquity have been examined. Most archaeological surveys have been located on floodplain and alluvial terrace settings where preserved sediments of early age and context may occur infrequently, if at all. Large lanceolate and stemmed lanceolate projectile points typify the Early Prehistoric Period (10,000-7,000 B.P.). Miss and Hudson (1986) described surface finds of projectile points from 10 sites around Lake Pend Oreille, several of which suggested "considerable antiquity." Recently two radiocarbon dates of ca.

11,000-10,000 years associated with obsidian debitage were obtained from a site in the area but the results have not been published (Roll and Hackenberger 1998: 123).

During the Middle Prehistoric Period (7,000-1,500 B.P.) a change from a continental to a maritime climate led to an expansion of forests in the region, and presumably, shifts in species of game utilized, and hunting techniques. Projectile point styles changed to two basic patterns: triangular side notched and lanceolate unnotched. Lanceolate indented-base points, which appear about 5000 B.P. is much of western North America, appear in a number of excavated sites in the Kootenai-Pend Oreille region. Corner-notched points also appear frequently. In the eastern Plateau these are treated as markers of the terminal Late Middle prehistoric period, but without corroborating evidence they provide a poor basis for assigning chronology or cultural affiliation (Roll and Hackenberger 1998).

The introduction of the bow and arrow, as indicated by small side-notched and corner-notched projectile points, marks the beginning of the Late Prehistoric Period (1,500-250 B.P.) in the eastern Plateau (Carley and Sappington 2005).

6.1.2 Pre-Contact Native American Traditions

The Refuge is within the area occupied by Kootenai-speaking people at the time of Euro-American contact. The area included the entire Kootenai River basin in what is now eastern British Columbia, eastern Montana, and north Idaho (Brunton 1998). The Kootenai language is an “isolate”—it is not known to be related to any other language. It has been proposed that Kootenai (also spelled Kutenai or Ktunaxa) is related to the Salishan languages but the relationship if any, is distant (Morgan 1980). There were two dialects spoken, Upper (upriver) and Lower (downriver), which differed mainly in lexicon (Garvin 1948).

Social and political organization: Bands were the units of primary social and cultural significance. Usually each band was identified by name with a winter village site on the Kootenai River and its adjoining territory. These villages were composed of 150 to 200 people divided among approximately 10 lodges (Schaeffer 1935 in Brunton 1998).

At contact, beginning about 1800, the Kootenai were divided into six bands (see Table 6.1) (Schaeffer 1935 in Brunton 1998). The Upper Kootenai comprised four bands, while the lower Kootenai, the *?a:k’aqlahalxu* or “meadow people,” included both the Bonners Ferry band and the Lower Kootenay band at Creston, BC. The name “meadow people” derives from the historically swampy nature of the lower Kootenai valley where these Kootenai reside.

Currently, the seven bands of the Kootenai (or the Ktunaxa Nation as they call themselves in Canada) are distinguished by the location they historically inhabited during the winter months and consist of five Canadian bands (including the Shuswap Band at Invermere, BC, descendants of a North Thompson Band Shuswap family that immigrated to the Ktunaxa territory almost 200 years ago), and two bands residing in the U.S: the Kootenai Tribe of Idaho at Bonners Ferry, Idaho, and the Ksanka Band at Elmo, Montana, part of the Confederated Salish and Kootenai Tribes of the Flathead Reservation (see Table 6.1) (Ktunaxa Nation 2005). copyright 2005 Ktunaxa Nation, URL: http://www.ktunaxa.org/fourpillars/land/index.html#

Table 6.1. Historic and Modern Kootenai (Ktunaxa) Bands.

	Kootenai Bands ca. 1800 (Source: Schaffer 1935 in Brunton 1998)	**Modern Kootenai Bands (Source: Ktunaxa Nation 2005) http://www.ktunaxa.org/fourpillars/language/faqs.html**
Upper Kootenai	Libby-Jennings band *?a:kiynink*	Ksanka Band (Confederated Salish and Kootenai Tribes of the Flathead Reservation) *kupawicq'nuk*, "people of the standing arrow," Dayton, Elmo, Big Arm, and Nairada, Montana
	Tobacco Plains band *?a:kanuxunik*, "people of the current"	Tobacco Plains Band *?akink'umlasnuqli?it* Near Grasmere, BC
	Saint Mary's/Ft. Steele band *?a:gamnik'm,* "people of St. Mary's River"	St Mary's Band *?aq'am* Near Cranbrook, BC
	Columbia Lake band *?a'kisqnuk'nik'*, "people of two lakes"	Columbia Lake Band *?akisq'nuk* South of Invermere, BC
		Shuswap Band *kyaknuqli?it* Invermere, BC
Lower Kootenai	Lower Kootenai *?a:k'aqlahalxu*, "meadow people"	Lower Kootenay Band *yaq'an nu?kiy*, "the place where the rock is standing," near Creston, BC
		Kootenai Tribe of Idaho *?aq'anqmi*, Bonners Ferry, Idaho

Kootenai society had four social ranks: *nasu?kin,* "band or village leader;" *kwanaqnamik,* "warriors;" *knupqaqaqa,* "those with power from a vision" (which included most people); and *?umacini*, "those without power," who were thought of as very unfortunate.

According to Schaeffer, when the Kootenai bands were in their winter villages, each was under the relatively informal leadership of a *nasu?kin*. This respected man coordinated day to day band activities, used his prestige to maintain order, and met with a council to make band decisions. He also chose village sites, and upon his death the entire band moved to a new location (Boundary County Historical Society 1987). The village leader position was usually hereditary but in some cases was elected by the village council (Boas 1890). According to one Bonners Ferry informant, the status of village leader did not exist before the coming of the Whites (Schaeffer 1935). The *nasu?kin* also appointed temporary leaders to supervise specific activities: a "travel leader" (*yakasin*) with an extensive knowledge of trails and campsites to oversee moves between summer and winter camps; fishing leaders; waterfowl hunting leaders; and deer or (in the case of the Upper Kootenai) bison hunting leaders.

<u>Population at time of Euro-American contact</u>: Before contact with non-Indians, the Kootenai living in Montana, Idaho, and Canada may have numbered over 10,000. Smallpox and other disease struck the Salish and Kootenai by at least the early 1780s, and during the 1800s waves of diseases repeatedly swept through the area. Curtis (1911) reported that smallpox first attacked the tribes of this region in 1780-1781, when it appeared among the Blackfeet. This was about the time the

Blackfeet appeared on the Montana prairies, and it is likely that the disease was communicated from them to the Tunaha (a Salishan tribe), from whom it passed to the *?a:kiynink* band of the Kootenai, and possibly to other bands.

Curtis's informants believed that at the beginning of the historical period the Kootenai numbered seven hundred lodges, or about five thousand persons (Curtis 1911). By 1890, after smallpox and other diseases had ravaged the tribes, the census reported a total of four hundred to five hundred Kootenai in Idaho and Montana. From this low ebb, the Tribe began to recover. Official reports for 1908 estimated the Tribe's population at 1,120 with 513 at the Kootenay Agency in British Columbia and 606 at the Montana Agency. However, Curtis disagreed with this estimate, doubting that the number of Kootenai on the Flathead Reservation exceeded 100. Curtis estimated that in addition to the Kootenai living on the Flathead Reservation, approximately a hundred Kootenai resided in Idaho and 515 in Canada, putting the tribal population at approximately 700.

<u>Subsistence and Seasonal Movement Patterns</u>: For much of the year the Lower Kootenai lived in conical lodges, consisting of a pole framework covered with mats made of bulrush. Ethnographers also described larger winter houses, dug about a foot into the ground, and also covered with bulrush mats (Magocsi 1999).

The Kootenai who lived in the vicinity of modern-day Bonners Ferry drew much of their subsistence from the Kootenai River and floodplain wetlands and not surprisingly, were "expert boatmen." Both they and the Kalispels, their neighbors to the south, built distinctive shovel-nosed bark canoes. The canoes were first described by David Thompson, who wrote in 1808: "The Lake Indians all make use of canoes in the open season, made of the bark of the White Pine, or of the Larch.… The inner side of the bark (that next to the Tree), is the outside of the Canoe, they are all made of one piece, are generally eighteen to twenty feet in length by twenty four to thirty inches on the middle bar, sharp at both ends" (Thompson 1916). In the early 1900s, Edward Curtis noted that this flat-bowed bark canoe had been "the commoner form of craft" among the Kootenai, and that this form was "still seen among the Kalispel" hinting that it may have fallen into disuse among the Lower Kootenai by that time. Among the Kootenai in Montana, he photographed a different type of canoe, with "a skeleton framework and a covering of fresh elk-hides sewn together and well stretched, which dried stiff and hard. This formed a remarkably seaworthy craft, very wide of beam and so bulging amidships.… The Kutenai made dugouts of cottonwood logs only after steel axes were acquired." The Kootenai were also adept in the manufacture of fishing gear, including traps, fish spears, and nets and lines made from the fibers of "Indian hemp" (*Apocynum cannabinum*). Since individual fibers could be two feet long or more, cordage made from this plant was extremely strong and durable. Large flight nets of the same material were also used to capture ducks and coots. Snowshoes were also manufactured, which allowed the Kootenai to hunt deer and other big game in winter.

Unlike the Kootenai in Montana who travelled to the plains to hunt bison, the Kootenai living on the lower reach of the river obtained most of what they needed from the rivers, lakes, and marshes of the valley. Horses were less important to the Bonners Ferry band than they were to the Kootenai living in Montana, who depended more on buffalo. Little Big Blanket (Three Moons), who was born about 1740, is said to have been the first Kootenai chief of the Bonners Ferry band to own horses (Bonners Ferry Historical Society 1987).

The Kootenai moved seasonally over a large territory. The seasonal round began in the early spring when they travelled to fishing grounds. There the Kootenai caught bull and cutthroat trout, kokanee, sturgeon, and whitefish using hook and line, or harpoons with detachable barbless points. They also set traps and weirs in streams. In early May, as the fishing season came to a close, the harvest of bitterroot, camas and other roots began. The camas ground near Cusick was in Kalispel territory, but the Kootenai also gathered camas there.

From mid to late summer the Kootenai harvested service berries, chokecherries, huckleberries, and other fruits. When fall approached, some of the Kootenai organized communal deer drives. The Kootenai also hunted elk, moose, caribou, bighorn sheep and bear, and birds such as grouse, geese, and ducks. Duck meat was dried and the skins carefully saved and rendered for their rich fat. The ethnographer H. H. Turney-High (1941) wrote that the Kootenai "considered their land a fortunate one wherein any industrious man could get plenty to eat for himself and [his] family."

Figure 6.1. Kootenai sturgeon-nosed canoe.
Photo ca. 1900, courtesy Boundary County Historical Society.

6.1.3 Post-Contact Traditions

The fur trade era. The first written mention of the Kootenai comes from Alexander Mackenzie of the North West Company, who travelled to the Pacific Ocean in 1793, apparently through Kootenai territory. The name "Cattanahowes" appears on a map he produced in 1801. In the summer of 1807, David Thompson, also of the North West Company, founded "Kootenae House" north of Lake Windermere in present-day British Columbia, establishing trade with the northern bands of Kootenais. This effectively began the fur trade in a broad swath of territory including north Idaho, northwest Montana, eastern Washington, and south-central British Columbia (Magocsi 1999). The fur trade had a profound impact on the traditional way of life, as it emphasized the privatization of resources, and altered the balance of wildlife resources. The fur trade, along with the introduction of horses and firearms, increased economic competition (and at times conflicts) between tribes, particularly between the Kootenai and Salish peoples and the Blackfeet to the east. It also sped the introduction of European religions (Confederated Salish-Kootenai Tribes 2000).

From Kootanae House, Thompson began sending gifts of tobacco south to the Flathead (his name for Salish peoples) and related tribes, calling on them to bring their furs in to trade. In mid-September, 1807, 12 men and one woman from a band of Kootenai who lived to the south and west (whom he called Flat Bows) came to visit, carrying small packs of furs to trade. They had never seen a white man before. They told Thompson that no elk or moose lived in their country, but sturgeon and berries were plentiful, and beaver abounded.

Thompson noted that "these People hunt on the Lands adjoining the Ear Pendant [Pend d'Oreille] Indians." Thompson realized that the Bitterroot Salish, Kalispel/Pend d'Oreille, and Spokane tribes spoke a common Salish language, formed a powerful political entity in opposition to the Blackfeet, and that the lands they occupied could provide a potentially rich source of beaver pelts (Nisbet 2009). Guided by the chief of the Flatbows, Ugly Head, he tried to follow the Kootenai River to meet the Pend d'Oreilles in late fall 1807. He had to turn back well short of his destination due to the oncoming winter.

Thompson tried again in the spring of 1808. He set out from Kootenae House on April 20, reaching Kootenay Falls on May 6. On May 8, he reached a camp of 10 Kootenai and Flathead lodges (Thompson's name for Salish) near present-day Bonners Ferry (Thompson 1916). Therefore, he and his party became the first Euro-Americans known to have visited the lower Kootenai River valley. The Kootenais were recovering from a recent fight with the Piegans during a hunting trip. The Piegans had captured 35 Kootenai horses, completely disrupting the spring hunt. Consequently the people had little food to offer Thompson, but shared what they had—sucker fish and a "bread" made of black goatsbeard lichen baked in a pit oven. But by the next day things were looking up when hunters brought in a *chevrueil* [mule deer] (Nisbet 1994).

Thompson continued downstream (north) on May 13, and reached Kootenai Lake in present-day British Columbia the following day. Here he encountered the Flat Bows (Lower Kootenais). Although they spoke the same language as the Kootenai living to the east, their lifestyle was quite different. Horses were of little use in their wet, wooded country. Instead they relied on canoes, and used dogs as pack animals when necessary. Their conical lodges were covered with bulrush mats rather than buffalo skins, and dried fish—not buffalo or elk—was their staple food. Individuals might travel east to hunt on the plains, but for the most part they obtained everything they needed from their own marshy country. Thompson called them "lake Indians." Indeed, the Flatbows spent so many hours in their canoes that Thompson noted that their legs were bent inward (Nisbet 1994).

Encountering high waters from the spring snowmelt, Thompson returned upriver (south) back to the Indian camp at Bonners Ferry, having engaged a canoe and two Indians as guides, to take them over the "overflowed meadows," avoiding the river itself, which was running so fast as to be "unnavigable." From the Indian camp, he went northwest up "McDonald's" or Moyie River, reached present day Ft. Steele on May 18, and Kootenae House on June 5 (Thompson 1916). Before he left, he established a makeshift post at the Bonners Ferry camp and left a voyageur named Joseph Beaulieu to man it. The location was strategic, since here a major Indian trail, which Thompson called "The Great Road of the Flat Heads," led south.

In 1809 he mounted another expedition, waiting until late summer to travel, when the rivers were low. Thompson reached the Kootenai Plains on August 3 and started west on horseback on August 8. On August 13 he reached the Columbia, and ascended it as far as McGillivray's Portage, which he reached on August 20. Then he descended the Kootenay River, and on August 29 reached the Great Road of the Flatheads, where he had come to Indian camp in the spring of 1808. Having obtained horses from the Indians, whom he called "a mild intelligent race of men: in whom confidence could be placed," he set out toward the south on September 8, pronouncing "the Road and Country good." The next day he arrived at the mouth of the Clark's Fork, where it empties into the Lake Pend Oreille. Here he found a large Indian camp, including "54 Saleesh, 23 Skeetshoo, and four

Kootenaes," 80 men and their families in all. Here he built Kulyspell House on a peninsula on the east side of the lake (Thompson 1916). Thompson continued on, building Saleesh House near Thompson Falls, Montana in November 1809; and Spokane House near Spokane, Washington in the summer of 1810 (Nisbet 2009a,b). From Spokane House, Thompson's party proceeded down the Columbia River to the Pacific Ocean, which they reached on July 15, 1811 (Oldham 2003). However, none of Thompson's establishments lasted for more than a few seasons on their original sites; all except Kullyspel House were eventually moved, rebuilt, and expanded (Nisbet 2009b).

A small outpost on the Kootenai River, a few miles northwest of present-day Bonners Ferry, was also maintained for a time between 1810 and 1812 by Michel Kinville, a bilingual employee of the North West Company (Idaho State Historical Society 1970). The location has not been determined but Elliott (1926) places it where Deep Creek empties into the Kootenai River. Therefore, there is the possibility that the post was located on the present-day Refuge. The post was referred to as "Kinville on McGillivray's River." The post was short-lived; on Nov 14, 1811 Thompson ordered Kinville to abandon the post and move his goods to Spokane House (Meyers 1919). This post is not be confused with "Lake Indian House," established on the Kootenai River near by another of Thompson's employees, Finan McDonald (Meyers 1922). Although Meyers described Lake Indian House as being located "below Bonners Ferry," a more likely location is near the Idaho-Montana border near present day Leonia, ID (Potucek 2003). The merger of the North West Company and the Hudson's Bay Company led to a reorganization of the fur trade, and a concentration of trading and trapping activity in the Snake River country of southern Idaho (Brosnan 1918:72).

In the 1840s Catholic missionaries traveled through the area and introduced the Kootenai Indians to Christianity. In the fall of 1844, Kootenai Chief Blind met the Catholic priest Peter DeSmet on his visit to the Kootenai valley. Chief Blind and many of his band were baptized, and given Biblical names. He was thereafter known as Chief Thomas (Tomas) Blind (Boundary County Historical Society 1987). However, the Kootenai mission was abandoned only two years later because spring flooding made farming (which DeSmet considered essential to the enterprise) difficult (French 1914). In 1888, a log mission church was erected on the south end of Long-Arm Island ("Mission Hill") along the Kootenai River. Later named St. Michael's and rebuilt several times, the church became a focus of the Kootenai community.

Tribal treaties. In July of 1855, Governor Isaac Stevens of Washington Territory met with the chiefs of the Salish, Pend d'Oreilles, and Kootenai near present-day Missoula to negotiate a treaty between the Tribes and the United States government. Stevens presented the assembled Indians with an agreement whereby the Kootenai and Pend d'Oreilles would live on the Jocko Reserve (now called the Flathead Reservation, home to the Confederated Salish and Kootenai Tribes). But only one band of the Kootenai was party to the treaty. The Kootenai living in north Idaho claimed that they had not been represented in the negotiations, and refused to move onto the reservation.

Euro-American settlement of north Idaho increased with the discovery of gold in British Columbia in 1863, and the completion of the Northern Pacific Railroad in 1884. With the increased ease of transportation, settlers began moving in to the area, causing conflicts with the Kootenai Indians over land use and property rights. In 1889, an Army officer was sent to offer the Bonners Ferry Kootenais a choice between allotments of land in the valley or residence on the Flathead Reservation (Illustrated History of North Idaho, 1903). Most chose to stay. Assisted by the U.S. Indian agent from the Flathead Agency, they applied for allotments (U.S. Office of Indian Affairs 1895).

The July 25, 1891 *Kootenai Herald* reported that "Lieutenant Hardiman, of the 4th Cavalry, with a detachment of 14 mounted troopers is enroute from Fort Sherman [at present day Coeur d'Alene, Idaho] to the scene of the Indian troubles on the Kootenai River. They have instructions from headquarters to investigate the matter, and protect the settlers if necessary. They passed through town to-day." In his 1891 report to the Secretary of War, Brigadier-General August V. Kautz wrote of the "repeated troubles between Indians and white settlers in the Kootenay River country. The Indians in that section seem to be unprovided with an agent, and have no one to look to for aid or counsel. In the near future a great increase in the number of settlers in that section will precede the building of the Great Northern Railroad, and trouble will follow unless some provision is made in anticipation" (US War Department 1892). An 1894 government report discussed the "trouble." A special agent of the U.S. Office of Indian Affairs (OIA), who had been sent to investigate, found that Indian land claims "had been trespassed upon by whites, and the Indians deterred from attempting to improve and cultivate some of the land they had always used and occupied, and to which they were justly entitled under the general allotment act" (U.S. Office of Indian Affairs 1895).

At the OIA's request, the General Land Office surveyed the township in which the disputed lands were situated, and adjusted the allotments to conform to the public survey. Patents were issued for the allotments, and, on August 14, 1894, were transmitted to the Coeur d'Alene land office for delivery to the allottees. The application for Arthur Frye, covering the lands upon which the town of Bonners Ferry was located, was relinquished, ending "a long and bitter contest." At this time, a small number of Bonners Ferry Kootenai moved to the Flathead Reservation, Montana, while others who claimed to be Canadian Indians moved to Canada. The report concluded that "the Kootenai question and troubles seem to have been finally and permanently settled" (U.S. Office of Indian Affairs 1895).

However, there were delays in the Kootenai getting legal title to their allotments. By 1897, only "tentative allotments" had been made (US Office of Indian Affairs 1907) and the OIA urged immediate action. Most allotments not made until 1907 and 1908, more than a decade after the matter had been "permanently settled." In total, the Federal government set aside 8,000 acres for the Kootenai, with each recognized member receiving a plot of 160 acres. Most of the Kootenai tribal allotments were on the east bank of the Kootenai River. Land records show that in 1908 two allotments, totaling approximately 150 acres, were made to Moshell and Ann Temo at the confluence of the Kootenai River and Myrtle Creek (the northwest corner of the present-day Refuge). Adjacent and to the east of these allotments, two allotments were made to Kootenai people who had registered at the Colville agency, Mary Ewing and William Manning (Bureau of Land Management 2010). Mary Ewing and William Manning were given fee title to these allotments a few years later, but the allotments eventually passed out of Indian hands. Approximately 2,500 acres of the Kootenai tracts were sold and other smaller allotments (5 acres per recognized member) were created in Idaho under the Act of March 11, 1926 (see below) (Indian Land Tenure Foundation 2008).

Figure 6.2. Kootenai people that attended conference with Capt. John Webster, Bonners Ferry, Idaho, May 31, 1911.
Moshell Temo, who had an allotment on the present-day Refuge, appears in the back row, third from left; his wife Ann is third from right. (Glenbow Museum Archives, Image No: NA-1957-1)

In 1934, the Idaho band of Kootenai had the opportunity to become a tribe under the Indian Reorganization Act (IRA). Two delegates from the Kootenai Tribe, along with delegates from three other tribes (the Nez Perce, Coeur d'Alene, and Kalispel), attended a conference on self-government held in March 1934 in Chemawa, Oregon. An article from the March 7, 1934 *Spokesman-Review* reported: "Indians to attend confab. - Delegations from four tribes to go to Oregon Wednesday. - Accompanied by members of Indian tribes of this region, A. G. Wilson, superintendent of the Coeur d'Alene Indian agency, will leave here Wednesday for Chemawa, Ore., to attend a conference on self-government and communal land tenure.… The new set-up, provided in a bill before congress, [Coeur d'Alene agency superintendent A.G.] Wilson said, would include the Indians' own courts and own government, plus tribal ownership of lands instead of ownership under individual allotments. The land provision is designed to prevent the Indians losing their lands through heirship division into unworkably small units that would pass through sale or lease to the whites." However, the Kootenai voted not to become an IRA tribe, believing that there were too many constraints on their sovereignty.

The Kootenai Tribe of Idaho obtained Federal recognition when its adult members ratified a constitution and bylaws on April 10, 1947. These were approved/signed by the Acting Commissioner of Indian Affairs on June 16, 1947. However, the members still had no formal reservation land. In 1974, the tribe gained national attention when it declared war on the United States in order to gain a reservation. It turned the road through their land into a toll road, charging each vehicle 10 cents and demanding that the U.S. government negotiate with it. In October 1974, President Gerald Ford signed legislation creating a 12.5 acre reservation for the tribe. The tribe now has 2,000 acres in individual trusts. In recent years, the Tribe has undertaken economic development with a casino, motel, and fish hatchery.

Tribal affiliations with lands now part of the Refuge are shown in Table 6.2.

Table 6.2. Tribal Affiliations with Lands Now Part of Kootenai Refuge.

Reservation	Tribes
Kootenai Tribe of Idaho No treaty; lands for Kootenai allocated in the Flathead Reservation, Montana. Flathead Reservation established by Treaty of July 15, 1855, ratified March 8, 1859, and proclaimed April 18, 1859. Kootenai Tribe of Idaho recognized June 16, 1947.	Kootenai (Lower Kootenai, Bonners Ferry band)

6.1.4 Recent Settlement and Economic Development Period

The Northwestern Boundary Survey (1857-1861). From the time David Thompson explored north Idaho until the 1860s, the area was of interest only to a few trappers, explorers, and missionaries. In 1846 Britain and the United States settled on the 49th parallel as the line dividing British and American possessions in the Pacific Northwest. The boundary survey, conducted jointly by British and American personnel, was begun in 1857. In 1860-1861, British and American surveyors camped in what is now Bonner and Boundary Counties as they worked their way north to mark the international boundary. Survey crews established a supply depot at Sineacateen (on Lake Pend Oreille) in 1860, and another one at Chelemta, near present-day Bonners Ferry (Lirette 2008). This expedition was staffed with excellent naturalists. The American portion of the expedition was headed by Archibald Campbell, and his naturalists were Joseph S. Harris and Dr. C.B.R. Kennerly, who corresponded with Spencer Fullerton Baird at the Smithsonian from the expedition's camps (Smithsonian Institution 2011). George Gibbs, an interpreter and geologist, and James Madison Alden, an artist, also accompanied the expedition. Naturalists with the British party—the botanist David Lyall and ornithologist John K. Lord—kept detailed records of the plants and animals of this region and assembled valuable collections (Knowles and Knowles 1995). Alden painted two views of the lower Kootenai from Chelemta depot, the first pictorial record of the area (see chapter 4). Kennerly died at sea on his way back from the survey in February 1861. The remaining participants returned later in the year to Washington to find the Civil War underway. One of the casualties of the war was the final report of the expedition; although manuscripts were completed and several short papers were published, including George Gibb's report on physical geography (1872), the main report was never printed due to lack of money. George Suckley published descriptions of several new species of salmon and trout collected by his friend Kennerly in 1858 and 1861 (Smithsonian Institution 2011).

Bonners Ferry established. The discovery of gold on Similkameen (Wildhorse Creek) near present day Fort Steele, British Columbia in 1863 brought a stampede of miners to the international boundary. Most of them traveled over the Wildhorse Trail, which originated at Ft. Walla Walla, Washington Territory, headed north from present day Sandpoint, crossed the Kootenai River at it southernmost point, and followed the river north to Canada (US Forest Service 2007). At first, Kootenai Chief Abraham oversaw the ferrying of miners and supplies across the river in canoes. A party of four men from Walla Walla—John Walton, H. Robertson, R.A. Eddy, and Edwin L.

Bonner—negotiated an agreement with Abraham, and then applied to the Idaho legislature for ferry rights. On December 22, 1864, the ferry rights were granted (Boundary County Historical Society 1987).

Bonners Ferry soon became an important supply stop for miners heading north on the Wildhorse Trail. Bonner charged 50 cents per person and $1.50 for loaded pack animals. In 1875 Richard ("Dick") Fry bought the ferry and the trading post, which also served as the post office. Fry freighted goods from Fort Walla Walla to the gold miners at Wild Horse Creek. About 1882 a custom house was built at Bonners Ferry, since three-fourths of the passenger and freight business in and out of the Canadian mining country passed through the town (Sleep 1963). In 1899, Malcolm Bruce purchased the ferry and then sold it to the county for $500 in 1902. The county operated the ferry until 1905. In late December of 1905, the ferry approaches were extended to build the first bridge across the Kootenai River at Bonners Ferry, known as the low water bridge (Boundary County Historical Society 1987).

Figure 6.3. Ferry Crossing on the Kootenai River at Bonners Ferry, circa 1864.
(Photo courtesy Paul Flinn, Boundary County Historical Society.)

Although the settlement was known to the outside world as Bonners Ferry, until it was incorporated in 1899 it had several names—Eaton (or Eatonville), Bonnerport, Fry, and Bonners Ferry—and the name of the post office was Fry. The *Kootenai Herald* noted in 1891, "People on the outside get the idea that these are rival towns located a few miles from each other cutting and slashing for the supremacy, when the truth is they are practically one." On April 15, 1899, the Kootenai County Commissioners approved the merger of Eaton and Bonnerport and established Bonners Ferry (Boundary County 2001).

Electric power came to Bonners Ferry in 1905 with the construction of a small 125 KVA, hydroelectric plant on Myrtle Creek, six miles west of Bonners Ferry, on the present-day Refuge. The plant began operation in the fall of 1905 under the name of Newport Electric Light Co., owned by Mr. Alex M. Winston. The name was changed to Northern Electric Light Co., and was purchased by Mr. A.H. Featherston[e], who installed a water system and then changed the name to Bonner Water and Light Company. In February 1921, after years of poor service, the Village of Bonners Ferry purchased the system and made improvements (Woodward 2009).

Figure 6.4. Bonner Water and Light Company powerhouse on Myrtle Creek, circa 1906.
Photo courtesy Boundary County Historical Society.

Transportation history. After canoes and pack trains, steamships were the next form of transportation to reach northern Idaho. The first, the *Midge*, was launched in 1883 and served for 25 years. She was imported by William Adolph Baillie-Grohman and supposedly was to be used to operate a steam plow on lands he intended to reclaim (see Agricultural Development, below). As an "agricultural implement" the *Midge* was therefore imported free of duty. Shipped from England to Montreal, and from there to Sandpoint, she was hauled overland to Bonners Ferry. She was actually used for exploring and cruising Kootenai River and the Kootenay Lake in Canada. Later she was abandoned by Grohman and taken over by T. Davis, who renamed her *Mud Hen* (Jordan 1956). By 1891, Bonners Ferry was "the head of deepwater navigation" on the River and five steamships ran between Nelson and Bonners Ferry (Kootenai Herald 1891).

The Great Northern Railroad line (now known as Burlington Northern Santa Fe) connecting Great Falls, Montana to the Puget Sound was completed in 1892 after six years of construction. The track to Bonners Ferry was completed in March 1892, and on April 28, 1892 the first through train arrived from St. Paul, Minnesota. The line allowed steamships to carry freight on the Kootenai River all the way to Kootenay Lake. The following day, the Bonners Ferry Herald reported: "Now that we have direct communication with the eastern markets and the very best of transportation facilities we are no longer shut out from the world in the woods of northern Idaho, but are in the direct line of commerce through the richest portion of the northwest and enjoy the flattering prospect of being the largest city in the state." Although Bonners Ferry never achieved this status, the railroad gave new life to the small settlement.

Between 1891 and 1899, Sam Smith's stagecoaches could be seen throughout the Kootenai River Valley all the way up to Kootenay Lake. Completion of the Kootenai Valley Railroad in 1899 marked the beginning of the end for horse-drawn coaches. Smith then retired to his ranch located on Westside Road four miles from the border near Bear Creek, which was renamed Smith Creek after him.

The Great Northern was followed by the Kootenai Valley Line, completed on December 14, 1899. This was a private line constructed to carry lumber from Bonners Ferry to the border at Porthill, where it connected with the Canadian Pacific, which in turn extended to Kuskonook, B.C. The construction of this line ended the need for big river boats. Fueled by expanding timber production in the area, the Spokane International, which rain from Spokane to Eastport, Idaho was constructed in 1906. Construction of the 139 mile route through the Selkirks and Cabinet Mountains required 28 bridges and three tunnels. On June 7, 1906 the train crossed its bridge over the Kootenai River in Bonners Ferry for the first time. Transcontinental passenger service began on the route in 1909 but was discontinued in 1954. A year later, the freight line was acquired by the Union Pacific Railroad and it still runs through the valley today. Highways were much slower in coming. Idaho's North and South Highway, running from the Canadian border to Nevada, was opened to traffic in 1923-1924. Designated US Highway 95 two years later, it was not paved until 1935 (Carley and Sappington 2005).

Logging. Logging played an important role in Boundary County's economy for many years. Species such as white pine, yellow pine, white fir, red fir, tamarack, cedar, spruce, cottonwood, hemlock, and lodgepole pine have been logged for over a century. Historical accounts mention that during the summer, many decks of logs could be seen along the Kootenai River until high water in the spring when they could be floated downriver in large log drives patrolled by men (Boundary County Historical Society 1987).

The timber industry developed in the area in response to increasing demand for timber for mining operations, railroad construction, and the construction of new towns. The first sawmills were built to meet local demand for "hewed [railroad] ties, posts, poles, piling, mine stulls, and shingles" (Spokesman-Review 1938). The writer remarked, "As 2640 ties are required per mile of track, the size of the hewed tie industry at the time of construction of the early railroads can easily be imagined." By the early 1900s, large eastern timber interests were looking for new sources of timber after the eastern white pine forests had been logged out. This marked the turning point in the lumber industry of north Idaho. Between 1900 and 1910 it mushroomed from a local enterprise to a large scale industry with national markets. Prior to 1911 the principal species harvested was ponderosa pine, but it was the white pine that attracted the attention of eastern lumbermen (Spokesman-Review 1938).

In 1900, a group of men determined to keep American timber out of Canada built the Stein Lumber Company mill at Bonners Ferry and bought huge stands of timber from homesteaders up the Kootenai River. In 1902 it became the Bonners Ferry Lumber Company, a Wisconsin corporation with Frederick Weyerhaeuser as its first president (Spritzer 1979). The company took over some 13,000 acres of timberland, logging contracts, a mill site, sawmill machinery, and riparian rights located on the Kootenai River at Bonners Ferry. The one-band sawmill began operating in 1904. The company was beset by problems from the beginning. Driving logs down the Kootenai was difficult; the Great Northern Railway could not carry logs through tunnels; the facilities for holding logs once they arrived at Bonners Ferry were inadequate; and at times flood waters inundated the drying yard.

Even after the mill burned and was rebuilt in 1909, earnings never measured up to expenses (Nielsen 1980).

Although production continued to rise from 1904, eventually peaking in 1913 at 50 million board feet, it then tapered off. During World War I, strikes closed logging camps in northern Idaho, with severe effects on company operations. The January 4, 1918 *Spokesman-Review* reported that “A strike in all camps of the Bonners Ferry lumber company was declared yesterday.… The strikers are demanding that their hours be computed from the time they leave the camps for the woods instead of from the time they begin to work. The company contends that it should pay only for eight hours’ actual work.” By the mid-1920s the company was losing money, due not only to heavy taxes and high transportation charges, but losses due to fires and insect damage, high logging costs due to the rugged terrain, and severe weather conditions (Nielsen 1980). A small percentage of white pine, a high percentage of other species, and unprofitably low market prices harassed operators except in wartime. The mill was closed down in 1926, after producing a total of almost 733,000,000 board feet of lumber (Hidy 1962).

Softwoods were also extensively logged for use in paper production. The Inland Empire Paper Company, which had built a paper mill near Spokane, Washington in 1911, had logging camps around Bonners Ferry as of 1918. In 1920 the *Spokane Chronicle* reported: “The Inland Empire has vast forests of spruce and other timber suitable for the manufacture of paper pulp.… The [north Idaho] district has raw material sufficient for several papermills. This time seems opportune for the expansion of this industry here to relieve the nation-wide shortage of newsprint paper.” A 1930 article in the *Spokesman-Review* announced a major expansion of the company, remarking that “The available supply of timber such as is used by the company for the manufacture of pulp, is virtually inexhaustible.… The species used are white fir, hemlock, and spruce.”

In the 1920s and 1930s, cottonwoods were also logged from the valley floor. In 1928 the *Spokane Chronicle* reported that “The Porthill Boom company has completed the construction of a boom and conveyor on the Kootenai river at Porthill, some 30 miles north of Banners [sic] Ferry, and will begin the loading of cottonwood cordwood for shipment to west coast paper mills in the middle of this week.… It is figured that at least 10,000 cords will be shipped annually from this district and Mr. Hudson estimates that there is sufficient cottonwood in this district to keep the plant running for 15 years.” In 1937 the *Spokane Chronicle* reported that “D. E. Richmond has been in the Bonners Ferry country looking for cottonwood timber to be used in the manufacture of acoustic board at the plant of the Northwest Magnesite company, Chewelah. He reports much suitable timber in the northern Idaho district.”

Mining. The discovery of gold, lead, and silver in the Coeur d’Alene Mountains in the early 1880s fueled population growth in north Idaho, from 7,000 in 1880 to 25,000 10 years later. While Boundary County never became a major mining district, mining still played an important role in the region’s development. Galena deposits were discovered in the 1880s near Kootenay Lake, British Columbia. In 1892, the arrival of the Great Northern Railroad enabled Bonners Ferry to become a major shipping and supply point for the mines in Canada. Steamboats carried the ore from Kootenay Lake to Bonners Ferry where the ore was transferred to the railroad cars bound for the smelters in Montana. Records of local mining activities became more prominent in 1890 when the Kootenai Herald was established in Bonners Ferry and accounts of new discoveries became a weekly feature to garner the attention of investors.

Mining occurred around Lake Pend Oreille, the Hope/Clark Fork area, and several sites in Boundary County, most notably on Continental Mountain (Hudson et al. 1981). The Continental Mine, located four miles south of the international border on Blue Joe Creek, was discovered by Albert Klockmann in 1890. The mine produced $5 million worth of silver and lead ore between 1910 and 1925. Production slowed in the 1920s, and the last documented mining activity was in the late 1940s, except for a brief attempt to extract silver in the late 1970s (Drumheller 2003). According to records, there are 17 abandoned mines located in Boundary County.

Early settlement of the Refuge. The 1894 Idaho cadastral survey for T62N R1E, and the 1896 survey for T62N R1W, shows eight residences on the present-day Refuge (see Table 6.3 below). Of these, two were issued land patents under the Homestead Act of 1862: Parks B. Bothel on October 21, 1896 for 158.99 acres on T62NR1E, Section 18; and Benjamin F. Brown on June 17, 1898, on T62NR1W, Section 24, for 160 acres (Bureau of Land Management General Land Office Records 2010).

Table 6.3. Settlers on Kootenai National Wildlife Refuge, 1894 (T62N-1E), 1896 (T62N-1W).

Name	Township/Range	Section	Notes
O. Youngquist	T62NR1W	12	On south bank of Kootenai River, at end of road
J. Davis	T62NR1W	13	On west bank of Myrtle Creek, at junction of Cascade Creek and Myrtle Creek
M.A. Harrin	T62NR1W	24	On south bank of Myrtle Creek, at junction of Myrtle Creek and unnamed creek
B.F. Brown	T62NR1W	24	At base of hill, north of unnamed creek
Burke	T62NR1W	24	West of large pond, near Deep Creek
William Strong	T62NR1W	25	At base of hill, southwest corner of Refuge
R. Bothell	T62NR1E	18	Cleared and plowed agricultural land on west bank of Kootenai River, just past northern terminus of Bonners Ferry Road
L.A. Reed	T62NR1E	19	On west bank of Kootenai River, on Bonners Ferry Road

Source: Bureau of Land Management, General Land Office Records, Cadastral surveys of T62NR1E, Feb. 2, 1894 (URL: http://www.glorecords.blm.gov/SurveySearch/Survey_Detail.asp?dmid=38848&Index=1&QryID=58455.74) and T62NR1W, May 28, 1896 (URL: http://www.glorecords.blm.gov/SurveySearch/Survey_Detail.asp?dmid=38589&Index=1&QryID=58619.95)

In 1907, two parcels on the Refuge were allotted to Kootenai Tribal members on T62NR1W, Section 12 (the northwest corner of the current Refuge): 72.06 acres to Moshell Temo (also spelled Michel or Michelle Timu) and 79.88 acres to his wife Ann Temo. Due to errors, the patents were reissued on October 12, 1908 (Bureau of Land Management General Land Office Records 2010). The confluence of Myrtle Creek and the Kootenai River was known to be a good fishing spot, and this may have influenced the Temos' choice of land. At the time the properties were sold to the Service in 1965, they were still owned by Temo descendants, but were being leased by a farmer who owned adjacent land. Adjacent to the Temo allotments and also on present-day refuge lands were allotments of Mary Ewing (Jan. 10, 1908, 71 acres) and William Manning (Jan. 10, 1908, 79.06 acres) (Bureau of Land Management General Land Office Records 2010). Like some other Kootenais, they had registered at the Colville agency and were listed as Colvilles in land records. In 1917, fee simple patents were issued to these two allottees. These lands were no longer under Indian ownership when the Refuge purchased them.

In Section 24, four homesteads were settled at the beginning of the twentieth century: Eli Moore in 1910, Ben F. Brown by 1896, August C. Hess in 1911, and George Phillips in 1913. Ben Brown received his patent in 1902 (Boundary County Deed Records 1902a). Brown sold the property to David S. Hobbs, who then sold it to Charles and Cora Reeder (Boundary County Deed Records 1902b; 1902c). Reeder was the Director of the Spokane and Montrose Motor Railroad in Spokane in the early 1900s (Poor 1901), and also speculated in land in both Washington and Idaho (Steele and Rose 1904). The Reeder estate still owned 320 acres in District 7 as of 1939 (Metsker Maps 1939).

Agricultural development and formation of diking districts. The first hints of plans for developing the Lower Kootenai Valley came in 1881, when David McLoughlin of Ockonook (later Porthill) Idaho was sponsored by the Northern Pacific Railway to address the Portland Chamber of Commerce about potential agricultural development in the valley (Welwood 1993). Although McLoughlin lived in a humble cabin with his Kootenai wife, he was the very well-educated son of John McLoughlin (the old Chief Factor of the Hudson's Bay Company), and the acknowledged expert about the region. On September 14, 1881, a lengthy letter from McLoughlin about "The Kootenai Country" was published in the Spokane Falls Chronicle. It outlined a visionary plan to divert the upper Kootenai River into the headwaters of the Columbia, south of present-day Invermere, B.C., "thereby protecting from yearly overflow the vast extent of the Flat Bow (Kootenai) valley, and reclaiming thousands of acres of the most valuable agricultural land in America."

In 1882-1883, William Adolph Baillie-Grohman, a British sportsman, author, and developer, visited the area and followed up with both McLoughlin and Dick Fry of Bonners Ferry, who, like McLoughlin had extensive knowledge of the area's geography. In July 1883, Baillie-Grohman outlined his scheme to the *Daily British Colonist* in Victoria, British Columbia. To reduce the floodwaters and take advantage of the rich alluvial soil of the lower Kootenai Valley, he

> *"proposed two separate projects [firstly] by digging a water ditch of considerable length connecting the upper waters of the Kootenay river with the headwaters of Columbia which at this point is of slightly lower elevation [McLoughlin's original plan], and secondly, by widening the outlet of Lake Kootenay. The first mentioned work will subdue the Kootenay waters only to a very limited extent; the latter will be far more effective"* (Welwood 1993).

His report on the Kootenay country dated December 31, 1883, was included in the annual report of the Chief Commissioner of Lands for British Columbia (Jordan 1956). Baillie-Grohman succeeded in building his canal, but it was little used. Although Baillie-Grohman's reclamation scheme was ultimately a failure, his ideas presaged later agricultural development of the region.

The region's rich soils continued to attract farmers, but flooding limited agricultural development. Record floods were reported in 1903 (Flinn 1987:15). As early as 1913 by Spokane developers were making plans to "reclaim" 30,000 acres of bottomlands in the Kootenai River valley (Anonymous 1913: 54). One of the "interested parties" cited in the 1913 article was "Charles G. Reeder of Spokane"—the same Charles Reeder who had purchased land in the Kootenai River Valley in 1902. Another destructive flood on June 19, 1916 created additional support for plans to dike the river. In 1919, the *Spokane Chronicle* reported that Albert Klockmann (the same Klockmann who had developed the Continental Mine) was working on a major diking project with the objective of increasing hay production, and experimenting with growing fodder crops "that can be successfully grown … after the water recedes in June." The article noted that at that time, "this overflowed land … only produces rush hay." In 1920, feasibility studies for diking the Kootenai River were underway.

The first diking district, an area of 4,310 acres just southwest of Bonners Ferry, was organized in 1921; the last, No. 16, was organized on June 7, 1947 (Critchfield 1948). The principal motive for organization of the districts was to make possible the floating of bond issues to finance the reclamation projects. The diking districts also attracted investors. For example the Colony Ranch, Inc. was formed on District 5 in 1924. The Sept 24, 1925 *Spokane Chronicle* reported that “A. Klockman … has more than 1000 acres which he has redeemed and which he will colonize with agriculturalists from Germany.” Bonners Ferry businessmen developed Kootenai Farms, Inc. on District 8. However, most of the land in the diking districts was owned by individuals rather than corporations.

The district containing the present-day Refuge, Drainage District No. 7, was established on Sept 24, 1925 by the residents of the 2,500 acres encompassed within Sections 12, 13, 24, 25, and 36 in Township 62 N, Range 1 W and in Sections 7, 18, 19, 30, and 31 in Township 62N, Range 1 E. Probably the most influential was Charles Reeder, who owned land on the proposed District 7. The residents petitioned “that … the remaining portion thereof are covered during a large portion of the year with water and during the remainder of the year boggy and wet to the extent that such condition tends to impair the health and welfare of such persons, and that the drainage of said lands will cause them to be highly productive, whereas, at the present there is little that can be realized therefrom by any use to which they are adapted” (Boundary County Courthouse Records 1925).

Figure 6.5. Sign on Diking District # 1, circa 1940.
(USACE Seattle District Archives).

On that day, the *Spokane Chronicle* reported: “One more drainage district was organized here Tuesday night when Judge W. F. Naughton named the commissioners and authorized the preliminary work which is expected to call for a bond issue of approximately $150,000, which will be used in draining 3000 acres … this makes more than 20,000 acres which have been redeemed from the Kootenai valley within a few miles of Bonners Ferry. Much of this land went into cultivation for the first time this year. The land has overflowed every spring for hundreds of years and left a soil that is tremendously rich.… Some of this land yielded this year 120 bushels of oats and 50 bushels of wheat to the acre.”

But the formation of the diking districts had another consequence: forcing Kootenai Tribal members from one-third of their land base. In 1926, a bill was working its way through Congressional committees. A February 10, 1926 article in the *Spokesman-Review* noted: “Favors selling Indian land - House committee reports French’s bill on boundary county units. - The house Indian committee has favorably reported Representative French’s bill, authorizing the sale of about 3000 acres of allotted lands of the Kootenai Indians in Boundary county, Idaho, and applying the proceeds to purchasing other lands in the vicinity of the Indian school for those Indians desiring such homes. The Indian holdings are frequently inundated by the Kootenai river and the Indians have not the funds to bring them into a drainage district. In private ownership, these and surrounding lands can be reclaimed by diking, and a large area which now has little farming value, made arable. Senator Gooding has introduced an identical bill in the senate." On February 16, the *Spokesman-Review* reported the passing of the bill in the House: "House passes Indian land bill. - Representative French today obtained passage through the house of his bill authorizing sale of allotted Indian lands along the Kootenai river in northern Idaho, and the purchase of other reclaimed lands for those Indians who want to maintain homes in that locality. This legislation is necessary to carry through the plan of reclaiming large areas in the Kootenai valley."

On March 11, 1926 Congress passed "An Act Authorizing the Secretary of the Interior to dispose of certain allotted land in Boundary County, Idaho, and to purchase a compact tract of land to allot in small tracts to the Kootenai Indians as herein provided, and for other purposes" ([H. R. 7173.] 44 Stat. 202) (Kappler 1929):

> *Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That the Secretary of the Interior is authorized in his discretion to sell through sealed bids in unit offerings not exceeding eighty acres certain allotted lands of the Kootenai Indians situated in Boundary County, Idaho, at not less than the appraised price and deposit the proceeds derived therefrom to the credit of the individual Indians entitled thereto and to use such individual funds so derived to purchase tracts not exceeding five acres for each Indian living at the time of the passage of this Act. That the Secretary of the Interior shall issue patents in fee for lands sold hereunder to the purchaser upon payment of the purchase price, and trust patents shall be issued to the Indians allotted the tracts as hereinbefore provided containing restrictions against alienation for a period of twenty-five years: *Provided,* That where the lands are held for allottees the consent of said allottees shall be obtained: *And provided,* That the proceeds derived from the sale of the allotted lands over and above the amount required for the purchase of tracts for the individual Indians shall be available to the individual Indian's credit and may be used in the discretion of the Secretary of the Interior for the purchase of building material, clothing, farming implements, livestock, foodstuffs, and other necessary purposes, and for the payment of the reclamation charges that may be assessed against such Indian allotments by a drainage district created in pursuance to the State laws of Idaho for the diking and drainage of such lands.
>
> Approved, March 11, 1926.

An article titled "Kootenai land bill is passed" appeared in the *Spokane Chronicle*, May 23, 1926:

> "Representative French obtained favorable action by the house on his bill which authorizes the secretary of the interior to execute contracts with drainage districts proposing the reclamation of Kootenai Indian allotments along the Kootenai river, Idaho.
>
> "Reclamation through dyking can be accomplished at a cost running from $30 to $70 per acre and the value of the lands after reclamation is estimated by the interior department to be from $150 to $200 per acre.

> "It is proposed that the six drainage districts be organized under the laws of Idaho that will embrace approx 16,300 acres, within which is included an area of 2437 acres held in trust for individual allottees of the Kootenai Indian tribe.
>
> "**Lands would benefit**. In the absence of legislation there is no way by which these lands can be made to bear any share of the cost of reclamation, while should the districts be organized and the projects developed, the lands would benefit equally with the lands owned by white settlers. It also appears that the drainage districts including these lands would not be able to proceed with the sale of bonds and construction of dykes and drainage works.
>
> "The total cost of reclamation of the lands included within the districts is estimated to be not more than $830,960, of which the estimated share chargeable to Indian lands is approximately $114,000.
>
> "**Advance money urged**. The bill proposes that the government advance $114,000 for the use of the secretary of the interior in carrying forward a drainage program in cooperation with the districts to be organized."

As reported by Tribal members in the *History of Boundary County* (1987), "When homesteading farmers tried to form a diking and drainage district to combat a serious flooding problem along the Kootenai River, the Kootenai people lacked funds to participate. Congress passed an act allowing them to join in, nevertheless, many simply sold their land. The government would re-invest the money they acquired from the sale, in benchland; but much of it was not suitable for farming." Although the law may have theoretically allowed the Indian allottees to join into the formation of the drainage districts (exactly how was not clear, since the law simply stated that Indian allotments were to be sold to the highest bidders), the point was moot since they did not have the funds necessary to join in, nor the means to raise such funds. So rather than being a way for Indians to share in the economic benefits of the diking districts, the effect of the law was to force the Indians off valuable bottomlands, in exchange for small plots of drier and less fertile benchlands and the promise of goods and services from the Government. In addition, the law stipulated that a portion of the proceeds from the sale of the allotments would be applied toward "payment of the reclamation charges that may be assessed against such Indian allotments by a drainage district created in pursuance to the State laws of Idaho for the diking and drainage of such lands." The point was driven home by the May 23, 1926 *Spokane Chronicle* article which stated that the "share [of reclamation costs] chargeable to Indian lands is approximately $114,000." In 1927, Kootenai tribal members attended a meeting where they were informed that their lands were to be sold. Perhaps because their allotments were on less desirable land, the Temos kept their 160 acres in District 7, and the land passed on to their descendants.

Plans to improve District 7 were underway by 1928. An article in the March 30, 1928 *Spokesman-Review* noted, "Approve reclamation bonds. - Idaho Commission favors Kootenai swamp improvement. - Plans for bonding district no. 7 in Boundary county, to finance construction work, were given tentative approval today by the Reclamation and Bond Commission. The district is engaged in reclaiming 2200 acres of swamp lands along the Kootenai river, at a cost of $138,000."

As of 1948 there were 50,000 acres of crops in Boundary County, of which 11,000 acres (22 percent) were on bench lands and the majority (39,000 acres or 78 percent) were on the alluvial floodplain of the Kootenai River. The cultivated area in the bottom lands had practically reached its maximum (Critchfield 1948). Thirty percent of the county's cropland (approx 17,000 acres) was in wheat, while oats, barley, and rye were grown on 20 to 25 percent (12,500 acres). Alfalfa was second to wheat in importance and was grown to feed livestock. The dairy industry was increasing in importance.

Today, agriculture is still a dominant land use along the lower Kootenai River. As of 2007, 73,500 acres of Boundary County were in farmland, of which 43,000 acres were in crops, 19,000 acres in woodland, and 8,500 acres in pasture. The amount of bottomland being farmed has changed little since the 1940s, while acres of benchlands in farms have increased. Today, the top two crops by acreage in Boundary County are wheat (16,000 acres) and livestock forage (11,000 acres). Canola production has increased in recent years, totaling more than 2,600 acres in 2007. Nursery stock, while accounting for only 1,500 acres, generates the greatest sales (more than $10 million annually, or 1/3 of the total value of agricultural products sold). Total sales for hay and other crops is $9 million annually, and all grains and oilseeds is approximately $8 million annually (USDA National Agricultural Statistics Service 2007).

Figure 6.6. Kootenai people that attended a land sale meeting, Bonners Ferry, Idaho, 1927. The original caption reads: “Seven Kutenai people pose for a group photo after a meeting in which they were told their lands were to be sold. Most Indian participants left but these seven stayed until the meeting was over. Left to right they are: Pierre Eneas Chiquiet (or Chiqui), Francis Adams, John David, Lucy Adams, Chief Narcisse Isadore, Mary Sam and Simon Francis.” (University of Washington Libraries Digital Collections)

The resettlement era. The 1930s brought a new group of settlers to the Kootenai River Valley. Under the New Deal’s Rural Resettlement Program, communities were created by the government in order to redistribute people throughout the country. The program chose families that had been made destitute by the drought and depression of the 1930s and moved them onto farms in small communities. The program was controversial, but was seen as a means of continuing the nation’s emphasis on an agricultural economy. The high ideals of the program were somewhat subverted by politics that chose land in less than desirable locations. In Boundary County, the site of one such resettlement effort, it is likely that the most productive farmland was not offered for sale to the government. Lands purchased by the Resettlement Administration were likely to be those that were more prone to flooding, and therefore less economically viable.

Beginning as the Resettlement Administration in 1935, the government began purchasing farms and moving families from marginal rural lands to more productive lands. The Farm Security Administration took over the program in 1937 until it was reorganized as the Farmer's Home Administration in 1946.

In Boundary County, the Government began purchasing land for "Boundary Farms" in 1938. The project eventually included 8,104 acres and 37 farms in Drainage Districts 3, 5 (Klockmann's old Colony Farms), 7 (the present-day Refuge) and 15 (Critchfield 1948). Anticipating the government's interest in purchasing land in the Kootenai River valley, Peter Nelson began an aggressive purchasing strategy in 1938, including the old Ben Brown homestead, which had been purchased by Theresa Hatchett in 1929 (Boundary County Deed Records 1929, 1938a). In May 1938, Nelson sold 720 acres, including the Hatchett farm, for more than $42,000 to the Farm Security Administration (Boundary County Deed Records 1938b). By 1939, an atlas of Boundary County showed that the FSA was the major landowner on the present-day Refuge, having purchased all of Section 24, half of Sections 13 and 25, and smaller portions of Sections 12 and 18, almost 1,500 acres total (Metsker Maps 1939).

The Boundary Farms project immediately got off to a rocky start. In 1938 floods destroyed large sections of the dikes, and water blanketed the government's recently acquired lands. The burden of repairing and reinforcing dikes and installing pumps and ditches to drain drenched soils fell upon the FSA. The agency was required to cut back on other proposed developments so that it could spend an additional $88,000 on the repairs (Cannon 1996b).

Residents of Boundary Farms specialized in dairying. Each family got approximately 100 acres of river bottom land to grow hay, oats, and wheat, along with small houses and barns supplied by the Government. The standard farm consisted of one or two barns, a one-story house, a chicken house, a wood storage building, and a silo. The government also dug wells and drained land in the hopes that the resettled farmers could create profitable enterprises and eventually purchase their farms from the Government. In 1939 the FSA land was leased to borrowers of the Farm Security Administration in family size units to 37 different families (Speulda 1999).

Jacob and Edith Carter were moved to the present-day Refuge by the Farm Security Administration in 1939. The Carters raised their family on the farm and maintained ownership until 1984 when they sold it to the US Fish and Wildlife Service (Boundary County Historical Society 1987:219). Four families were resettled in Section 24 on the present-day Refuge: Zinnie and Helen Foust in the northern portion; John and Clara Borden in the central section, August C. Hess on the eastern edge, and Theressa Hachett reclaimed the southwest corner of the section. Theressa Hachett settled the area that is now the Kootenai NWR headquarters, Jake and Edith Carter lived across the road, and Zinnie and Helen Foust lived just to the north (Speulda 1999).

Smaller tracts of the present-day Refuge remained in private hands: Lucien (also spelled Lucian) Brockley on the southeast quarter of Section 7, on the large bend of the Kootenai River; three smaller parcels, including the two Indian allotments, on the south half of Section 12; the Charles G. Reeder estate on the north half of Section 13 and the northwest quarter of Section 18 to the Kootenai River;

D.B. Whitbeck and George Irving, et al. on the west half of Section 19 along the Kootenai River north of Deep Creek; and E.J. Morton on the south half of section 25, between Deep Creek and the County road (Metsker Maps 1939). With the exception of the Indian allotments, all of these properties had changed hands by the time the Refuge was established.

Boundary Farms was the only project sponsored in Idaho; other farm projects were located in the western states of New Mexico, Arizona, Montana, Colorado, and Utah (Cannon 1996:4). As part of the program, professional photographers documented the farms and people. Russell Lee traveled to Northern Idaho in 1939 and 1941 to take photographs of the Boundary Farms project. These photos are in the Library of Congress and offer a rare glimpse of a national policy in action.

Boundary Farms was the most expensive of all the resettlement farms to operate, with a cost per farm estimated at $21,393 (Cannon 1996:79). The extra cost associated with the Boundary Farms was caused by expenditures for community facilities including roads, canals, dikes, and bridges. The Kootenai River caused considerable flood damage to the new farms, and the government expended funds to repair the dikes almost annually. Because of the costs involved in the program and other political reasons, the Farm Security Administration was closed in 1945 and its main functions reorganized under the Farmer's Home Administration. The Boundary Farms project operated until about 1945 when the program was closed and the government began divesting itself of resettlement project farms. Some farmers chose to purchase their farms from the government and continued to operate, while others sold out because of the poor returns and problems with flooding. Of the 8,000 acres of RA farmland in Boundary County, only an estimated 19 percent (1,500 acres) was still in the hands of the resettled farmers or their heirs by the 1980s (Cannon 1996).

In 1945, Olaf J. and Teddy Coffey patented the claim that had been Theressa Hachett's farm (Boundary County Deed Records 1955). Olaf was killed in an accident in 1947 and Teddy Coffey remarried to Max Cottrell (Boundary County Historical Society 1987:232; 242). In 1948 a huge flood breached the dikes and caused extensive damage to the farms. In a 2003 interview, long-time resident Bill Kuntz recalled, "It didn't break the dike right at Bonners. It broke the dike down at Myrtle Creek. And the Myrtle Creek dike caused an eddy and it cuts the District One dike out, the water backs up into Bonners Ferry" (Kuntz 2005). A photograph of Drainage District No. 7 (Fig. 6.7) shows water impounded behind the dikes up to the roof rafters of the houses (Speulda 1999). The Fousts survived the 1948 flood, but sold to Joseph Neves in 1954. Neves sold his parcel to the USFWS in 1964. In 1960 Max and Teddy Cottrell sold the property to Wayne Tucker (Boundary County Deed Records 1960). Tucker sold his parcels to the U.S. Fish and Wildlife Service in 1964.

Figure 6.7. District # 7 May, 1948 Flood.
Photo courtesy Boundary County Historical Society.

Figure 6.8. Looking east from a nearby hill on part of the nine farmsteads established on the former Colony Ranch in Drainage District Number Five. Boundary Farms, Idaho.
Russell Lee Photograph, 1939. Library of Congress, Reproduction No. LC-USF347-015893-D DLC (black and white film neg.)

Immigrants and "stump farmers." By the mid 1920s, logging in northern Idaho was starting to decline, and by the 1930s large mills were shutting down. In Sandpoint, the large Humbird mill shut down in 1930, and the FSA noted that "many of those dependent on the mill have turned to small stump farming and many have been forced on relief." The same scenario played out in Boundary County during the Depression years. In 1935, the *Spokesman-Review* reported the closure of the Bonners Ferry Lumber Company along with a number of other Idaho timber companies, noting that "[it is] astonishing and depressing to note that in each case the final shutdown came before the company had finished cutting the timber naturally tributary to its own operation, and before the company had finished cutting its own timber." Lumber companies also began to sell off logged over lands, and the prospects of cheap farmland attracted both unemployed loggers and mill workers, and hopeful immigrants from distressed areas of the Great Plains.

In her 1942 book *Stump Ranch Pioneer*, Nelle Davis painted a portrait of what life was like for these new immigrants in the 1930s. Davis, her husband, and their two children were forced to abandon their home in Colorado when dust storms and drought made the area unlivable. When they learned that cut-over timberland in North Idaho was cheap and available, and there was no drought, they migrated 1500 miles to Boundary County. There, they purchased 40 acres of land and laboriously cleared stumps and brush to create a farm. They raised their own fruit, vegetables, and livestock, and like many people in Boundary County during the Depression, they supplemented their diet with venison and fish from the lakes and rivers. Burbot, or "ling," was a common item in the Depression era diet, and many people canned the fish for use throughout the year. Davis depicts a hard-working but relatively idyllic life, but in actuality the "stump farmers" usually lacked adequate labor and capital and could clear at best, an acre and a half of land per year. The noted Depression era photographer Dorothea Lange documented the arduous task of removing stumps from logged-over lands in Boundary County (Blanchard 2008).

Figure 6.9. Ex-mill worker clears 8-acre field after bulldozer has pulled the stumps. Boundary County, Idaho.
Dorothea Lange photo, 1939. Library of Congress, Reproduction No. LC-USF34-021724-E DLC (black and white film nitrate neg.)

In the 1930s and 1940s a number of Mennonite families moved to the area; one of them recalled that "the dust bowl caused his family to move." One such was Curtis Dirks, who moved from Copeland, Kansas to Bonners Ferry in 1936. Curtis's father was a Mennonite minister and formed the Mountain View Church of God in Christ in 1936, and a meeting house was built in 1943 (Holdeman 1957). Sometime after 1939 he purchased a portion of the Carter estate lands on the present-day Refuge, living there until 1965, when he sold his land to the government for the Kootenai NWR. Today there is a large Mennonite community in the Kootenai Valley.

Refuge establishment. Despite the dikes, flooding remained a problem for farmers in Diking District 7. In the 1960s interest in establishing a wildlife refuge and returning the valley floor to a seasonal wetland was gaining momentum. In the early 1960s, the DOI was considering creating a wildlife refuge in the lower Kootenai valley. By that time, nearly all of the Kootenai River bottomlands in Idaho were devoted to agriculture, and the consequent reduction in waterfowl habitat on the lower Kootenai River had been noted by the Migratory Bird Conservation Commission (MBCC). Agriculture was dominated by grain, hay, and pasture, which all provided some benefit to wildlife. However, nearly all the historic wetlands along the lower Kootenai River, and most of its riparian habitat, were gone. Crop depredation was also a concern to valley farmers. These factors were the major justifications for the establishment of the Refuge (MBCC 1964).

The Service acquired its first Kootenai NWR property, a 117-acre tract, from Arthur Hart on August 31, 1964. Other acquisitions soon followed. Most lands within the refuge acquisition boundary were purchased in 1964 and 1965. Given the longstanding problems with flooding, most of the landowners were willing sellers. However, a single parcel was acquired by the Service in 1966 using condemnation as a means of settling on the land's value. The landowner received twice as much per acre as the other landowners (U.S. Fish and Wildlife Service, Realty files). Marking the end of an era, Drainage District 7 was dissolved by Court decree on June 4, 1971 as part of the sale of the final tract of land within that district to the Refuge. With the acquisition of the small Carter tract in 1985, all lands within the acquisition boundary had been acquired.

6.1.5 Prehistoric and Historic Sites

As Federal property, stewardship of prehistoric and historic sites on the Refuge is mandated and guided by Sections 106 and 110 of the National Historic Preservation Act (NHPA) as well as other relevant Federal cultural resource laws. Although the Refuge has not had a complete cultural survey, there have been limited systematic archaeological surveys in response to specific ground disturbing projects. Approximately 30 acres of the Refuge have been surveyed since 1980, representing 15 Section 106 or Section 110 related projects.

There are two recorded archaeological sites on the Refuge, including one prehistoric habitation site (10By7) which was originally recorded in 1966 (Sneed and Sims). The site, located near the headquarters on the banks of Myrtle Creek, was described as "open camp with chipping debris." Attempts to relocate the site in 1979 (Chavez and Snyder) and 2001 (Daehnke) were unsuccessful. One historic site (10By268), recorded in 1983 (Hudson) is a farmstead dating from 1939. It is located along Cascade Creek, about 1 mile north of the refuge headquarters (Speulda 1999). The site consists of a concrete foundation, a stone wall, a trash area, and an area where two houses once stood (Hudson and Gauzza 1983). A survey conducted in 1996 at the refuge headquarters for the location of a modular office, found no significant archaeological resources (Arneson 1996). Two known prehistoric sites that occur within a mile of the refuge boundary are purported to contain burials (10By5, 10By6). These sites were likewise not relocated in 1979 (Speulda 1999).

At the time of establishment, the Refuge contained a number of buildings dating to the Resettlement Era (1939-45) and perhaps earlier. According to the 1966 annual narrative report,

> Removal of old unneeded buildings during the past year has been an activity that improved the appearance of the refuge considerably although much still remains to be done in this category. A total of 12 buildings were disposed of including 7 various sized sheds, 3 barns, 1 residence and one log cabin. All of these buildings were offered for sale through bid invitations. About half of them were sold and the remainder were in such poor condition no one bid on them. These were taken down and the grounds cleaned up by refuge personnel. (USFWS 1966:6)

The origin of the log cabin is unclear; it may have been the old Myrtle Creek ranger station. The ranger station was situated on the south bank of Myrtle Creek where it crosses the refuge boundary (Metsker Maps 1939). This ranger station was likely one of the Forest Service's less intensively developed administrative sites, and used seasonally or occasionally.

In 1999, four standing structures at the refuge headquarters were documented on an Idaho Historic Sites Inventory Form (updated in 2005) because they were greater than 50 years old. These included Quarters #1 (1939-1940), Gothic Arch Barn (1939-1940), Garage (1939-1940), and Gable Roof Barn (date unknown). All the buildings had experienced some level of alteration, and the only building determined to be eligible to the National Register of Historic Places (NRHP) was the Gothic Arch Barn. The most noteworthy building type from the Resettlement Era is the Gothic Arch barns that still dot the valley. As of 1999, there were about six Gothic Arch or gambrel roof barns north of the refuge headquarters along the West Side Road. Many of the other farms in the valley contain the remnants of the standard plan buildings built by the Government for resettled farmers (Speulda 1999).

Though the Gothic Arch barn remains eligible for NRHP designation, it has not been formally nominated. The barn has been subject to various rehabilitation efforts that meet the Secretary of the Interior's Standards for Historic Preservation. Of the four structures remaining in 1999, one has been demolished (Quarters 1), and the Garage, Gothic Arch Barn and the Gable Roof Barn remain. No sites on the refuge are listed in the National Register of Historic Places. Only seven of Boundary County's buildings are listed on the National Register of Historic Places and these are primarily associated with the town of Bonners Ferry (Speulda 1999).

The Refuge also contains the concrete foundation for the old Bonner Water and Light company powerhouse, constructed in 1905. The location is on Myrtle Creek west of the refuge office. By 1976 only the crumbling foundations of the powerhouse were still in place. The building and generator were gone and the Pelton wheel and nozzle had been pulled uphill to the city diversion dam on Myrtle Creek. The Pelton wheel was moved to Bonners Ferry in 1983 (Woodward 2009). The wheel was installed in an exhibit in Bonners Ferry in 2010.

6.2 Social/Economic Environment

6.2.1 Population, Housing, and Income

The Refuge is located in Boundary County, Idaho 20 miles south of the Canadian border and 35 miles north of Sandpoint. The nearest community, Bonners Ferry, is five miles west of the Refuge. Table 6.4 shows the population of Boundary County, growth rates, and other social statistics collected by the U. S. Census.

Boundary County attracted many new residents in the 1980s and 1990s but population and economic growth slowed in 2001, picked up and slowed again in 2005 and 2008, respectively. From 2000 to 2009, the County's population grew 11 percent to 10,951 but was outpaced by the 20 percent State growth rate. Beautiful scenery, abundant outdoor recreational opportunities, and rural lifestyle are likely to continue to draw new visitors and residents to Idaho's northernmost county. The designation of the International Selkirk Loop (a 280-mile drive that travels through northern Idaho, eastern Washington and southeastern British Columbia) as the only North American Scenic Byway and subsequent promotion brought many new visitors to the area when the economy was more robust.

Bonners Ferry is the county seat and largest city with 2,596 people. Moyie Springs, with 727 people, is the only other municipality in the county. Boundary County has 9 people per square mile.

Table 6.4. Selected Population and Associated Social Statistics, Local Counties.

Population Parameter	Boundary County	Idaho
Population, 2009 estimate	10,951	1,545,801
Population, percent change, April 1, 2000 to July 1, 2009	10.9%	19.5%
Population estimates base (April 1) 2000	9,871	1,293,955
Persons under 5 years old, percent, 2008	6.4%	8.0%
Persons under 18 years old, percent, 2008	24.4%	27.1%
Persons 65 years old and over, percent, 2008	14.7%	12.0%
Female persons, percent, 2008	50.3%	49.7%
White persons, percent, 2008 (a)	95.7%	94.6%
Black persons, percent, 2008 (a)	0.3%	0.9%
American Indian and Alaska Native persons, percent, 2008 (a)	2.3%	1.5%
Asian persons, percent, 2008 (a)	0.7%	1.1%
Native Hawaiian and Other Pacific Islander, percent, 2008 (a)	0.1%	0.1%
Persons reporting two or more races, percent, 2008	1.0%	1.7%
Persons of Hispanic or Latino origin, percent, 2008 (b)	3.9%	10.2%
White persons not Hispanic, percent, 2008	92.3%	85.1%
Living in same house in 1995 and 2000, pct 5 yrs old and over	57.5%	49.6%
Foreign born persons, percent, 2000	2.9%	5.0%
Language other than English spoken at home, pct age 5+, 2000	6.0%	9.3%
High school graduates, percent of persons age 25+, 2000	80.0%	84.7%
Bachelor's degree or higher, percentage of persons age 25+, 2000	14.7%	21.7%
Persons with a disability, age 5+, 2000	1,626	200,498
Mean travel time to work (minutes), workers age 16+, 2000	21.5	20.0
Housing units, 2008	4,734	641,479
Homeownership rate, 2000	78.3%	72.4%
Housing units in multi-unit structures, percent, 2000	5.1%	14.4%
Median value of owner-occupied housing units, 2000	$96,900	$106,300
Households, 2000	3,707	469,645
Persons per household, 2000	2.61	2.69
Median household income, 2008	$40,817	$47,561
Per capita money income, 1999	$14,636	$17,841
Persons below poverty level, percent, 2008	15.0%	12.5%

Source: U.S. Census, http://quickfacts.census.gov/qfd/states/15/16021.html

6.2.2 Employment and Business

Over 75 percent of the Boundary County land base is owned by the Federal or State government, with the Forest Service, Bureau of Land Management, and Idaho Department of Lands as the major land managers. This has a major influence on the employment and business opportunities (Boundary County Comprehensive Plan 2008). Table 6.5 displays business statistics for Boundary County. While forest products, manufacturing, and agriculture are important industries in the county, retailing, services, and government provide employment opportunities. The major employers include U.S. government (mainly Forest Service and Border Patrol), Kootenai River Inn and Casino, Boundary Community Hospital, Boundary Regional Community Health, Elk Mountain Farms, Boundary County School District, Boundary Trading Company, Idaho Education Services, and Welco of Idaho Inc. Mill closings coupled with lumber price downturns have reduced the logging-related jobs in the county. Hop farming at Elk Mountain Farms, ornamental and Christmas tree nurseries, and Kootenai Tribe of Idaho's Kootenai River Inn and Casino have added jobs to the county economy (Idaho Department of Commerce 2010 and Body, Idaho Department of Labor 2010)

The Boundary Economic Development Council, formed in 2001, includes Boundary County, City of Bonners Ferry, City of Moyie Springs, Kootenai Tribe of Idaho, and Boundary County School District, and has played a role in diversifying business opportunities in the county. Private sector employers grew 17 percent between 1999 and 2009 (Body 2010).

Table 6.6 shows relative contributions of various industries to Boundary County's economy. In 2004, agriculture/forestry and manufacturing were the leading contributors to the County's economy generating $87 million and $84 million in output, respectively. The largest employers in the County are government, agriculture/forestry, and health and social services.

Table 6.5. Boundary County Business Statistics.

Business QuickFacts	Boundary County	Idaho
Private nonfarm establishments, 2007	412	47,411[1]
Private nonfarm employment, 2007	2,477	544,541[1]
Private nonfarm employment, percent change 2000-2007	-3.0%	20.8%[1]
Nonemployer establishments, 2007	872	114,338
Total number of firms, 2002	1,025	121,560
Black-owned firms, percent, 2002	F	0.3%
American Indian and Alaska Native owned firms, percent, 2002	F	0.9%
Asian-owned firms, percent, 2002	F	0.9%
Native Hawaiian and Other Pacific Islander owned firms, percent, 2002	F	0.1%
Hispanic-owned firms, percent, 2002	F	2.3%
Women-owned firms, percent, 2002	18.0%	23.7%
Manufacturers' shipments, 2002 ($1000)	NA	15,174,196
Wholesale trade sales, 2002 ($1000)	13,341	11,458,012
Retail sales, 2002 ($1000)	68,101	13,540,952
Retail sales per capita, 2002	$6,821	$10,081
Accommodation and foodservices sales, 2002 ($1000)	D	1,653,671
Building permits, 2008	69	6,470
Federal spending, 2008	75,579	11,227,185[1]

Source: U.S. Census, http://quickfacts.census.gov/qfd/states/15/16021.html

Table 6.6. Boundary County Output, Employment, Labor Income, Other Value Added, 2004.

Industry	Output ($ Millions)	Employment	Job Income ($ Millions)	Other Value Added ($ Millions)
Agriculture, Forestry, Fish and Hunting	86.78	591	10.14	24.99
Mining	0.29	4	0	0.10
Utilities	0.49	7	0.17	0.18
Construction	36.78	372	11.01	4.63
Manufacturing	84.43	394	15.19	15.12
Wholesale Trade	3.81	43	1.43	1.17
Transportation and Warehousing	17.61	181	5.90	3.57
Retail Trade	23.63	370	8.79	5.91
Information	8.17	65	0.40	0.78
Finance and Insurance	6.58	51	1.85	3.07
Real Estate and Rental	3.61	39	0.19	2.00
Professional, Scientific, and Tech Services	9.13	116	3.44	1.82
Management of Companies	0.09	1	0.04	0.01
Administrative and Waste Services	1.92	41	0.49	0.42
Educational Services	1.39	48	0.91	-0.13
Health and Social Services	24.16	484	13.56	2.59
Arts, Entertainment, and Recreation	1.37	52	0.13	0.62
Accommodation and Food Services	8.71	173	2.28	1.58
Other Services	12.87	205	1.96	4.86
Government	74.23	1,113	47.23	20.64
Boundary County Totals	406.03	4,350	125.11	93.93

Source: IMPLAN using 2004 Boundary County data.

6.2.3 Refuge Impact on Local Economics

In 2004 the Fish and Wildlife Service evaluated how refuge recreational visitors affect the local economy, specifically local income and employment, for Kootenai as well as 92 other national wildlife refuges (Caudill and Henderson, 2005). Refuge visitation estimates were used to assess the economic impact. Total expenditures for FY2004 were $1.7 million (Table 6.7), with nonresidents accounting for 90 percent of all expenditures and non-consumptive activities accounting for 94 percent of the total expenditures.

Recreational spending generates jobs and multiplier effects in the economy. The total monetary effect of economic activity generated by Kootenai NWR visitors spending totaled $2.2 million. This final demand generated 43 jobs, with $748,400 in job income (Table 6.8). Based on the 2004 refuge budget, we estimated the ratio of economic effects per dollar of refuge expenditure to be $4.29. For every dollar of refuge budget expenditures, approximately $4.29 of total economic effects was generated.

Table 6.7. Kootenai Refuge Visitor Recreation-related Expenditures (2004).

Activity	Resident	Non-resident	Total
Non-consumptive	$110.12	$1,477.77	$1,587.89
Hunting			
Big Game	$23.1	$18.8	$41.9
Small Game	$5.3	$5.3	$10.6
Migratory Birds	$37.9	$22.9	$60.9
Total Hunting	$66.3	$47.0	$113.3
Fishing	$2.5	$5.4	$7.9
Total	$178.9	$1,530.2	$1,709.1

Source: Caudill and Henderson (2005). All figures in thousands

Table 6.8. Kootenai Refuge Economic Effects Associated with Visitation.

Economic Effect	Residents	Non-residents	Total
Final Demand	$223.2	$1,962.2	$2185.3
Jobs	5	38	43
Job Income	$75.3	$673.1	$748.4
Total tax revenue	$34.3	$317.5	$351.8

Source: Caudill and Henderson (2005). All figures in thousands

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Great horned owl
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Chapter 7 Summary of Effects

Chapter 7. Environmental Effects

In Chapter 7 we provide an analysis of the environmental consequences, of implementing the alternatives described in Chapter 2. Impacts are described for the main aspects of the environments described in Chapters 3 through 6, including physical, biological, cultural, and socio-economic resources. The alternatives are compared “side by side” under each topic, and both the adverse and beneficial effects of implementing each alternative are described. The overall cumulative effect on the environment from implementing the various alternatives is summarized in Section 7.7. More detailed assessments of the Refuge’s cumulative effects for relevant impact topics are presented section by section.

The information used in this Draft CCP/EA was obtained from relevant scientific literature, existing databases and inventories, consultations with other professionals, and personal knowledge of resources based on field visits, and experience. The terms identified below were used to describe the scope, scale, and intensity of effects on natural, cultural, and recreational resources.

- **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 would be so slight there would not be any measurable or perceptible consequence to a population, wildlife or plant community, recreation opportunity, visitor experience, or cultural resource.

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

- **Intermediate.** Effects would be readily detectable and localized; with consequences to a population, wildlife, or plant community; recreation opportunity; visitor experience; or cultural resource. Mitigation measures would be needed to offset adverse effects, and would be extensive, moderately complicated to implement, and probably successful.

- **Significant (major).** Effects would be obvious and would result in substantial consequences to a population, wildlife or plant community, recreation opportunity, visitor experience, or cultural resource within the local area and region. Extensive mitigating measures may be needed to offset adverse effects and would be large scale in nature, very complicated to implement, and may not have a guaranteed probability of success. In some instances, major effects would include the irretrievable loss of the resource.

Time and duration of effects have been defined as follows.

- **Short-term or Temporary.** An effect that generally would last less than one year or season.

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

7.1 Summary of Effects

Table 7.1 provides an overview of the effects under each alternative by indicator. Effects are described in terms of the change from current conditions. Thus, Alternative 1, the no-action alternative (current management) has a neutral effect because minimal or no changes to management programs would occur under this alternative.

Although the analysis shows that none of the alternatives would be expected to result in significant effects, some positive (beneficial) or negative effects are expected. The terms intermediate, minor, and slight, are used to describe the magnitude of the effect. To interpret these terms, intermediate is a higher magnitude than minor, which is of a higher magnitude than slight. The word neutral is used to describe a negligible or unnoticeable effect compared to the current situation. For more detail, please refer to the remainder of Chapter 7.

Table 7.1. Summary of Effects under CCP Alternatives.

	Alternative 1 (No Action)	Alternative 2 (Preferred)	Alternative 3
EFFECTS TO WILDLIFE AND HABITATS			
Effects to Fall-migrating waterfowl	Neutral effect—same habitat actions as at present.	Intermediate positive effect from increased acreage in moist soil and improved wetland management. Minor positive effects from closing Island Pond Trail.	
Effects to Spring-Migrating Waterfowl	Neutral effect—same habitat management as at present.	Intermediate positive effects from improvements to habitat and water management infrastructure, and invasive species control. Minor positive effects from closing Island Pond Trail.	
Effects to Breeding Waterfowl and Waterbirds	Neutral effect—same habitat management as at present.	Intermediate positive effects from improvements to habitat and water management infrastructure, and invasive species control. Minor positive effects from closing Island Pond Trail.	
Effects to Threatened and Endangered Species (Bull Trout)	Neutral effect—same habitat management as at present except 2011 regulations allow fishing in Myrtle Creek year round beginning in 2011. Some potential taking of bull trout due to angler misidentification and injury from use of barbed, baited hooks.	Minor positive effect to bull trout due to improvements to instream habitat. Neutral effect on take of bull trout—same fishing regulations as at present.	Minor positive effect to bull trout due to improvements to instream habitat. Reduced potential for take of bull trout due to change to catch and release fishing, and restricting fishing to single, barbless, non-baited hooks.
Effects to Grassland Habitats and Associated Wildlife	Neutral effect—same habitat management as at present.	Intermediate positive effects for breeding grassland landbirds from improved grassland management, invasive species removal. Minor positive effects from native grassland restoration.	

<table>
<tr><td>Effects to Wetland Habitats and Associated Wildlife</td><td>Neutral effect—same habitat management as at present.</td><td colspan="2">Intermediate positive effects from improvements to habitat and water management infrastructure, and invasive species control. Minor positive effects from closing Island Pond Trail.</td></tr>
<tr><td>Effects to Riparian Forests and Associated Wildlife</td><td>Neutral effect—approximately same amount of habitat work and same level of public use disturbance as at present.</td><td>Minor positive effect from restricting jogging and dog walking to Auto Tour Route.
Minor positive impact from closure of Island Pond Trail.
Intermediate positive effect from restoration of riparian habitat and management of suitable areas for recruitment of bottomland hardwoods.
Minor positive effect from acquisition of 120 acres of Deep Creek flood plain (pending land protection plan study).</td><td>Minor positive effect from restricting jogging and dog walking to Auto Tour Route.
Minor negative impact from re-opening walking trail on Kootenai River Dike (runs through riparian habitat).
Minor positive impact from closure of Island Pond Trail.
Intermediate positive effect from restoration of riparian habitat and management of suitable areas for recruitment of bottomland hardwoods.
Minor positive effect from acquisition of 120 acres of Deep Creek floodplain.</td></tr>
<tr><td>Effects to Upland Forest and Associated Wildlife</td><td>Neutral effect from approximately the same amount of habitat work as present and the same level of public use disturbance as at present.</td><td colspan="2">Neutral impacts from restriction of big game and grouse hunting to west of Lions Den Road.
Neutral impacts from allowing turkey hunting west of Lions Den Road.
Minor positive impacts from hand thinning to open understory and increasing aspen/cottonwood recruitment.
Minor positive impact by initiating snag creation and recruitment.</td></tr>
<tr><td>Effects to Instream Habitats and Associated Wildlife (Native salmonids)</td><td>Neutral effect, approximately same amount of habitat work and same level of public use disturbance as at present.</td><td>Minor positive effects from increased riparian plantings.
Neutral effect on native salmonids—same fishing regulations as at present.</td><td>Minor positive effects from increased riparian plantings.
Minor positive effect to native salmonids by changing regulations to catch and release fishing and requirement for single, barbless, non-baited hooks.</td></tr>
<tr><td colspan="4">EFFECTS TO PHYSICAL ENVIRONMENT</td></tr>
<tr><td>Effects to Hydrology</td><td>Neutral effect</td><td colspan="2">Minor positive effect locally through improved water management and improvements to instream habitat. Minor positive effects to the Lower Kootenai River watershed as a result of spring summer drawdowns for moist soil that will add nutrients to river.</td></tr>
<tr><td>Effects to Water Quality</td><td>Neutral effect</td><td colspan="2">Minor local negative effects from herbicide use on croplands, restored uplands, riparian, and aquatic areas.
Minor improvements in clarity and temperature resulting from increased acreage of riparian vegetation.</td></tr>
</table>

<table>
<tr><td>Effects to Air Quality</td><td>Neutral effect</td><td colspan="2">Possible minor negative effects due to prescribed burns in limited habitat areas. Minor negative effect from increased vehicle emissions associated with increased visitation.</td></tr>
<tr><td>Effects to Visual Quality</td><td>Neutral effect</td><td colspan="2">Negligible negative impact from additional facilities.</td></tr>
<tr><td colspan="4">EFFECTS TO SOCIAL ENVIRONMENT</td></tr>
<tr><td>Overall visitation</td><td>Minor rise due to demographic trends and rising demand for outdoor recreation</td><td colspan="2">Minor positive effect. Minor rise in visitation, due to demographic trends, rising demand for outdoor recreation, and refuge actions to improve facilities and programs.</td></tr>
<tr><td>Opportunities for Quality Wildlife Observation and Photography</td><td>Neutral effect—no increase in the number of acres available for wildlife observation and photography; habitat management same as present.</td><td colspan="2">Neutral to minor positive effect. Slight increase in the number of acres available for wildlife observation and photography. Intermediate positive effect by restricting jogging and dog walking to Auto Tour Route. Actions may increase habitat quality within areas open for wildlife observation and photography.</td></tr>
<tr><td>Opportunities for Quality Waterfowl Hunting</td><td>Neutral effect due to hunting acres and habitat management remaining the same as present.</td><td colspan="2">Neutral effects. This alternative proposes to slightly reduce the hunting area relative to overall acreage by increasing the size of the no-shooting (retrieval) zone for public safety. About the same number of hunters could be accommodated as in Alt 1; however hunter success may increase slightly due to improved habitat quality for waterfowl. Hunt quality would increase due to fewer conflicts between hunters.</td></tr>
<tr><td>Opportunities for Quality Big Game and Upland Game Hunting</td><td>Neutral effect due to hunting acres and habitat management remaining the same as present.</td><td colspan="2">Overall neutral effect. Minor negative effect by eliminating general big game hunting and grouse hunting west of Westside Road; however, the impact is mitigated by allowing turkey hunting in the forested portions of the Refuge, grouse and big game hunting west of Lions Den Road with the opportunity to access other public lands from this parcel, and the potential for lottery or special permit big game hunts in the future.</td></tr>
<tr><td>Opportunities for Quality Fishing</td><td>Neutral effect due to lack of actions to improve facilities or outreach but fishing regulations changes allowed year round fishing in Myrtle Creek in 2011.</td><td>Minor positive effect because of facility improvements and emphasis on education and orientation for fishing visitors.</td><td>Minor positive effect of facility improvements and emphasis on education and orientation for fishing visitors. Minor reduction in fishing opportunity due to change to catch and release fishing only.</td></tr>
<tr><td>Opportunities for Quality Environmen-tal Education</td><td>Neutral effect, no changes to EE facilities/programs.</td><td colspan="2">Minor positive effect because of facilities dedicated to EE, trail improvements, and staffing strategies that could result in enhanced volunteer support for the program.</td></tr>
<tr><td>Opportunities for Quality Interpretation</td><td>Neutral effect—no changes to interpretive facilities/programs.</td><td colspan="2">Neutral to minor positive effects due to trail and Auto Tour Route improvements and staffing strategies that could result in enhanced volunteer support for the program.</td></tr>
</table>

Opportunities for Nonwildlife-Dependent Uses	Neutral effect—no changes to regulations on nonwildlife-dependent uses.	Intermediate negative effect due to closure of trails to dog walking and jogging. Dog walking and jogging would continue to be allowed on the Auto Tour Route.
Amount of Illegal Uses	Neutral effect.	Minor to intermediate positive effects due to actions to deter illegal uses.
Environ-mental Justice	Neutral to minor positive effects on human health, and the social environment.	
Economic Effects	Neutral effect.	Minor positive effect due to slightly higher number of local jobs and slightly greater recreational expenditures of refuge visitors.
OTHER EFFECTS		
Effects to Cultural and Historic Resources	Neutral effect	Minor potential for negative effects from wetland restoration work; upland restoration; disking associated with invasive species control and moist soil management; and from increased trails and public facilities. Minor positive effects from various proactive measures taken for protection and management of cultural resources.
Effects to Adjacent Lands and Nearby Residents	Neutral effect. Under all alternatives the Refuge would work closely with adjacent landowners and local governments to minimize impacts to adjacent lands.	
Cumulative Effects	The value of refuge lands and waters for a wide variety of native fish and wildlife would be maintained. Invasive species could become more prevalent on surrounding lands and on the Refuge itself. Although mortality will occur to some wildlife under the refuge hunt program, there would be no significant adverse cumulative population level impacts to hunted or non-hunted wildlife species.	Improvement of the capability of the Refuge to provide food for migrating waterfowl and habitat for migrating and breeding waterfowl and waterbirds. Prevalence of invasive species on refuge lands will decline. Improved water management capability would increase productivity of refuge wetlands. Active improvement of riparian forest and shrub habitat, instream, and wetland habitats would increase the value of refuge lands and waters for a wide variety of native fish and wildlife. However, actions will not reverse or halt the regional trend toward reduced biological integrity within the lower Kootenai River Valley. The Service would improve the availability and quality of wildlife-dependent recreation, but within a regional context, there would be little cumulative difference in recreational opportunity. Although mortality will occur to some wildlife under the refuge hunt programs, there would be no significant adverse cumulative population level impacts to hunted or non-hunted wildlife species.

7.2 Effects to Wildlife and Habitats

7.2.1 Effects to Waterfowl

The primary actions of the proposed alternatives that have the potential to affect waterfowl consist of the waterfowl hunting program, management of croplands, grasslands, and wetlands, and non-hunting public uses that either directly affect habitats through physical alterations or place the public in close proximity to waterfowl, thus increasing the potential for disturbance.

Effects of Waterfowl Hunting on Local, Regional and Flyway Waterfowl Populations—All Alternatives

Migratory game birds are those bird species designated in conventions between the United States and several foreign nations for protection and management. Under the Migratory Bird Treaty Act (16 U.S.C. 703-712), the Secretary of the Interior is authorized to determine when "hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any … bird, or any part, nest, or egg" of migratory game birds can take place and to adopt regulations for this purpose. These regulations are: Written after giving due regard to "the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds;" and updated annually (16 U.S.C. 704(a)). The responsibility for managing and conserving migratory birds in the United States was delegated to the Service.

In acknowledgment of regional differences in hunting conditions, the Service has administratively divided the nation into four flyways for the primary purpose of managing migratory game birds. Each flyway (Atlantic, Mississippi, Central, and Pacific) has a Flyway Council, a formal organization generally composed of one member from each state and province in that flyway. The Refuge is within the Pacific Flyway and allows hunting for ducks, geese, and coots.

The Service annually prescribes frameworks, or outer limits, for dates and times when hunting migratory birds may occur, and the number of birds that may be taken and possessed. These frameworks are necessary to: (1) allow states to select seasons and limits for recreation and sustenance; (2) aid Federal, State and Tribal governments in the management of migratory game birds; and (3) permit harvests at levels compatible with population status and habitat conditions.

Because the Migratory Bird Treaty Act stipulates that all hunting seasons for migratory game birds are closed unless specifically opened by the Secretary of the Interior, the Service annually promulgates regulations (50 CFR Part 20) establishing the frameworks from which states may select season dates, bag limits, shooting hours, and other options for each migratory bird hunting season. The frameworks are essentially permissive, in that migratory bird hunting would not be allowed without them. Therefore, annual Federal regulations both allow and limit migratory bird hunting.

The process for adopting migratory game bird hunting regulations, located in 50 CFR Part 20, is constrained by three primary factors. Legal and administrative considerations dictate how long the rulemaking process will last. Most importantly, however, the biological cycle of migratory game birds controls the timing of data-gathering activities, and thus the dates on which these results are available for consideration and deliberation. The process of adopting migratory game bird hunting regulations includes two separate regulation development schedules, based on "early" and "late" hunting season regulations.

Early hunting seasons pertain to all migratory game bird species in Alaska, Hawaii, Puerto Rico, and the Virgin Islands; migratory game birds other than waterfowl (e.g., dove, woodcock); and special early seasons for some waterfowl species such as teal or resident Canada geese. Early hunting seasons generally begin prior to October 1. Late hunting seasons generally start on or after October 1 and include most waterfowl seasons not already established. There are basically no differences in the processes for establishing either early or late hunting seasons. For each cycle, Service biologists and others gather, analyze, and interpret biological survey data and provide this information to all those involved in the process through a series of published status reports and presentations to Flyway Councils and other interested parties.

Because the Service is required to take the abundance of migratory birds and other factors into consideration, it undertakes a number of surveys throughout the year in conjunction with the Canadian Wildlife Service, state and provincial wildlife-management agencies, and others. To determine the appropriate frameworks for each species, the Service considers factors such as population size and trend, geographical distribution, annual breeding effort, the condition of breeding and wintering habitat, the number of hunters, and the anticipated harvest. After frameworks are established for season lengths, bag limits, and areas for migratory game bird hunting, migratory game bird management becomes a cooperative effort of Federal and State governments. After the Service establishes final frameworks for hunting seasons, the states may select season dates, bag limits, and other regulatory options for the hunting seasons. States may always be more conservative in their selections than the Federal frameworks but never more liberal. Season dates and bag limits for national wildlife refuges open to hunting, including the Kootenai NWR, are never longer or larger than the State regulations.

National Environmental Policy Act (NEPA) considerations by the Service for hunted migratory game bird species are addressed by the programmatic document, Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds (FSES 88-14), filed with the Environmental Protection Agency (EPA) on June 9, 1988. A Notice of Availability was published in the Federal Register on June 16, 1988 (53 FR 22582), and a Record of Decisions (ROD) was signed on August 18, 1988 (53 FR 31341). Current year NEPA considerations for waterfowl hunting frameworks are covered under a separate Environmental Assessment—Duck Hunting Regulations for 2006-2007, and an August 24, 2006, Finding of No Significant Impact (FONSI). Further, in a notice published in the September 8, 2005, Federal Register (70 FR 53376); the Service announced its intent to develop a new supplemental environmental impact statement for the migratory bird hunting program. Public scoping meetings were held in the spring of 2006, as announced in a March 9, 2006, Federal Register notice (71 FR 12216).

The waterfowl harvest in Idaho and adjacent areas of Washington and Montana is presented in table 7.2, below. This includes waterfowl harvested on other national wildlife refuges, other public lands and waters, and private lands. In comparison with statewide harvests, the harvest of migratory birds on the Refuge is minimal, and represents less than 0.5 percent of the statewide harvest. The Refuge's role in the cumulative impact of migratory bird harvest, even solely on a statewide basis, is insignificant.

Waterfowl hunting would occur under all three alternatives. Total harvest could be slightly higher under Alternatives 2 and 3 relative to Alternative 1, due to the likelihood of increased waterfowl use of the Refuge due to habitat management changes.

Hunting causes direct mortality and thus has the potential to adversely affect waterfowl populations. Specific measures are in place to avoid adverse impacts and these measures are described in detail below. Table 7.2 details the current harvest levels and populations (where available) or population trends for various scales for duck, geese, and other migratory birds. Wintering populations are not accurately measurable for migratory birds at small scales such as at the refuge or refuge management unit scale. This is because birds can easily move from one site to another and even make long distance journeys from day to day while the survey is underway. Regional and local population surveys are best understood as an "index" (best used to measure trends over time) and not a true census at any particular time.

Table 7.2. Waterfowl Harvest and Population at Flyway, State, and Local Scales.*

Area	Area harvest: 2008/2009	Area harvest: 2009/2010	Area Population
DUCK			
Pacific Flyway Total	3,300,600±10%	2,781,900±12%	Mid-winter survey (Pacific Flyway): 5,356,550 (2008); 5,235,386 (2009); 5,679,473 (long-term average 1955-2009)
State of Idaho	257,700±22%	228,300±22%	Mid-winter survey: 21,894 ducks in area 33-1N (North Idaho) (2009)
State of Washington	399,200 +/- 18%	380,800±25%	Mid-winter survey: 173,722 ducks, in area 89-2E)
State of Montana	119,800±21% 81,500-Pacific Flyway 38,300-Central Flyway	105,400±21% 62,400- Pacific 43,000-Central	Mid-winter survey: 5,177 ducks in area 53-1W (NW Montana) (2009)
Kootenai NWR	414*	955*	See Pacific Flyway and State level mid-winter survey information, above
GOOSE			
Pacific Flyway Total	555,100±22%	430,700±10%	Mid-winter survey: 1,777,400 (2009); 1,000,652 (long-term average 1955-2009)
State of Idaho	64,500±25%	58,300±25%	Mid-winter survey: 7,824 geese in area 33-1N (north Idaho) (2009)
State of Washington	66,000 +/- 15%	81,800±28%	Mid-winter survey: 9,355 geese in area 89-2E)
State of Montana	40,800±24% (24,600 Pacific 16,200 Central)	45,800±18% (26,800 Central 19,000 Pacific)	Mid-winter survey: 676 geese in area 53-1W (NW Montana) (2009)
Kootenai NWR	20*	20*	Data not presented at this scale

*Estimates of refuge waterfowl harvest were based on annual number of waterfowl hunter visitors (RAPP) multiplied by an average hunter success rate off 1.91 birds per hunter (derived from 1987-1997 harvest data).
Sources: Richkus et al. 2008; Raftovich et al. 2009; Raftovich et al. 2010; USFWS 2008; and USFWS 2009.

Harvest Management—Regulatory Procedures

Waterfowl and migratory bird hunting in the United States rests upon a thorough regulatory setting process that involves numerous sources of waterfowl population and harvest data. Waterfowl hunting is regulated on the Refuge with hunting allowed only within specific areas. In addition, waterfowl hunting is only allowed on the Refuge four days per week.

Waterfowl hunters harvested an estimated 950 ducks and less than 20 geese at the Refuge in 2009-2010 (Table 7.2). In 2008/2009 waterfowl hunters harvested an estimated 440 ducks and less than 20 geese. These harvest numbers represent just 0.4 percent of Idaho's duck harvest in 2009-2010 and less than 0.2 percent for 2008-2009. Goose harvest at the Refuge for both 2008 and 2009 was a negligible percentage of the Idaho harvest.

Significance Conclusion for Waterfowl

None of the three alternatives will cause any significant adverse effects to local, regional, or flyway waterfowl populations. With regard to the effects on the Refuge's current harvest of migratory birds, the impacts of continuing the recreational hunting program would be negligible. In fact, both action alternatives will have beneficial effects for some waterfowl species, though these impacts are not considered regionally significant. As detailed in Table 7.2 above, overall waterfowl harvest levels on the Refuge represent a small portion of the State and Flyway harvest. Waterfowl harvest on the Refuge also accounts for a very small portion of the overall waterfowl production and the number of birds available to hunt based on mid-winter surveys both at the Flyway and State levels.

Likewise, the indirect effects of harvesting migratory birds on the Refuge is negligible, as there are no known significant correlations between the population sizes of these species and other refuge resources. Some birds are taken by coyotes, bald eagles and other raptors; however, the slight fluctuations in population sizes from hunting would have no effect on predatory species. Eagles foraging for waterfowl in these areas would not be impacted by hunting due to the spatial separation from hunting areas. This, added to the hunting regulations described earlier (e.g., nontoxic shot requirement), would protect eagles. Therefore, and in consideration of the regulatory oversight of the harvest conducted at the flyway prior to each season, we conclude that waterfowl hunting will not have a significant impact on local, regional, or Pacific Flyway waterfowl populations.

Effects of Waterfowl Hunting on Waterfowl Habitat Use

<u>Effect on distribution and use of habitat</u>: Belanger and Bedard (1995) concluded that disturbance caused by hunting can modify the distribution and use of various habitats by birds (Owens 1977; White-Robinson, 1982; Madsen 1985). In Denmark, Madsen (1995) experimentally tested disturbance effects of hunting by the establishment of two experimental reserves where hunting activity was manipulated such that sanctuary areas were created in different parts of the study area in different hunting seasons. In both areas, waterbird numbers increased, most strongly in hunted species (3-40 fold increase), with highest densities found in sanctuary areas, irrespective of where these sanctuaries were sited. At Sacramento National Wildlife Refuge, in California, researchers found statistically significant differences in the densities of northern pintails among hunting units, units adjacent to hunting units, units adjacent to auto tour route, and units isolated from disturbance (Wolder 1993). Prior to the opening of hunting season, pintail used units in proportion to their availability, indicating no preference to particular areas. During the hunting season, 50 to 60 percent of the pintails on the Refuge were located on the isolated units that contained 26 to 28 percent of the refuge wetlands, suggesting a strong waterfowl preference for areas of little human activity. Units along the auto tour route and adjacent to hunting units maintained pintails at similar proportions to their availability. Three to 16 percent of the pintails on the Refuge were located on hunted units (36 to 40 percent of the available habitat) during non-hunt days (4 days per week) and almost entirely absent on days when hunting was taking place, indicating an avoidance of the hunted areas.

Belanger and Bedard (1989) studied the effect of disturbances to staging greater snow geese in a Quebec bird sanctuary over 471 hours of observation. They found that the level of disturbance (defined as any event causing all or part of the goose flock to take flight) that prevailed on a given day in fall influenced goose use of the sanctuary on the following day. When disturbance exceeded two events per hour, it produced a 50 percent drop in the mean number of geese present in the sanctuary the next day.

Effects on energetics and survival: Hunting limits access of waterfowl to food resources and may modify migration timing. Madsen (1988 as cited by Dalgren and Korschgen 1992) suggested that hunting on the coastal wetlands of Denmark modified waterfowl movements and caused birds to leave the area prematurely. However, Kahl (1991) suggested that lack of adequate access to food may decrease survival of canvasbacks by causing birds to remain on a staging site longer and forage under suboptimal conditions, or by causing birds to migrate in shorter flights with more frequent stops.

Disturbance due to hunting has caused waterfowl to cease feeding or resting activities, thus decreasing energy intake and increasing energy expenditure. At Chincoteague NWR, Morton et al. (1989a) found that wintering black ducks experienced reduced energy intake while doubling energy expenditure by increasing the time spent in locomotion in response to disturbance. Belanger and Bedard (1995) in a quantitative analysis, estimated that neither the response to disturbance by flying away and promptly returning to the foraging site to resume feeding, nor the response of flying away (leaving the foraging site for a roosting site - thus interrupting feeding) allowed snow geese to balance their daytime energy budget. At high disturbance rates (>2/hour; these included hunting and transport related disturbance), Belanger and Bedard estimated that an increase in night feeding as a behavioral compensation mechanism could not counterbalance energy lost during the day. Likewise, geese could not compensate for a loss in feeding time by increasing their daily foraging behavior to maximize food intake during undisturbed periods. Belanger and Bedard suggested mitigation with spatial or temporal buffer zones.

Considerations for design of hunt units: Fox and Madsen (1997) found that mobile hunting activity close to roosting and or feeding areas is more disturbing than hunting from fixed points or where birds are shot moving between such areas. For sanctuary areas, they recommended areas with regular shape, maximum practicable size, and with a diameter of three times the escape flight distance (at a minimum) of the most sensitive species present. Flock size also affects flush distance, larger flocks tending to react at a greater distance. Based on estimated flight distances from boats, Kahl (1991) recommended that sanctuaries should be at least 1.5-2.0 km square and encompass as much of a feeding area as feasible.

Summary of effects of waterfowl hunting: It is expected that continuation of the existing waterfowl hunting program under Alternative 1 will result in no change in current use of habitats by waterfowl as it continues the current waterfowl hunting program. Waterfowl hunting would occur on less than 40 percent of the available fall waterfowl habitat. Reduction in the size of the hunt area by exclusion of areas buffering the Auto Tour Route and the Deep Creek Trail by 200 yards in Alternatives 2 and 3 will have little impact on waterfowl habitat use, as these areas are mostly grassland.

Effects of Habitat Actions on Waterfowl

Habitat actions that would have the greatest effect on waterfowl use of the Refuge are cropland and grassland management, and water management, which affects the availability of moist soil and fall-flooded wetland habitat including permanent open water used by divers, tundra swans and roosting dabblers. Alternative 1 habitat actions would have a neutral impact on waterfowl as no changes are expected in the area of croplands, managed grasslands or wetland habitat. Alternative 2, which continues cropland management on 200 acres, modifies and improves the water management system to allows independent management of ponds, rotates management of 7 permanent ponds, and increases acreage of moist soil habitat, will result in the greatest positive response by waterfowl (see Section 7.1.5 for effects to wetland habitats). The effects of Alternative 3 would be slightly less positive than Alternative 2 as a result of fewer acres managed for moist soil.

Effects of Non-hunting Public Uses on Waterfowl

With the exception of the direct mortality resulting from shooting, the effect of non-hunting public use activities on waterfowl are similar to waterfowl hunting. Public use programs can affect waterfowl either through direct alteration of habitat as a result of facility construction, physical alteration of habitat from off-trail use, and disturbance effects associated with visitors in close proximity to nesting, feeding, and roosting waterfowl.

<u>Physical alteration of habitat</u>: The physical impact of public use activities depends upon the size of the group(s), the season of use, and the location and the duration of the activity. The construction and maintenance of visitor use facilities (i.e., trails, pullouts, and photography blinds) could have effects on soils, vegetation, and possibly hydrology in specific areas. This could potentially increase erosion and cause localized soil compaction (Liddle 1975); reduced seed emergence (Cole and Landres 1995); alteration of vegetative structure and composition; and sediment loading (Cole and Marion 1988).

<u>Effects of human activity</u>: Numerous studies have confirmed that people on foot can cause a variety of disturbance reactions in waterfowl, 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). These studies and others have shown that the severity of the effects depends upon the distance of the disturbance to the animal(s) and the disturbance's duration, frequency, predictability, and visibility to wildlife (Knight and Cole 1991).

Variables that typically have the greatest influence on wildlife behavior are the distance from the animal to the disturbance and the duration of the disturbance. Animals show greater flight response to humans moving unpredictably than to humans following a distinct path (Gabrielsen and Smith 1995). In a review of several studies of the reaction of waterfowl and other wetland birds to people on foot, distances greater than 328 feet (100 meters) generally did not result in a behavioral response (DeLong 2002).

Dogs also elicit a greater response from wildlife than pedestrians alone (MacArthur et al. 1982; Hoopes 1993). In the case of birds, the presence of dogs may flush 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 that are 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 a dog. Under Alternatives 2 and 3, dog walking will be allowed only on the Auto Tour Route, and dog-walkers will be required to use short (6 foot or less) leashes while on the Refuge, thereby reducing the potential and severity of these impacts to wildlife.

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).

Summary of effects of other public use: With the continuation of existing public use activities and facilities under Alternative 1, a projected increase in refuge visitation is expected to have a minor negative impact on waterfowl usage of refuge habitats in the future. Continuation of use on the Island Pond Trail on non-hunt days, and the use of refuge trails by walkers (especially joggers and dog walkers) and bicyclists would result in these negative impacts. Under both alternatives 2 and 3, Island Pond Trail is closed, removing nearly 80 acres of wetland habitat from potential human disturbance on non-hunting days. The location of more than 60 percent of 200 acres of croplands outside the hunt units, at least 100 meters from public use facilities, will also reduce human disturbance to feeding waterfowl. Under both the action alternatives, dog walking and jogging are also restricted to the Auto Tour Route, further reducing the potential disturbance of waterfowl adjacent to the remaining trails. The use of vegetation screening, construction of an elevated viewing platform, and an additional photo blind will reduce the potential for human activities to disturb wildlife. None of the new facilities are proposed in waterfowl habitat and restrictions on off-trail use eliminate the potential for direct physical impacts to waterfowl habitat.

7.2.2 Effects to Federal and State Listed Species

Listed species receive special consideration in terms of refuge management. Federally listed species are trust resources that require additional consultation whenever an activity conducted by or permitted by the Refuge may have an effect on these species or their habitats. Impacts from wildlife-dependent recreation and habitat management are assessed in this chapter. Impacts associated with the use of herbicides and pesticides are assessed in the IPM Plan Description (Appendix F).

The bald eagle was delisted from threatened status by the Service in 2007. Bald eagle populations in Idaho have increased; however, the species is still listed as threatened in Idaho. The Refuge's riparian habitats support wintering and nesting bald eagles. Alternatives 2-3 would potentially provide intermediate long-term positive benefits for bald eagles by improving 169 acres of riparian forest habitat and increasing productivity of wetlands and waterfowl foraging habitat, while Alternative 1 provides no additional habitat benefits from the existing conditions.

Effects from habitat management actions: Wetland improvements in all alternatives would likely provide more foraging opportunities for eagles due to increased waterfowl presence. Invasive plant control is part of our wetland management program, as described above. In the event that mechanical and cultural methods do not provide adequate control, the Refuge may use approved herbicides pursuant to our IPM Program description in Appendix F. Herbicide applications will be made in accordance with label requirements and during conditions that will reduce the opportunity for drift. Applications over water bodies may result in some material entering the water column and potentially affecting species preyed upon by eagles. However, the low toxicity of the approved compounds and the small amounts applied to refuge water bodies will not result in significant impacts to eagles or their forage, either locally or regionally.

Effects from public use activities: An analysis of over 4,000 human activity events near bald eagle nests in Central Arizona (Grubb and King 1991) found distance to disturbance to be the most important classifier of bald eagle response, followed in decreasing order of discriminatory value by duration of disturbance, visibility, number of units per event, position relative to affected eagle, and sound. Breeding bald eagles in north-central Minnesota (Fraser et al. 1985) flushed at an average distance of 476 m at the approach of a pedestrian. A multiple regression model, including number of previous disturbances, date and time of day, explained 82 percent of the variability in flush distance and predicted a maximum flush distance at the first disturbance of 503 m (SE=131). Skagen (1980), also studying bald eagles in northwest Washington, found a statistically significant decrease in the proportion of eagles feeding when human activity was present within 200 m of the feeding area in the previous 30 minutes. A statistically significant between-season variation occurred in the use of feeding areas relative to human presence, which correlated with food availability. Eagles appeared more tolerant of human activity in the season of low food availability.

Alternatives 2 and 3 would cause fewer disturbances to the eagles themselves by restricting dog walking and jogging to the Auto Tour Route, which avoids important perches and roost areas. Overall, Alternative 2 appears to be the best alternative with respect to bald eagle habitat because of the smaller footprint of wildlife observation and photography activities. Alternative 3 increases the footprint by reopening the Kootenai River Dike Trail.

Public hunting for waterfowl is provided under all three alternatives. Waterfowl hunting takes place in areas that can be used by bald eagles for perching or foraging. Thus, eagles can potentially be disturbed by being pushed out of roosting/perching areas or temporarily prevented from using certain areas due to the presence of hunters. Eagles are also attracted to areas where there is hunting and habitat management for waterfowl because of increased food sources. Eagles are widely known to feed on waterfowl that is either not retrieved by hunters or wounded during hunting. In some areas, waterfowl hunting has provided a net benefit for eagles.

Potentially, eagles could be shot; however, that is an illegal activity under several Federal laws and has not been documented on the Refuge. Waterfowl hunting is only open four days per week, which provides eagles with access to hunted areas the remaining three days. Further, portions of the Refuge are completely closed to hunting, which provides perching and foraging habitat for displaced eagles. None of the alternatives would have a significant impact on bald eagles due to hunting.

Developed public use facilities such as the Auto Tour Route and the Deep Creek, Myrtle Creek, and other trails are sited in areas used by foraging and perching eagles. Developed public use facilities are sited away from eagle nests. Nests can be observed from these facilities with the use of binoculars or spotting scopes, which provides the public an opportunity to appreciate this species. Eagles continue to occupy these areas at the current level of public use, and no significant negative impacts have been observed.

Effects to Bull Trout (federally threatened species)

The Service revised the designation of critical habitat for bull trout pursuant to the Endangered Species Act of 1973, as amended (Act). Under the final rule (50 CFR Part 17) which became effective on November 17, 2010, Deep Creek and Myrtle Creek were included on the list of water bodies designated as critical habitat for bull trout. The Service defines critical habitat as the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the Act, on which are found those physical or biological features essential to the conservation of the species and which **may require special management considerations or protection** (emphasis added).

While bull trout have been documented in Myrtle Creek, it is not known if they are spawning in the creek. Therefore, detailed surveys will be conducted in 2011 in coordination with the Service's Idaho Fisheries Resource Office to gather more information.

<u>Effects of habitat management</u>: Alternatives 2 and 3, both propose to protect and maintain the upper reaches of Myrtle Creek and Cascade Creek on the Refuge, which currently have relatively good habitat quality. The Refuge will coordinate with the U.S. Forest Service, the adjacent landowner upstream, to provide the greatest amount of protection against potential degrading uses upstream of the Refuge.

Under Alternatives 2 and 3, instream habitat on the lower reaches of Myrtle and Cascade Creeks could be restored (based on the results of feasibility studies) to provide a suitable migratory corridor for salmonids moving to the upper reaches from the Kootenai River. The lower reach of Myrtle Creek is degraded, with a primarily sand and silt substrate and low shading and mature riparian vegetation "set back" from the streambank due to backwaters of the Kootenai River. While it may be impossible to breach the Myrtle Creek dike due to the existing infrastructure, instream restoration techniques may be used to restore the thalweg to enable the creek to carry its bedload down to the river. This would restore the historical salmonid spawning habitat which once existed in this westside tributary. Restoration of salmonid spawning habitat would also benefit kokanee, an important prey item of the endangered Kootenai River white sturgeon. In addition, restoration of Myrtle Creek under Alternatives 2 and 3 would remove the barrier at its mouth, potentially reconnecting a historical spawning area for burbot to the Kootenai River. This action would not occur under Alternative 1.

The current condition of the lower reach of Cascade Creek, from where it flows through a culvert under Westside Road to its confluence with Myrtle Creek, is highly braided. At Cascade Creek's confluence with Myrtle Creek, the stream channel is entrenched and eroded, thus creating a barrier to native salmonid migration. Restoration of this lower reach as proposed under alternatives 2 and 3 (again dependent upon the results of a feasibility study) would reestablish the creek's natural channel and allow native salmonid movement to the upper reach to spawn.

<u>Effects of public use</u>: Recreational fishing in Myrtle Creek, from the banks only, has been allowed on the Refuge since 1965. Prior to 2011, the Idaho Department of Fish and Game had a seasonal restriction for rivers and streams, whereby the season opened the Saturday of Memorial Day weekend and ran through November 30. In order to simplify the fishing regulations for the public, many streams, including Myrtle Creek (critical habitat for bull trout), will now be open year round to fishing (IDFG 2011).

Under Alternative 2 (the preferred alternative), fishing would be restricted to Myrtle Creek, from the banks only, during daylight hours (sunrise to sunset) only, in accordance with IDFG seasons and regulations (see Appendix B. Compatbility Determinations). Roberts and White (1992) established that the effects of angler wading on trout eggs and pre-emergent fry in artificial redds was dependent upon wading frequency and the stage of egg or fry development. They found that twice-daily wading killed up to 96 percent of eggs and pre-emergent fry while a single wading episode just before hatching killed up to 43 percent. Wading killed the most eggs and fry from the time of chorion (egg shell) softening to the start of emergence from the gravel. Therefore, restricting fishing to banks only is an essential tool to protect limited salmonid spawning habitat on the Refuge.

Threats to bull trout populations include illegal harvest, an increasing number of anglers and angler misidentification, and incidental take due to hooking mortality (USFWS 2002). In Alternatives 1 and 2, the potential to unintentionally harvest bull trout exists. Also, the ease of angler access to small water bodies, such as Myrtle Creek, has been shown to lead to increased angler effort and has been associated with declines in bull trout abundance (Parker et al. 2007). While small, easily accessible streams or lakes containing highly vulnerable bull trout populations could be well signed to educate anglers, and enforcement of restrictive regulations could be increased, these measures may not be of enough benefit to recover declining bull trout populations in these water bodies. Increased visitor education and orientation under Alternative 2 could result in lower incidental take of bull trout. However, monitoring of bull trout would be conducted under both Alternatives 2 and 3 and regulations that are more protective of bull trout would be developed if a demonstrated need exists.

Alternative 3 would still provide public recreational fishing opportunities on the Refuge, but only under a catch-and-release program, and only single, barbless, non-baited hooks would be allowed. This alternative provides the most protection to bull trout of the three alternatives, other than eliminating the public use altogether. Schmetterling and Long (1999) examined the ability of anglers to correctly identify six salmonid species. They concluded that while anglers correctly identified salmonid species 63 percent of the time, related species such as bull trout, brook trout, and brown trout were frequently confused. Bull trout were correctly identified by only 44 percent of anglers; resident anglers were found to be better at identifying bull trout than nonresidents. Since non-native brook trout do occur in Myrtle Creek, and the Refuge receives visitors from all around the country, a high potential of anglers to unknowingly harvest bull trout exists.

The restriction to single barbless, non-baited hooks in Alternative 3 would be intended to reduce hooking mortality. Numerous studies which have shown that barbed hooks, especially when used with natural baits, often result in fish mortality (Cooke and Suski 2005). Restricting the ability of anglers to remove hooked bull trout from the water will serve to decrease mortality due to air exposure and unnecessary handling.

Since it is believed that bull trout inhabit Myrtle Creek upstream of the Refuge's pedestrian bridge, restricting anglers to fishing below the bridge in Alternative 3 would reduce the take of bull trout. This stipulation would require coordination with the U.S. Forest Service (USFS) since they own the property immediately upstream of the Refuge.

7.2.3 Effects to Grassland Habitats and Associated Wildlife

The Refuge's upland grasslands provide breeding habitat for a number of migratory bird species including northern harrier, savannah sparrows, and numerous dabbling duck species, as well as foraging areas for breeding American kestrel, red-tailed hawk, and tree swallow. Mammals such as coyote, meadow and montane voles, and long-tailed weasel, and reptiles such as western garter snake also use the grasslands throughout the year.

Alternatives 2 and 3 include measures to improve management of existing grasslands.

Mowing and haying remove vegetation and are used by the Refuge to reduce vegetation height, stimulate new shoot growth, control noxious weeds, and reduce thatch, which can interfere with shoot production. Mowing does not reduce thatch as effectively as haying. Although pasture management benefits Canada geese and large ungulates such as white-tailed deer, elk, and mule deer, as well as migratory bird species such as northern harrier and American kestrel that use open habitats, there will be negative impacts to some grassland birds, small mammals, reptiles and amphibians. Not only are these species subject to mortality from machinery, but the conversion of tall pasture grasses to mowed grasses results in habitat loss. The Refuge reduces impacts of pasture management by delaying haying/mowing operations until after most grassland bird species have completed nesting (approximately August 1). Although impacts may affect these populations on a refuge level, they are not significant regionally or nationally.

Impacts to species of grassland birds, small mammals, reptiles, and amphibians associated with crop production include both direct mortality and habitat loss. The Refuge reduces the impacts by restricting the amount of cropland to less than 10 percent of refuge acreage, protecting water bodies and groundwater using Best Management Practices and controlling weeds using the Refuge's IPM program. Impacts associated with the Refuge's crop production program may affect local populations of some species, but are not significant either regionally or nationally.

Invasive weed species have the potential to reduce habitat quality and forage and have been identified as one of the most serious threats to refuge habitats. Preventing infestations is the most effective strategy. Early detection followed by rapid response (ED/RR) helps prevent new invasive plant occurrences from becoming established. The refuge staff searches refuge lands and waters on an annual basis to identify new occurrences and implements control efforts to eradicate these species.

A variety of methods including mechanical and cultural treatments and herbicide applications are used to reach refuge goals of less than 5 percent weed cover and no new infestations in managed grasslands. The Refuge uses an integrated pest management (IPM) approach to control weeds, whereby management options are selected based on site conditions and not implemented until established thresholds (such as percent weed cover) are exceeded.

For species that are or become established, mechanical, cultural, and biological controls methods are evaluated in that order. If these methods are not expected to be effective or would have undesirable consequences (such as impacting nests of grassland-nesting birds), then the Refuge may decide to use an herbicide. The Refuge may only use the most efficacious herbicide available with the least potential to degrade environment quality (soils, surface water, and groundwater) as well as least potential effect to native species and communities of fish, wildlife, plants, and their habitats. All applications of herbicides will conform to the specific pesticide label requirements.

The Refuge reviews herbicide use annually and submits herbicide use proposals to the Region 1 IPM Coordinator for all herbicide applications conducted on refuge lands. Herbicides are only applied when thresholds have been exceeded, and only after mechanical and cultural methods have been evaluated and found to be unsatisfactory. Herbicides are not applied to each field every year. Applications are only made under conditions where drift is minimized and risk of surface and groundwater contamination is minimal (applications are not made when precipitation is predicted or high winds are present). Given the low toxicity of these compounds and the conditions under which they are applied, any impacts to fish and wildlife, or their habitat are localized and insignificant. For additional descriptions and information on the refuge farm program and the use of herbicides, refer to the Compatibility Determinations for haying and mowing (Appendix B) and the Refuge's IPM program description (Appendix F).

7.2.4 Effects to Wetland Habitats and Associated Wildlife

Differences between alternative in effects to wetland habitat and associated wildlife are the result of changes in the quantity and quality of wetlands through changes in the management of water and wetland vegetation, control of invasive species and management of public uses (hunting, fishing, wildlife observation, photography, and environmental education).

Effects of Habitat Actions

Alternative 1 is not expected to result in any significant changes in the quantity and quality of wetland habitat over time. The action alternatives (2 and 3) are similar in their proposed treatments of wetlands. Each Alternative would put approximately 615 acres of wetland impoundments into a rotation to improve habitat quality for waterfowl. To maximize productivity and vegetation diversity, wetlands will be rotated between drawdown (drying) and flooding. Drawdowns reduce water levels, allow organic material to decompose and release stored nutrients, and allow wetland annuals to germinate from propagules present in the seedbank. Drawdowns also allow staff entry to the wetland to control dense emergent vegetation and invasive species through chemical and mechanical methods (i.e., disking of up to 100 acres per year). Wetlands will be maintained in a flooded condition through the entire growing season for up to 5 years to increase the interspersion of open water areas in emergent stands, provide breeding and foraging habitat for waterfowl, amphibians, fish, and other waterbirds, and help control reed canarygrass.

The Refuge uses a variety of mechanical and chemical controls to manage wetland vegetation, particularly to control common cattail, hardstem bulrush, and reed canarygrass. Under stable water regimes, native persistent emergent plant species such as common cattail and hardstem bulrush form dense monotypic stands with little interspersion of open water and low plant species diversity. This results in reduced habitat use by many species of birds, particularly waterfowl. Reed canarygrass tends to form dense monocultures and displaces native species in wet meadow and seasonally-flooded wetlands and around the borders of semi-permanently flooded wetlands. However, young reed canarygrass does provide nutritious forage for geese.

The use of equipment can cause soil compaction or soil/water contamination. To minimize these impacts, mowing and disking are only performed when soils are dry enough to support equipment. Disking is only performed when needed to control reed canarygrass and improve wetland plant diversity by opening dense stands of cattail and bulrush. The Refuge reduces impacts of management by delaying disking and mowing operations until after most wetland bird species have completed nesting (approximately August 1). To minimize the risk of contamination, refuge equipment is regularly maintained and inspected before each use. Spill kits are available on-site and all maintenance is sited away from wetlands and water bodies. Equipment operators are trained in spill prevention and response and are provided appropriate personal protective equipment.

Invasive species may be spread by moving equipment from site to site. These species may also become established where soils and existing plant cover is disturbed. The refuge equipment operators are required to clean equipment before moving between sites to reduce the spread of seeds and plant parts. The Refuge will continue to monitor wetlands for invasive weeds, aggressively control invasive plants, and restore sites to vegetation with high wildlife value.

If mowing and disking are not expected to be effective or would have undesirable consequences such as the destruction of desirable vegetation that is interspersed with weed species, then the Refuge may decide to use an herbicide. The Refuge's IPM Program description (Appendix F) describes the steps taken by the Refuge to select an herbicide and avoid undesirable effects. The Refuge may only use the most efficacious herbicide available with the least potential to degrade environment quality (soils, surface water, and groundwater) as well as least potential effect to native species and communities of fish, wildlife, plants, and their habitats. All applications of herbicides conform to the specific pesticide label requirements. The Refuge reviews herbicide use annually and submits pesticide use proposals to the Region 1 IPM Coordinator for all applications conducted on refuge lands. Only approved, low toxicity agents are used and then only when needed. Herbicides are not applied to each field every year.

The need to have sufficient water available near hunt blinds also limits the management options for wetlands in the hunt area for all alternatives. Wetlands in hunt areas must have sufficient water depths by the start of the hunting season to attract waterfowl, and provide a reasonable opportunity for successful hunts. Over time, in the absence of any management changes, this may result in changes to the vegetation community such as a reduction in species diversity and plant density, which would result in a reduction of habitat quality for species such as Pacific tree frog, marsh wren, and northern harrier. Under the action alternatives, the Refuge will reduce the scope of these impacts by using pumps to reduce the time required to flood up and draw down wetlands in the hunt area. Under the action alternatives, the Refuge will work to mitigate these impacts by improvements to the water management system that will allow adjusting the timing of water level management to provide more flexibility in wetland management and enhance habitat conditions.

<u>Moist soil/seasonal wetland habitat</u>: Under the two action alternatives (2 and 3) there would be a minor decrease in the area of seasonal wetlands, as more moist soil habitat is created and areas of seasonal wetlands associated with the seven permanent ponds are drawn down once every 5 to 7 years for vegetation management. This shift in seasonal wetland management is expected to provide significant improvements in spring and fall shorebird habitat as moist soil areas are drawn down (May-June) or slowly re-flooded (September-October), providing substantial increases in the acres of saturated mudflats and shallow flooded emergent marsh habitat. These same areas will provide important feeding areas for marsh birds such as rails, bitterns, and herons, especially along the emergent vegetation edge. Under Alternative 2 there would be up to twice as much of this habitat as in Alternative 3.

<u>Semi-permanent wetlands</u>: Maintaining the current management of this wetland type under Alternative 1 would result in lowered productivity and suitability of a majority of this habitat, since extensive closed stands of emergent vegetation (cattails and bulrush) would persist and potentially increase. Under the action alternatives (2 and 3) there would be a decrease by as much as 100 acres of semi-permanent wetland acres as a result of the rotational drawdown of permanent ponds in order to manage emergent vegetation and invasive species to improve overall productivity. Although this reduction could have minor short-term impact to overwater nesting waterfowl such as redheads, canvasback and ruddy ducks, as well as rails, bitterns and northern harriers, the long-term improvements in habitat diversity, and productivity will actually result in improved habitat conditions for these species.

<u>Permanent wetlands</u>: Under Alternative 1, the stable management of the major permanent ponds has resulted in lower productivity of aquatic beds as a result of accumulations of organic material and the encroachment of emergent vegetation. This continued condition will result in diminished food

resources for numerous wetland associated birds species such as diving ducks, waterfowl broods, tundra swans, and black terns. Rotational management of these ponds under Alternatives 2 and 3 through periodic drawdowns would allow the decomposition of accumulated organic material and release of nutrients, and improve plant diversity. This would improve the quality and productivity of this habitat over time for the species mentioned above.

Effects from Public Use

All public use programs result in some level of habitat damage and wildlife disturbance. In the context of the limited areas where public use is allowed under all alternatives, the limited activities that are allowed, and the amount of sanctuary habitat on the Refuge, the overall effects of public use are not expected to be significant under any of the alternatives.

Impacts specific to hunting and recreational angling: All three alternatives provide public hunting for waterfowl and recreational angling. The nature of these potential impacts is described in greater detail in the Waterfowl section above. Direct effects to wetland habitat from the hunting or fishing public are difficult to measure, but would likely be minimal for the following reasons:
1) Waterfowl hunters are only allowed to hunt 4 days per week on less than 40 percent of the available waterfowl habitat.

2) Although hunters that use the fixed blinds and free-roam areas will access their positions via cross-country travel which can trample vegetation and disturb wildlife, this impact is expected to be low because of small numbers of hunters and the time of the year. Breeding wildlife are not present and most vegetation is dormant and resistant to damage.

3) Anglers represent relatively low numbers and are only allowed access to a relatively narrow strip of habitat along Myrtle Creek.

Migratory and resident birds of various species and other wildlife may be interrupted while foraging or forced out of resting habitat or thermal cover, causing an unnecessary expenditure of energy and possibly subjecting them to increased risk of predation or weather-related stresses. These disturbances are quite difficult to measure, and are likely minor, since waterfowl hunters typically will follow an established trail to get to a blind and most distances to blinds are short. There is also some trampling of vegetation associated with accessing blinds, setting up decoys, and retrieving downed birds, but this is primarily restricted to trails leading to blinds and the immediate vicinity of the blinds and is considered to be negligible on a refuge level. Hunters, anglers, and other users can spread invasive species by varied mechanisms, such as transport on equipment, clothing, footwear, and hunting dogs. These impacts are very limited in scope and duration and result in insignificant impacts to the Refuge.

The refuge hunt program does affect the habitat management program, but these impacts are minor. Impacts include adjusting water levels for blind maintenance or modifications and/or holding water to attract waterfowl (primarily ducks) to hunt areas. From a habitat management standpoint, the Refuge may wish to keep moist soil units drawn down for longer periods of time to promote annual wetland plants with lower tolerance for inundation, but high wildlife forage value. Most of the potential moist soil units are located in hunt units.

Hunters hunting wetland areas have a direct impact by harvesting species that use wetlands or adjacent habitats (ducks, geese, and coots), though the impact is not significant on a regional basis. The direct effects of hunting waterfowl were analyzed in the Waterfowl section above.

Under Alternatives 2 and 3, the area open to waterfowl hunting would be reduced from 740 acres to 605 acres as a result expanding the non-shooting (retrieval) zone from 91 acres (current) to 225 acres (Alts 2 and 3). This would create a 200-yard safety zone along both the Auto Tour Route and Deep Creek Trail, which are used by visitors engaged in wildlife observation and photography during the hunt season. As these areas are mostly grassland areas and receive very little hunting pressure except to retrieve downed birds, the likely result would be a slight reduction in disturbance to wetlands and associated wildlife.

<u>Effects from wildlife observation, Auto Tour Route, and trails</u>: Wildlife observation from trails, the auto tour route, and photography blinds have direct and indirect impacts on the use of wetland habitats by assorted wildlife. Wildlife observers traveling along trails and roads can disturb migratory and resident birds of various species and other wildlife by interrupting foraging or forcing animals out of resting habitat or thermal cover, causing an unnecessary expenditure of energy and possibly subjecting them to increased risk of predation or winter weather-related stresses. These disturbances are quite difficult to quantify. However, some wildlife may avoid wetland habitats in close proximity to public use facilities, such as the auto tour route, due to the frequent presence of visitors.

Some researchers have attempted to correlate disturbance events in wildlife to the intensity, proximity, or loudness of human disturbance. Burger (1986), studying shorebirds on an eastern coastal Refuge, found that the level of disturbance in the shorebirds increased (fewer remained, more flew) as the total number of disturbances and the number of children, joggers, people walking, dogs, aircraft, and boats increased, and the duration of the disturbance and distance from the disturbance decreased.

Several researchers have looked at the question of proximity: at what distance do humans on foot elicit a disturbance response? From an examination of the available studies, it appears that the distance varies dramatically from species to species. Burger and Gochfeld (1991) found that sanderlings foraged less during the day and more during the night as the number of people within 100 m increased. Erwin (1989) studied colonial wading and seabirds in Virginia and North Carolina. Mixed colonies of common terns-black skimmers responded at the greatest distances, with respective means of 142 and 130 m; mixed wading bird species were more reluctant to flush (30-50 m average). There were few statistically significant relationships between flushing distance and colony size. Similarly, there were few differences between responses during incubation compared to post-hatching periods.

Klein (1989) studied the effect of visitation on migrant and resident waterbirds at Ding Darling National Wildlife Refuge, finding that resident birds were less sensitive to human disturbance than migrants. Migrant ducks were particularly sensitive when they first arrived on-site in the fall. They usually remained more than 80 m from a visitor footpath on a dike, even at very low visitor levels. Herons, egrets, brown pelicans, and anhingas were most likely to habituate to humans, thus exposing them to direct disturbance as they fed on or near the dike. Shorebirds showed intermediate sensitivity. Strauss (1990) observed piping plover chicks spent less time feeding (50 percent versus 91 percent) and spent more time running (33 percent versus 2 percent), fighting with other chicks (4 percent versus 0.1 percent), and standing alert (9 percent versus 0.1 percent) when pedestrians or moving vehicles were closer than 100 m than when they were undisturbed. In addition plover chicks spent less time out on the feeding flats (8 percent versus 97 percent) and more time up in the grass (66 percent versus 0.1 percent) during periods of human disturbance.

Wildlife photography is likely more disturbing, per instance, than wildlife observation. Klein (1993) observed at Ding Darling NWR, that of all the non-consumptive uses, photographers were the most likely to attempt close contact with birds, and that even a slow approach by photographers disrupted waterbirds.

Dwyer and Tanner (1992) noted that wildlife habituate best to disturbance that is somewhat predictable or background. Investigating 111 nests of sandhill cranes in Florida, Dwyer and Tanner found that nesting cranes seemed to habituate to certain forms of human disturbance and nested within 400 m of highways, railroads, and mines; cranes also were tolerant of helicopter flyovers. Even so, investigator visits to nests and development-induced alterations of surface water drainage were implicated in 24 percent of the nest failures.

Under all Alternatives, public use for wildlife observation is expected to increase slightly, compared to existing levels as a result of increasing regional populations and a greater awareness of the Refuge. Alternatives 2 and 3 would have a decreased impact to wetland habitats resulting primarily from the closure of the Island Pond Trail thereby reducing the potential for disturbance of over 80 acres of wetland habitat.

Overall wetland wildlife impacts from wildlife observation and wildlife photography activities associated with Alternative 2 and 3 are likely to be similar or slightly less than those associated with Alternative 1, which maintains the existing auto tour route, and does not add any additional public roads or walking trails. In addition, the Refuge will assess whether vegetative screening along portions of the auto tour route will be useful in reducing disturbance while allowing sufficient opportunities for wildlife observation.

7.2.5 Effects to Riparian Forests and Associated Wildlife

Effects of Habitat Actions

Other than protection of existing riparian and floodplain forest, Alternative 1 will provide little to no restoration of these habitats except for allowing the opportunistic recruitment of bottomland hardwood trees. Wildlife use of these habitats will not likely change when compared to the current situation.

Alternatives 2 and 3 both continue to protect and maintain existing riparian habitat. In addition, these alternatives restore up to 15-20 acres of mid-late successional riparian woodland while managing suitable areas for increased recruitment of bottomland hardwoods. Restoring 20-30 acres of riparian scrub-shrub within already managed grasslands is also included in these alternatives. This represents a 14-19 percent and 18-28 percent increase over the current acreage in each of these habitats, respectively. The increased acres will provide nesting habitat for many additional pairs of riparian dependent passerines and stop-over habitat for hundreds of migrants annually. In addition, there would be increased efforts to protect and maintain existing floodplain forest and riparian habitat, by controlling invasive species, establishing native understory vegetation, and enhancing recruitment of native trees. The cumulative impact of these actions would be an intermediate positive effect on riparian forests and wildlife.

Included in Alternatives 2 and 3 is the option to develop a special permit hunt for white-tailed deer and elk on the refuge flats. Although this hunt has the potential to limit habitat damage caused by these browsing ungulates, improve the health and vigor of existing woody riparian vegetation, and increase restoration success, these positive effects are likely to be minor and short-term.

Alternative 2 and 3 also include a land protection plan study to analyze alternatives for possible refuge boundary expansion to include 120 acres of Deep Creek floodplain immediately south of the Refuge that is under current ownership of Idaho Dept. of Lands (IDL). This would allow for eventual acquisition through purchase or long-term lease. If successful, this acquisition would increase the amount of bottomlands on the Refuge suitable for restoration of riparian forest and scrub-shrub habitats by 50 percent. A portion of this property is already supporting woody riparian vegetation. Acquisition and restoration activities on these lands over the life of the CCP would result in a slightly greater amount of habitat available for the wildlife species mentioned above.

Effects of Public Use Actions

Hunting effects: Impacts to riparian habitat and associated wildlife will be minor across all alternatives. Changes to the timing and location of hunting described in alternatives 2 and 3 will not significantly affect riparian areas. Generally, the disturbance is concentrated at regular fixed points around the blinds and to a much lesser degree elsewhere in the hunt area.

Effects from wildlife observation, Auto Tour Route, and trails: Alternatives 2 and 3 restrict dog walking and jogging to the Auto Tour Route. These actions will decrease the level of wildlife disturbance in riparian areas currently open to these activities. The impacts of these activities on wildlife have already been described for waterfowl and the effects on riparian wildlife are similar. Alternatives 2 and 3 also close Island Trail to hiking, reducing disturbance to the riparian habitat and associated wildlife in the adjoining areas.

Alternative 3 would re-open the walking trail on the Kootenai River Dike. The increased human caused disturbance would negatively impact wildlife occupying the adjacent riparian habitat. By introducing human impacts discussed above. However, this effect would be relatively minor.

7.2.6 Effects to Upland Forests and Associated Wildlife

Effects of Habitat Actions

Changes in management described in Alternatives 2 and 3 are not extensive but could result in positive enhancements to upland forest habitats. Creation and retention of snags would benefit a diverse cohort of snag dependent species. The understory thinning will help reduce ladder fuels and may allow for the use of prescribed fire in some very limited areas, particularly on the sites supporting late seral dry forest. A more substantive positive effect of thinning occurs when applied to sites trying to support aspen and/or cottonwood trees but where these hardwoods are being out-competed and shaded by conifers. Thinning will reduce the competition for space, nutrients and sunlight, encouraging suckering and growth. The vegetative diversity contributed by healthy hardwood enclaves in the coniferous dominated forest provides critical habitat for several species of birds, mammals, and other wildlife. A minor positive effect is the expected result from the cumulative impacts of these management actions.

Effects of Public Use Actions

Hunting effects: Alternatives 2 and 3 allow big game, grouse, and turkey hunting only in the upland forests west of Lions Den Road, and eliminate big game and upland game hunting in the narrow strip of refuge land west of Westside Road. These restrictions were developed to address safety and law enforcement issues related to hunting west of Westside Road. A potential effect on big game and grouse is the establishment of a sanctuary area within the Refuge for those species; however, the small size and narrow width of this area compared to the adjacent lands open to hunting minimizes the impact this "safe zones" would have on these wildlife species. Similarly, opening the area of upland forest west of Lions Den Road to turkey hunting removes what had been a de facto sanctuary for them within a much larger area open for turkey harvest. Neither change is expected to have more than a minor impact on these species.

Disturbance to other wildlife resulting from pursuit of big game and grouse is probably minimal. Both activities occur in the fall, well after the breeding and nesting season. The reduction in hunt area under Alternatives 2 and 3 will likely have only a minor positive impact on other wildlife species.

Conversely, allowing turkey hunting as described in alternative 2 and 3 may have a minor negative impact on other wildlife species. Turkey hunting can occur in spring during periods of breeding and nesting causing localized disturbance of other forest birds. However, the short duration of this disturbance and the low number of hunters anticipated to participate in this activity contribute to a low expected impact.

Effects from wildlife observation and trails: Ole Humpback and Myrtle Falls trails provide access to the forested upland portions of the Refuge. Neither Alternative 2 nor 3 make any changes to the length of these trails or the season of use. However, those alternatives prohibit dog walking on those trails. Disturbance to wildlife will be reduced with that management change, but the impact will be minor.

7.2.7 Effects to Instream Habitats and Associated Wildlife

There are six native salmonid species in the Lower Kootenai River Subbasin which are dependent upon quality instream habitat: bull trout (S*alvelinus confluentus*), westslope cutthroat trout (*Oncorhynchus clarkii lewisi*), redband rainbow trout (*Oncorhynchus mykiss* ssp.), kokanee salmon (*Oncorhynchus nerka*), pygmy whitefish (*Prosopium coulterii*), and mountain whitefish (*Prosopium williamsoni*) (DEQ 2006). The Lower Subbasin is also home to the endangered Kootenai River white sturgeon (*Acipenser transmontanus*) as well as Idaho's only population of native burbot (*Lota lota*). Of these, bull trout, rainbow trout, cutthroat trout, kokanee, and mountain whitefish are known to occur on the Refuge (Myrtle Creek and Cascade Creek). Kokanee were present in Myrtle Creek until the late 1980s. In 2003-2005, kokanee eggs were planted in Myrtle Creek, which resulted in returns on 2008. No returns have been observed in 2009-2010.

Under Alternative 1 the current, degraded condition of Deep Creek, lower Myrtle Creek, and lower Cascade Creek would continue due to siltation and backwater of the Kootenai River that prevent establishment of riparian vegetation. Habitat quality in the upper portions of Myrtle and Cascade creeks would remain good. Populations of native fish would be expected to remain at current levels. However, the bull trout population in Myrtle Creek, already low, may decline further due to climate change, inadvertent take by anglers, and competition and/or hybridization with non-native brook trout, which have a marked negative effect on bull trout at higher water temperatures (16°C-20°C [60°F-68°F]) (McMahon et al. 2007).

If deemed to be feasible, instream and riparian restoration as proposed under alternatives 2 and 3 would increase riparian shading and reduce sediment loads, thereby improving habitat quality for native salmonids and other native fish in Myrtle Creek. The bull trout population may increase due to improved water quality, particularly if shade targets can be achieved and water temperatures in lower Myrtle Creek can be reduced, and if sedimentation in lower Myrtle Creek can be reduced. Partnerships to improve quality in Deep Creek may also benefit native fish. However, the impacts of climate change may counteract the positive effects of habitat restoration and cause instream habitat on the Refuge to become thermally unsuitable for bull trout (Rieman et al. 2007). Changes to fishing regulations under Alternative 3 would reduce inadvertent take of bull trout. While impacts of Alternative 3 may affect populations of these species on a refuge level, they are not significant regionally or nationally.

7.3 Effects to the Physical Environment

Topics addressed under the physical environment section include direct and indirect effects to hydrology, water quality, air quality, visual quality, and geology/soils.

7.3.1 Effects to Hydrology

Under both Alternatives 2 and 3 improvements to the water management system through repair of dikes, separation of wetland units allowing independent management, and replacement of pumps will have a positive effect locally through more efficient use of water diverted from the Kootenai River and Myrtle, Deep and Cascade Creeks. Considering that the runoff of the Kootenai River measures approximately 11.2 million acre-feet annually (IWRB 2010), the proposed withdrawal of approximately 4,100 acre-feet from the river and three of its tributaries would not significantly affect the Kootenai River hydrograph or local hydrological patterns. Return of approximately 800 acre-feet during the spring and summer as a result of drawdown would slightly augment Kootenai River flows and potentially improve nutrient conditions in a nutrient poor system.

7.3.2 Effects to Water Quality

Minor short-term impacts to water quality could occur under all alternatives, stemming from the control of invasive plant species and short-term sedimentation associated with construction and maintenance activities. In situations where mechanical and cultural invasive plant control methods are ineffective, the Refuge may use approved herbicides in accordance with the Refuge's IPM program (Appendix F). Although mechanical removal has the potential to expose soils to wind and water erosion, this activity would be limited, largely due to the use of hand tools (except in cropland areas) and would focus on individual plant removal, rather than the removal of large areas of vegetation. Therefore, the continuation of this control method is not expected to introduce substantial amounts of additional sediments into the local wetlands or rivers.

The use of herbicides or pesticides to control invasive plants or animals, or to control weeds or pests in croplands, also poses several environmental risks, including drift, volatilization, persistence in the environment, water contamination, and harmful effects to wildlife (Bossard et al. 2000). A similar number of acres would be subject to herbicide or pesticide use under Alternatives 2 and 3 than under current management (Alternative 1), as shown in Table 7.3.

Table 7.3. Area Potentially Subject to Annual Herbicide or Pesticide Use.

Maximum acres treated annually	Alt. 1	Alt. 2	Alt. 3
Croplands[1]	200	200	200
Managed grasslands [2]	560	410	410
Native grasslands (treatment to control nonnative weeds prior to restoration)		75 acres over 15 years	75 acres over 15 years
Wetlands (reed canarygrass control)	20	100	50
Riparian forest/shrub restoration[3]	0	50	50
Upland forest, maintain existing	0	0	0
	0		
Total acres	**780**	**835**	**785**

Note: Acres are maximums. If allowed, prescribed fire would reduce herbicide required in grasslands.
1 Herbicide treatments may not occur annually in all croplands.
2 Grasslands are typically treated annually or bi-annually depending on coverage by noxious weeds and effectiveness of spring treatments.
3 Herbicide applications in riparian forest/shrub would be required for 2 to 3 years, to deplete reed canarygrass until shrub and tree seedling plantings or native understory vegetation becomes established.

Although there are a large number of acres on the Refuge potentially subjected to herbicide treatment, the potential for such risks under this alternative are considered minimal due to the types of herbicides used (nonpersistent), the limited number of acres that would be exposed in riparian habitat, and the precautionary measures taken during application (see Appendix F, IPM Program). Effects would not be considered significant under any alternative.

Mechanical soil disturbance would occur in wetland basins to control reed canarygrass and discourage woody vegetation, reduce cover of dense tall emergent vegetation (e.g., cattail) and stimulate vegetation growth. Alternatives 2 and 3 are similar in their proposed treatments of wetlands. Each alternative would put about 800-850 acres of impoundments into a rotation to improve habitat quality for waterfowl, and control invasive species through chemical and mechanical methods.

Mechanical treatment of wetlands would include disking of approximately 50-100 acres per year. Even though the Refuge restricts wetland mowing timing to after August 1, by which time most wetland birds and amphibians have completed their breeding seasons, mechanical treatment may result in some mortality to amphibians and late-nesting birds. Some mortality to small mammals and reptiles is also likely during mechanical treatments. Although the actual extent of this mortality is not known, the Refuge believes it is localized and temporary. Areas that are treated mechanically are identified as providing relatively poor habitat for focus species; generally consisting of stands of reed canarygrass or dense stands of emergent vegetation. By mowing and/or disking these habitats, the Refuge can reduce the coverage of reed canarygrass and dense emergents, and encourage native vegetation with high wildlife value. Mowing also encourages growth of young vegetative shoots, a preferred food of geese.

The impacts associated with mowing and disking are also offset by the resulting habitat improvements. Populations of wildlife species killed or displaced by these actions can be relatively rapidly replaced by individuals moving into the habitat from adjacent areas. Impacts will also be partially mitigated by restricting these techniques seasonally and spatially (less than 30 percent of emergent wetlands will be treated in any one year).

7.3.3 Effects to Air Quality

None of the alternatives would be expected to have significant effects to air quality compared to current management. Some minor impacts to local air quality may result from refuge management actions.

Prescribed fire: Prescribed fire has been used on the Refuge to manage grasslands and restore grass vigor. Fire performs several important functions including increased nutrient availability, suppression of woody vegetation, removal of thatch, and exposes bare soil for seed germination. Prescribed fire may also be used to control undesirable vegetation and reduces the weed seedbed. It could be used to reduce competition when establishing moist soil habitat and may be used after forest mechanical treatments to reduce hazard fuels.

Smoke produced by prescribed burns to manage grasslands or to control reed canarygrass could temporarily impact local air quality. The Refuge prepared a fire management plan in 2001 and will be updating this plan in the near future. This plan is a guide for managing the Refuge's wildland fire and prescribed fire programs. It defines levels of protection needed to provide for firefighter and public safety, protect facilities and resources, and restore and perpetuate natural processes, given current understanding of the complex relationships in natural ecosystems. It is written to comply with a Service-wide requirement that refuges with burnable vegetation develop a fire management plan (620 DM 1). The goals of the Refuge's prescribed fire program follow.

- Use prescribed fire to enhance wetland and upland habitats.
- Restore fire into fire-dependent ecosystems and promote nutrient recycling to the soil.
- Control nonnative wetland vegetation while thinning and invigorating tall emergent wetlands.
- Integrate prescribed fire with current management practices such as disking, mowing, chemical treatments, tree and shrub thinning, and water management

The rural nature of the Refuge, its distance from cities, and the relatively small size of prescribed fires (up to 20 acres) minimize negative effects related to safety and public health. Fire prescriptions will target favorable winds to maintain air quality. To ensure effective smoke management and air quality concerns, burn units would be relatively small (less than 20 acres) and fuel consumption less than 100 tons in a 24-hour period. Adequate personnel and equipment would be present to shut down a fire if the conditions are outside stated prescriptions.

Permits for conducting prescribed fires on the Refuge are not necessary but prescribed burning is conducted in compliance with the requirements of the Montana/North Idaho State Airshed Group. The meteorologist for this group coordinates with the Idaho Department of Environmental Quality on smoke production. Any prescribed burning for habitat management would occur under the guidelines described in the Refuge's Fire Management Plan which is scheduled to be updated in 2011. As required by Service policy, all burns are managed through a prescribed fire plan for the specific burn unit(s).

Vegetation management: Herbicide drift could contribute to minor localized impacts to air quality. Applicators are trained to minimize drift by managing droplet size and only applying during light winds (less than 10 mph). Since any drift would rapidly dissipate, this effect is determined to be extremely localized and negligible under all alternatives.

Auto Tour Route operations: The Refuge would experience increases in visitation over the 15-year time horizon of the CCP (see Section 7.3), due to demographic trends and projected increases in outdoor recreation regionally. The increased visitation would generate additional traffic on local and refuge roads. However, if auto tour traffic regularly exceeds 200 vehicles per day, actions would be taken to limit auto tour traffic. This increase would not degrade local air quality to any significant degree under any of the alternatives.

7.3.4 Effects to Visual Quality

All three alternatives would be expected to have negligible effects on visual quality (i.e., scenery). The Refuge's scenic beauty will remain undisturbed under these alternatives. A few minor additions to visitor facilities, such as signs and pullouts, will be placed in a few areas under Alternatives 2 and 3. These improvements would be designed to enhance visitors' appreciation of the natural and visual resources contained within the area. Except for these minor modifications, there are no effects to visual resources under the CCP.

7.4 Social Effects

The Social Effects section opens with an assessment of the change in refuge user numbers expected under each of the alternatives. Following this assessment, how management actions under each alternative could affect quality opportunities for each of the Refuge System's priority public uses (hunting, fishing, photography, wildlife observation, environmental education, and interpretation) is evaluated. In addition, opportunities for nonwildlife-dependent recreation are examined, as is the amount of illegal uses.

7.4.1 Projected User Numbers in 15 Years

As an overview to assessing the social effects of the alternatives, it is important to understand the broader context of the Refuge within the region and how recreational demand and public use is expected to change over time. A growing visitor presence on the Refuge can be expected in the future. Many of the public use opportunities currently provided at the Refuge are very popular within the State, and are forecast to attract new participants in the coming years.

Idaho Department of Parks and Recreation (IDPR) began tracking outdoor recreation trends in 2002 and published their information in the Idaho Statewide Comprehensive Outdoor Recreation and Tourism Plan (Idaho SCORP) for 2003-2007 (Idaho Parks and Recreation, 2006). Their most recent survey data from 2004 and 2005 (Idaho SCORP, 2006-2010) show that since 2002 trends are emerging that are likely to influence visitation and use at Kootenai, including increases for the following activities: outdoor photography (+44 percent), bird watching (+29 percent), snowshoeing (+28 percent), walking for exercise (+22 percent), watching wildlife other than fish (+21 percent), and cross-country skiing (+15 percent). Other noteworthy changes include a 22 percent decrease in running. Of the Idahoans surveyed in 2005, 70 percent participated in outdoor photography, with more than half described as regular participants or enthusiasts. This increase was attributed in part to the affordability and ease of digital photography.

Almost 13 percent of Idahoans surveyed in 2004 participate in waterfowl hunting, 37 percent in big game hunting with rifles, and 57.7 percent in fishing from a bank or shore. Northern Idaho counties (Benewah, Bonner, Boundary, Kootenai, and Shoshone) participation rates for waterfowl hunting were estimated to be 9 percent of those surveyed, one of the lowest rates in Idaho. The survey measured participation and trends in activities for Idaho residents but these trends are assumed to be similar nationally. The 2010 census (U.S. Census Bureau, 2010) reported a 21.1 percent increase in Idaho's population. The growing Idaho population coupled with an increasing interest in nature based recreation and tourism within the State will influence public uses at Kootenai under all management alternatives.

Cordell (2008) described general trends in nature-based recreation, comparing data from the National Survey on Recreation and the Environment (NSRE) in 2000 (NSRE surveys from 1999-2001) and 2007 (NSRE surveys from 2005-2008). Six of the top 17 fastest growing activities involved viewing, photographing, identifying, visiting or otherwise observing elements of nature. Viewing and photographing increased most dramatically at 78 percent and 60 percent respectively. He also noted that visitation at national wildlife refuges grew from 33 million in 1998 to over 40 million in 2007, an increase of 21 percent. Conversely, Cordell noted a decline in migratory bird hunting by 10 to 20 percent.

The 2000-2004 National Survey on Recreation and the Environment (NSRE), updated in 2006 by Cordell et al. (July 2006) for people living near the Kaniksu National Forest* (the Idaho portion of the Kaniksu National Forest is administered by the Idaho Panhandle National Forest in northern Idaho) described the following rates of participation by activity for Idahoans surveyed: 77 percent view or photograph natural scenery, 64.7 percent view or photograph other wildlife, 57.8 percent view or photograph wildflowers and trees, and 40.9 percent view or photograph birds.

The 2002 Idaho Outdoor Recreation Survey established baseline information for Idaho outdoor recreation trends. IDPR considered the trends from the NSRE as well as how these national rates of participation compared to Idaho's population. IDPR noted in the 2002 Idaho Outdoor Recreation Demand Assessment that Idahoans participate more than the rest of the nation in wildlife activities, particularly hunting. Idahoans are four times more likely to hunt big game and six times more likely to waterfowl hunt than the national average.

Table 7.4. Kootenai NWR's Projected Annual Visitation in 15 Years.

Recreational Activity	Current Visitation* (2010)	Projected Change (%)	Projected Visitation (2025)
Hunting Total	650		
Waterfowl	200	+8	216
Big game	300	+8	324
Upland	150	+8	162
Fishing	50	+21	60
Environmental Education	1,513	na	na
Wildlife Observation		+25	
auto	14,455		18,070
foot	35,000		43,750
Photography	6,000	+25	7,500

* From 2010 Refuge Annual Performance Plan database.
Projected change is an estimate based in part on the 1999 models for the Rocky Mountain Region published in Bowker et al. 1999 Outdoor Recreation in American Life: a National Assessment of Demand and Supply Trends as described in IDPR 2002 and the information from Idaho SCORP data from 2006-2010 (IDPR, 2010).

7.4.2 Opportunities for Quality Wildlife Observation and Photography

Wildlife Observation and Photography

The chosen indicators for each alternative were (1) areas open or closed to the public; (2) facilities improvements that affect wildlife observation and wildlife photography; and (3) overall habitat improvements that could increase wildlife viewing and photographic opportunities.

Alternative 1. Alternative 1 represents current management and public use programs with some adjustments to programs and anticipated growth in wildlife observation and photography at the Refuge and nationwide. The actions outlined below would result in neutral effect to opportunities for wildlife observation and photography.

Areas open or closed to the public for wildlife observation and photography: The 4.5 mile auto tour would be maintained and available year-round to auto, foot, dog walking, and bicycle traffic. During winter, use would also include snowshoeing and cross-country skiing. Photography would be allowed on the auto tour, 5.2 miles of trails, at the orientation kiosk at headquarters, at the Cascade Pond overlook, at pullouts off Lions Den Rd. One photography blind would be available for viewing and photography. Island Pond Trail would be closed to these uses during waterfowl hunt days.

Facilities improvements that affect wildlife observation and wildlife photography: Existing facilities would be maintained. Traffic and trail counters would be maintained and calibrated to improve visitation estimates.

Alternative 2. Alternative 2 represents the continuation of most existing public use programs and uses with some restrictions to protect sensitive wildlife as well as several facility improvements to enhance the wildlife viewing experience. Enhancement to wildlife habitats are expected to attract more wildlife which may improve viewing and photography opportunities. The actions outlined below would produce minor positive effects to wildlife observation and photography opportunities.

Areas open or closed to the public for wildlife observation and photography: Wildlife observation, photography, walking (including leashed dog walking), jogging, and bicycling would continue on the 4.5 mile auto tour. Snowshoeing and cross-country skiing would also continue during winter months. Island Pond Trail would be closed to all non-consumptive uses. All trails would be open year-round to walking, cross-country skiing, and snowshoeing, but jogging and walking with dogs would not be allowed on the 3.7 miles of open trails (Deep Creek, Ole Humpback, Myrtle Falls, and Chickadee).

Facilities and program improvements that affect wildlife observation and wildlife photography: Existing facilities would be maintained but additional improvements would be made to the auto tour. These improvements include developing alternative interpretation such as a radio announcing system, CD, and/or interpretive brochure, building an elevated viewing platform, adding up to 2 additional pullouts or passing areas, and adding new interpretive signs. An additional photography blind would be developed for viewing and photography which would have a slight positive effect in photography opportunities. Photography programs and contests would also be developed. Other improvements may result from hiring staff or training volunteers to work on additional programs and enhancements for the viewing and photographing public. These customer service improvements would enhance the visitors' experience.

Habitat improvements that could increase wildlife viewing and photographic opportunities: Wetland, cropland, and grassland management of habitats for migratory birds and big game would continue. Enhancements of native riparian, grassland, and moist soil habitats could increase the viewing opportunities available along the auto tour. Water management infrastructure improvements could also have minor positive effects to viewing and photographing opportunities in wetland habitats. Restrictions to auto tour viewing and photography may be necessary during special deer and elk hunts.

Alternative 3. Alternative 3 is similar to Alternative 2 in the improvements to the auto tour and habitat enhancements and slightly expands opportunities for viewing along trails and enhances viewing and photo blind facilities. The actions outlined below would produce minor positive effects to wildlife observation and photography opportunities.

Areas open or closed to the public for wildlife observation and photography: Wildlife observation, photography, walking (including leashed dog walking), jogging, and bicycling would continue on the 4.5 mile auto tour. Snowshoeing and cross-country skiing would also continue during winter months. Island Pond Trail would be closed to all non-consumptive uses but the 1.1 mile Kootenai River Trail that was closed in 2004 would be reopened. All trails would be open year-round to walking, jogging, cross-country skiing, and snowshoeing but walking with dogs would not be allowed on the 4.8 miles of open trails (Deep Creek, Ole Humpback, Myrtle Falls, and Chickadee). An additional photography blind would be developed for viewing and photography which would have a slight positive effect in photography opportunities.

Facilities and program improvements that affect wildlife observation and wildlife photography: As in Alternative 2, existing facilities would be maintained but additional improvements would be made to the auto tour including developing alternative interpretation modes such as a radio announcing system, CD, and/or interpretive brochure, building an elevated viewing platform, adding up to 2 additional pullouts or passing areas, and adding new interpretive signs. An additional photography blind would be developed for viewing and photography, which would have a slight positive effect on photography opportunities. Photography programs and contests would also be developed. Other improvements may result from hiring staff or training volunteers to work on additional programs and enhancements for the viewing and photographing public. An eagle cam would be added to the refuge website allowing virtual visitors to see the nesting bald eagles during incubation and brood rearing.

Habitat improvements that could increase wildlife viewing and photographic opportunities: Habitat improvements that could affect viewing and photography opportunities are similar to those described in Alternative 2, including continuing wetland, cropland, and grassland management of habitats for migratory birds and big game, would continue as well as enhancing native riparian, grassland, and moist soil habitats and improving water management infrastructure. These actions could increase the viewing opportunities available along the auto tour and would have a positive effect to viewing and photographing opportunities in wetland, grassland, and riparian habitats. Restrictions to auto tour viewing and photography may be necessary during special deer and elk hunts.

7.4.3 Opportunities for Quality Hunting

Waterfowl Hunting

The Refuge will continue its waterfowl hunting programs that provide first-come first served opportunities for youth only during the last weekend in September, and for all legal hunters from the first weekend in October through the second weekend in January. Both free-roam and blind hunting will be available unless monitoring dictates another course of action to ensure public safety and protect wildlife. Alternatives 2 and 3 increase the size of no-shooting (retrieval) zone from 91 acres (current management) to 226 acres along the west side of the auto tour route and the Deep Creek Trail to ensure the safety of the non-hunting public using those facilities. In Alternative 1 (current management) the no-shooting area runs along the west side of the auto tour route only. This would reduce the size of the hunt area from 740 acres (current management) to 605 acres. The chosen indicators for the effects on waterfowl hunting opportunities for each alternative were: (1) acres available for hunting; (2) number of blinds available; (3) habitat quality; and (4) other management actions that affect hunt quality.

Alternative 1. Alternative 1 continues the current waterfowl hunting program, which allows waterfowl hunting for ducks, geese, and coots is on 740 acres during the State waterfowl season on Tuesday, Thursday, Saturday, and Sunday. Hunters use fixed blinds (18 are provided) and free roam hunting within the hunt area. A 91-acre no-shooting area along the west side of the auto tour route provides for public safety. The actions outlined will have a neutral effect on waterfowl hunting opportunities and quality.

Acres and number of blinds available for waterfowl hunting: No change, therefore a neutral effect.

Habitat quality for waterfowl: The current habitat management actions would be continued under Alternative 1 with no changes to the area of cropland, grassland, and managed wetlands. A neutral effect to quality of waterfowl hunting is expected under this alternative.

Alternative 2. As in Alternative 1, Alternative 2 allows waterfowl hunting for ducks, geese, and coots during the State waterfowl season on Tuesday, Thursday, Saturday, and Sunday. Hunters use fixed blinds (18 are provided) and free roam hunting within the hunt area. Alternative 2 reduces the area available for waterfowl hunting from 740 to 605 acres due to the expansion of the 200 yard no-shooting area to include the west side of the Deep Creek Trail. Under Alternative 2, the no-shooting area would increase from 91 to 226 acres. Retrieval of birds would be allowed in this area. The actions described below will have a neutral effect on hunt quality.

Acres and number of blinds available for waterfowl hunting: Waterfowl hunting would be allowed on 605 acres. A 200 yard (226 acre) no-shooting area would be established. Retrieval of birds would be allowed in the no-shooting area. This action is not expected to have a negative effect upon waterfowl hunting opportunities since waterfowl hunters do not generally hunt in the proposed no-shooting area. Hunting from both free roam and fixed blinds will be allowed unless hunt program monitoring demonstrates that conflicts are negatively affecting waterfowl or hunter safety. One additional ADA hunt blind will be developed in the north hunt unit. In the south hunt unit, free roam and fixed blind hunting will be allowed except that on South Pond, hunters must use the blind (ADA blind) and will not be allowed free roam opportunities. These actions would increase waterfowl hunting opportunities for people with disabilities.

Habitat quality for waterfowl: Under Alternative 2 habitat management actions will increase the acreage of moist soil habitat for fall migrating waterfowl and improve wetland management. These habitat management actions are expected to have a positive effect on waterfowl use of fall migration habitat on the Refuge, and therefore have the potential to increase waterfowl hunting opportunities.

Other management actions: Additional management will include adjusting the blind designs and locations based on waterfowl habitat use and hunter survey data, increased law enforcement patrols, establishment of a hunter hotline for reports of bird and hunt activity, and provision of hunter clinics. Other management actions include provision of numbered parking spaces that correspond to blind numbers may be instituted to reduce crowding; instituting a non-reservation permit system to provide managers with information about hunters and harvest statistics; and development of a new waterfowl hunt brochure. These actions have the potential to increase the quality of the waterfowl hunt by reducing conflicts between hunters and promoting ethical behavior.

Alternative 3. The actions pertaining to waterfowl hunt facilities and program management in Alternative 3 are the same as Alternative 2; therefore the effects would be the same.

Acres and number of blinds available for waterfowl hunting: Alternative 3 is the same as Alternative 2.

Habitat quality for waterfowl: Under Alternative 3 habitat management actions will increase the acreage of moist soil habitat for fall migrating waterfowl and improve wetland management. These habitat management actions are expected to have a positive effect on the quality of waterfowl habitat but these actions will take place outside the waterfowl hunt units and may not improve hunt quality.

Other management actions: Alternative 3 is the same as Alternative 2.

Big Game Hunting

Current management allows big game hunting on the 295-acre forested portion of the Refuge west of Westside Road and west of Lions Den Road.

Alternatives 2 and 3 allow hunting in the area west of Lions Den Road (173 acres) but prohibit hunting west of Westside Road (122 acres). Whether a "quality" hunt could be achieved on the narrow strip of the Refuge west of Westside Road is questionable. The effect of the loss of that area on opportunities for big game hunting is probably minor, and would be mitigated by the potential for developing special permit hunts and/or depredation hunts for white-tailed deer and elk on the refuge flats. The area west of Lions Den road is larger, less visible from the road, and provides access to much larger areas of huntable public land. Under this alternative hunting this larger forested parcel of the Refuge is still available to big game hunting. The effect on big game opportunities, either locally or regionally, would be minor to negligible due to the small area, the large amount of nearby State and Federal lands where this activity is allowed, and low number of hunters who participate in this activity.

Upland Game Hunting

Forest grouse hunting is allowed in the 295-acre forested area west of Westside and Lions Den Roads under current refuge rules. Alternative 2 and 3 treat grouse hunting in the same way as big game hunting; therefore, the effects described above for big game hunting apply equally to grouse hunting. The effect on upland game opportunities regionally would be negligible due to the small area, the large amount of nearby State and Federal lands where this activity is allowed, and low number of hunters who participate in this activity.

Both action alternatives would allow turkey hunting west of Lions Den Road. Nonnative wild turkey populations are growing throughout the region. Adding this new hunting opportunity during State seasons in this limited area is expected to have a minor positive effect on upland game hunting opportunities.

7.4.4 Opportunities for Quality Fishing

Quality fishing opportunities for the public are considered to be limited on Kootenai National Wildlife Refuge since fishing is allowed only on Myrtle Creek. While the exact number of fishing visits is unknown, it is estimated to be less than 100 visits per year. While fishing opportunities are limited on the Refuge, numerous fishing opportunities exist elsewhere in Northern Idaho. Boundary County alone has 176 streams and 61 lakes (ID HomeTownLocator 2011). Fishing is a popular activity in north Idaho. In 2003, Idaho Department of Fish and Game (IDFG) estimated that anglers participated in over 37,000 trips to Boundary County. The top waters for 2003 included the Moyie River, Brush Lake, Robinson Lake, and Smith Lake (IDFG 2011a).

Alternatives 1 and 2 (the Preferred Alternative) would continue the existing fishing program on the Refuge, which allows the public to fish from the banks of Myrtle Creek. In 2011, IDFG's fishing season, which applies to Myrtle Creek, changed from 6 months (Memorial Day weekend to November 30) to year round (IDFG 2011b), an increase of 6 months of fishing opportunities.

Alternative 3 would provide the public recreational fishing opportunities but only under a catch-and-release program, year round, to protect the federally threatened bull trout in their designated critical habitat. Under Alternative 3 anglers must use single, barbless, non-baited hooks. Alternative 3 would also restrict anglers to Myrtle Creek below the Refuge's pedestrian bridge. Given the small area of the Refuge where fishing is allowed, and the ample fishing opportunities that are available in north Idaho on other public lands, Alternative 3 would have a minor to negligible negative impact to fishing opportunities.

7.4.5 Opportunities for Quality Environmental Education

No significant adverse effects are expected under any of the alternatives, because none of the alternatives would displace any existing environmental education activities. The environmental education program would grow under Alternatives 2 and 3 by expanding the schedule, using teachers as facilitators, and expanding the volunteer or employee base. Since the Refuge would schedule educational visits and regulates the time, date, size, location, and duration of educational visits, crowding would be unlikely to occur. Finally, none of the alternatives would result in substantial anticipated losses of wildlife or habitat supporting the environmental education experience. Changes in refuge management would provide new opportunities for educating people about managing the Refuge.

7.4.6 Opportunities for Quality Interpretation

No significant adverse effects are expected under any of the alternatives, because none of the alternatives would displace existing interpretive activities. Crowding at interpretive sites, already low, would be unlikely to occur. None of the alternatives would result in significant anticipated losses of wildlife or habitat supporting the interpretation experience.

Under Alternatives 2 and 3, the positive effects to opportunities stemming from facility enhancements would not be considered significant because the proposed actions represent slight increases in opportunities or quality of interpretive experiences as compared to existing conditions. Facilitated interpretive experiences may be improved under the action alternatives since each alternative proposes to hire seasonal or temporary staff or train volunteers to provide interpretive programs, including talks, walks, or self-guided activities.

7.4.7 Opportunities for Nonwildlife-Dependent Recreation

Potential opportunities for other public uses not considered priority, or deemed nonwildlife-dependent under the Refuge Improvement Act, are contingent on the completion of refuge appropriate use findings and compatibility determinations for that particular use.

Cross-country skiing, snowshoeing, and bicycling are considered as ways to access wildlife observation and photography opportunities and are considered under the Compatibility Determinations for those uses (Appendix B). No significant effects are expected for bicycling under all alternatives because no change in the timing and location of the activity would occur. Under Alternatives 1 and 2, no significant effects to cross-country skiing and snowshoeing are expected because no changes in the location or timing of these activities would occur. Minor positive effects are expected for cross-country skiing and snowshoeing under Alternative 3 because the 1.1 mile Kootenai River Trail would be reopened, allowing greater opportunities for these two activities.

Currently, two non-wildlife-dependent uses (jogging and dog walking) are allowed on refuge roads and trails. Under Alternative 1, no significant effects to jogging and dog walking are expected, since these activities would continue on the ATR and all refuge trails, except for the Island Pond Trail, which is closed on hunt days during the waterfowl hunt season. Although dogs must be leashed, there is not restriction on number of dogs per walker or leash length/type. Dog walkers are not required to pick up and remove dog feces from the Refuge. Intermediate negative effects are expected to jogging and dog walking under Alternatives 2 and 3 since these activities would be limited to the 4.5 mile Auto Tour Route to reduce disturbance to wildlife and conflicts with visitors who are engaged in wildlife-dependent recreation. Besides reducing opportunities for these uses, there may be increased congestion as these uses are concentrated on the ATR. Organized running groups and jogging events would be prohibited and jogging groups limited to five people or less. Dogs would be required to be on a short (6 feet or less), non-retractable leash at all times and no more than two dogs per walker would be allowed. Organized training or competition events for dogs would be prohibited. Dog walkers would be required to pick up after their dogs and remove the feces from the Refuge. Some users may perceive these greater restrictions as reducing the quality of the activity. On the other hand, these measures would reduce conflicts among dog walkers and between dog walkers and other visitors.

Intermediate positive effects are also expected under Alternatives 2 and 3 for user groups engaged in wildlife-dependent recreational activities (wildlife observation and photography). Prohibiting jogging and dog walking on refuge trails and restriction these activities to the ATR will likely result in reduced conflicts between user groups and enhanced opportunities for visitors to observe and photograph wildlife.

Limited outreach and law enforcement capability has, at times, resulted in prohibited nonwildlife-dependent activities occurring such as horseback riding and ATV riding. Increased capability for public outreach, education and law enforcement proposed under Alternatives 2 and 3 should reduce occurrences of these prohibited uses.

7.4.8 Amount of Illegal Use

Trespass into closed areas and illegal hunting occur on the Refuge. Some of the same refuge qualities that attract legitimate refuge visitors—solitude, open public spaces, wooded areas, and minimal human interference—also attract individuals seeking places for illegal activities. Under all the alternatives we intend to curb illegal activities and create a safe environment for visitors. Continued cooperation with local and Federal law enforcement agencies will continue to deter illegal activities while promoting visitor safety and security. In October 2010, the Inland Northwest NWR Complex hired a law enforcement officer who has increased the law enforcement presence on the Refuge is expected to curb illegal activities.

The actions outlined above would result in intermediate positive effects to opportunities for recreational public uses, but they would not be significant because they would likely not result in a substantial increase in the opportunity for or quality of any wildlife-dependent public uses.

7.4.9 Environmental Justice

Since CCP implementation is expected to result in generally positive effects on the human environment, all proposed public use actions have little risk of resulting in disproportionate adverse effects on human health, economics, or the social environment.

7.5 Economic Effects

Kootenai NWR has direct economic impacts on the local economy. The refuge budget supports employee salaries, operations and maintenance costs, and various programs. At times the Refuge receives funding allocations for capital improvements for facilities including but not limited to buildings, water management infrastructure, and roads. Spending associated with these activities results in local economic effects. Since 1935, counties have received yearly payments for refuge lands under Fish and Wildlife Service administration through the Refuge Revenue Sharing Act. The revenue sharing fund consists of income from the sale of products or privileges on all wildlife refuges including timber sales, permit fees, and oil and gas royalties. The payment is based on the greatest of three values: a percent of market value of acquired lands, a percent of net receipts, or a flat per acre rate. In-lieu of tax payments may be used by counties for any governmental purpose. Boundary County received $9469 during 2010 for payment in lieu of taxes for fiscal year 2009.

The Refuge also provides an indirect economic impact on the local economy through the recreational activities that it offers. These activities - hunting, fishing, wildlife viewing, photography, hiking, bicycle riding, cross-country skiing, snowshoeing, environmental education, and interpretation would all continue under both action alternatives. People that participate in these activities on the Refuge frequently buy goods and services in nearby towns (e.g., food, lodging, fuel, equipment) and are contributing to the local economy. The action alternatives include the potential to offer cooperative haying or mowing contracts which could benefit potential cooperators as well as further refuge habitat objectives.

The economic influence area is mainly Boundary County, Idaho, where the Refuge is located. Some economic benefits may also accrue to Bonner County where some refuge transactions occur. Many refuge visitors live within these two counties and are assumed to make most of their purchases within those counties.

The economic effects of Alternative 1 would be neutral since habitat and public use management would be similar to the current situation. Alternative 2 would have a minor positive impact due to increased refuge workforce (including temporaries, interns, and AmeriCorps members, increased spending by the Refuge related to improvements to infrastructure and public use facilities (auto-tour, interpretation, etc.; see Appendix C). Most infrastructure improvements would be one-time costs. Alternative 3 would have similar operational and visitor-related expenditures to Alternative 2.

Effects are considered significant if the gain or loss in total personal income stemming from expenditures associated with the Refuge exceed 5 percent of the total personal incomes of the counties in the economic influence area.

The refuge budget contributes to the regional economy as both payrolls and other expenses. Since refuge operational expenditures would vary by alternative based on staffing levels and programs associated with each alternative (see Appendix C), each alternative would result in a different degree of economic effect (Appendix C, Table C-3). Alternatives 2 and 3 require a higher level of staffing and expenditure on habitat restoration and infrastructure than Alternative 1, and therefore would have a greater effect on the local economy than Alternative 1. This would translate into more jobs and more personal income within the analysis area under Alternatives 2 and 3, compared with Alternative 1 (current management). Alternative 1 includes $335,500 annually in payroll expenses for four full-time and one seasonal employee, while Alternatives 2 and 3 include $535,000 for seven full-time and one seasonal employee. One-time expenses for maintenance and improvement of habitat and facilities would be approximately $400,000 under Alternative 1, and $12-$13 million under Alternatives 2 and 3. Alternative 1 would have the least economic benefit locally as a direct result of refuge expenditures, with fewer jobs and less personal income generated than Alternatives 2 and 3.

The Refuge's recreational programs and facilities would vary by alternative. In 2004 (similar to current conditions), refuge visitors were estimated to spend about $1.7 million per year to recreate on the Refuge (Caudill and Henderson 2005; see Table 6.7 in Chapter 6). The total monetary effect of economic activity generated by Kootenai NWR visitors spending totalled $2.2 million. This final demand associated with refuge visitation was estimated to generate 43 jobs, with $748,400 in employment income and $352,000 in total tax revenue (Caudill and Henderson 2005). The authors estimated that for each $1 of refuge budget expenditures $4.29 in total economic effects is generated. Note that this ratio broadly compares the magnitude of recreational benefits and the refuge budget and should not be used as a benefit-cost ratio (Caudill and Henderson 2005).

In the future, the types and quantities of visitor facilities, access, and programs are expected to influence the number of visitors. In addition, over the next 15 years, visitation is expected to be affected by demographic changes and changing cultural values that influence people's choices for recreation. Estimates of the change to annual visitation to the Refuge over the next 15 years for different recreational categories are presented in Table 7.4. As evident from the table, visitation is estimated to change by activity, with an overall increase in visitation. The addition is mostly due to projected increases in wildlife observation/photography activities. Overall recreational visitation is expected to be similar under Alternatives 2 and 3, and slightly higher than under Alternative 1 (current management), because of the improvements to visitor facilities. As a result, Alternatives 2 and 3 would result in a slightly higher number of local jobs and have a slightly greater local economic effect stemming from the recreational expenditures of refuge visitors, than Alternative 1 (current management).

One aspect of the recreational activity analysis deserves explanation. Visitors from outside of the local area spend more money in the local area (motels, restaurants), while recreating on the Refuge than local residents do. Spending by nonresidents due to choosing the Refuge as a recreation destination thus represents an infusion of money into the local economy that would not occur if the Refuge were not there. If the Refuge did not exist, local residents would possibly take advantage of similar recreational opportunities nearby, such as local wildlife areas and state parks. To the extent that nearby areas could replicate the recreational experiences provided at the Refuge, the expenditures made by these visitors may have taken place inside the county regardless of the Refuge's existence. Hence, the analysis may overestimate somewhat the contribution of the Refuge to the local economy.

In 2008, Boundary County, Idaho had a total personal income (TPI) of $266.7 million dollars, which represented about 0.5 percent of the State's total of $50.4 billion; while Bonner County had a TPI of $1.29 billion dollars, or 2.5 percent of the Idaho total (Idaho Department of Labor 2011). A detailed economic analysis of the alternatives was not completed to determine the multiplier effects the alternatives would have on the county. However, based on the background information presented above and the estimated changes in refuge spending under Alternative 2 (see Appendix C, Table 3.4; Alternative 3 would be similar), the Refuge's effect on total personal income in Boundary and Bonner Counties under Alternatives 2 and 3 would not be significant because the effect of refuge expenditures on the counties' TPI would not exceed 5 percent of the total.

7.6 Effects to Cultural and Historical Resources

The National Historic Preservation Act (NHPA) of 1966, as amended, establishes the Federal Government's policy on historic preservation and the programs through which that policy is implemented. An impact to cultural resources would be considered significant if it adversely affects a resource listed in or eligible for listing in the National Register of Historic Places (NRHP). In general, an adverse effect may occur if a cultural resource would be physically damaged or altered, isolated from the context considered significant, affected by project elements that would be out of character with the significant property or its setting. Title 36 CFR Part 800 defines effects and adverse effects on historic resources.

Cultural resource surveys will be conducted before any major construction or habitat restoration project. These projects may include, but are not limited to, the construction of roads, trails, bridges, dikes, and visitor facilities. Earth moving activities occurring in proximity to known sites would be monitored because of the potential for buried cultural material in these areas. If any cultural materials are uncovered during excavation, the Regional Historic Preservation Officer would be contacted to review the materials and recommend a treatment that is consistent with applicable laws and policies. Any new cultural resources identified during the survey would be recorded and evaluated for eligibility to the NRHP. If any sites are determined to be eligible to the NRHP, the restoration plans would need to be assessed for potential effects to the historic property. If effects are possible, the proposal would be reviewed to ensure that the effects have the least impact to original materials and are in conformance with the Secretary of the Interior's Standards for the Treatment of Historic Properties. Changes that comply with the Secretary's Standards would have no adverse effect on historic properties. Once an assessment has been completed, the findings would be forwarded to SHPO for concurrence. Implementation of the procedures described above is expected to avoid adverse effects to historic resources; however, additional analysis under NEPA may be required once specific details are known.

The construction and public use facilities proposed under all of the alternatives would not be expected to have an adverse effect on historic resources. The habitat management and restoration projects proposed under all of these alternatives would not be expected to have an adverse effect on historic resources.

Major disturbance would be avoided by the survey and consultation process as described in Section 106 of NHPA described above. Expansion of facilities and trails under the alternatives would receive the same scrutiny, to ensure they would not detract from cultural resources; therefore, no adverse effects to cultural resources as a result of human activity within the Refuge are anticipated.

Based on the criteria for assessing adverse effects that are provided in the NHPA, all of the alternatives are considered to be a "No Adverse Effect" undertaking as per 36 CFR Part 800.5(3)(b), hence none of the alternatives would have a significant impact to cultural resources. The Service's determination of no adverse effect would be submitted to SHPO for concurrence. No mitigation would be required.

7.7 Other Effects

7.7.1 Potential Impacts on Adjacent Lands and their Associated Natural Resources and to Nearby Residents

Minor impacts to air and water quality would occur but these are not considered significant; see physical environment effects analysis in Section 7.3. The Refuge would work closely with adjacent landowners and local governments to minimize impacts to adjacent lands. Given this, impacts to nearby residents would be expected to be minimal.

7.8 Cumulative Effects

Cumulative effects can result from the incremental effects of a project when added to other past, present, and reasonably foreseeable future projects in the area. Cumulative impacts can result from individually minor but cumulatively significant actions over a period of time. This analysis is intended to consider the interaction of activities at the Refuge and with other actions occurring over a larger spatial and temporal frame of reference.

The Council on Environmental Quality (CEQ) regulations for implementing the provisions of NEPA define several different types of effects that should be evaluated in an EA including direct, indirect, and cumulative. Direct and indirect effects are addressed in the resource-specific sections of this Draft CCP/EA. This section addresses cumulative effects.

The CEQ (40 CFR § 1508.7) (CEQ 1997) provides the following definition of cumulative effects:

> the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.

It should be noted that the cumulative effects analysis has essentially been completed by virtue of comprehensive nature by which direct and indirect effects associated with implementing the various alternatives was presented. The analysis in this section primarily focuses on effects associated with reasonably foreseeable future events and/or actions regardless of what entity undertakes that action.

As described in Chapter 4, cumulatively, there has been a substantial modification to native habitats of the lower Kootenai River valley over the past 100 years. Although a number of natural areas have been designated and are maintained on the lower Kootenai River, the natural hydrology of the river has been altered and most native floodplain habitat is highly altered from precontact conditions. Invasive species and altered ecosystem processes are widespread within the area. Within this context, region-wide biological integrity may be at risk. Over time, the Refuge, although relatively small, may become increasingly valuable for the persistence of native wildlife of the lower Kootenai River. All of the alternatives would maintain refuge habitats valuable to wildlife. Active improvement of riparian, wetland, and coniferous woodland habitats in Alternatives 2 and 3 (action alternatives) would increase or maintain the value of refuge lands and waters for a wide variety of native fish and wildlife.

The action alternatives emphasize habitat improvements for waterfowl and other migratory birds, would improve the capability of the Refuge to provide food for waterfowl during migration, and would provide habitat improvements for other native species. However, actions proposed under the Draft CCP/EA will not reverse or halt the regional trend toward reduced biological integrity within the lower Kootenai River. Under all alternatives, biological diversity (the number of species present on the Refuge) would probably remain about the same. Invasive species could become more prevalent on surrounding lands but on the Refuge, active efforts would be made to reduce their populations. The Service would improve the availability and quality of wildlife-dependent recreation, but within a regional context, there would be little cumulative difference in recreational opportunity. Although mortality will occur to some wildlife under the Refuge's hunt program, the analysis presented previously in this chapter supports the conclusion that there would be no adverse population level impacts to hunted or nonhunted wildlife species, even when added to other hunt programs regionally or nationally.

Throughout this analysis, effects to resources of concern have been considered. The overall effect of an alternative stemming from the combination of individual actions included in that alternative was assessed. The cumulative effects of the hunt program are covered where applicable in previous sections of this chapter. If no effect from hunting (or any other activity) is listed or discussed (for instance in cultural resources analysis, section in sections 7.6) this means that in our judgment, the activity is not considered to have any effect on the resource in question.

7.9 References

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Appendices

Bald eagles

Appendix A. Appropriate Use Determinations

Introduction

The Appropriate Refuge Uses Policy outlines the process that the Service uses to determine when general public uses on refuges may be considered. Priority public uses previously defined as wildlife-dependent uses (hunting, fishing, wildlife observation and photography and environmental education and interpretation) under the National Wildlife Refuge System Improvement Act of 1997 are generally exempt from appropriate use review. Other exempt uses include situations where the Service does not have adequate jurisdiction to control the activity and refuge management activities.

In essence, the appropriate use policy, 603 FW 1 (2006), 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 before allowing it on a refuge. The policy also requires review of existing public uses. During the CCP process the refuge manager evaluated all existing and proposed refuge uses at Kootenai National Wildlife Refuge using the following guidelines and criteria as outlined in the appropriate use policy:

- Do we have jurisdiction over the use?
- Does the use comply with applicable laws and regulations (Federal, State, tribal and local)?
- Is the use consistent with applicable Executive orders and Department 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 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 that the following refuge use(s) are appropriate, and directed that compatibility determinations be completed for each use: research, haying, dog walking, and jogging.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Kootenai 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:______________________________ Date:________________

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:________________

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

FWS Form 3-2319
02/06

Appropriate Uses Justification, Attachment 1

Date:

Refuge: Kootenai National Wildlife Refuge (NWR)

Project: Conducting research on refuge lands and waters

Summary: The Refuge receives requests to conduct scientific research on refuge lands and waters. Research applicants must submit a proposal that would outline: 1) objectives of the study; 2) justification for the study; 3) detailed methodology and schedule; 4) potential impacts on refuge wildlife and/or habitat, including disturbance (short- and long-term), injury, or mortality; 5) personnel required; 6) costs to the Refuge, if any; and 7) end products (i.e., reports, publications). Research proposals would be reviewed by refuge staff, Regional Office Branch of Refuge Biology, and others as appropriate prior to the Refuge issuing a special use permit (SUP). Projects will not be open-ended, and at a minimum, will be reviewed annually.

For each of the findings listed on FWS Form 3-2319, a justification has been provided below:

a. Do we have jurisdiction over the use?

Some or all of the proposed activities would take place within refuge boundaries. The Refuge has jurisdiction over those research projects that are sited within refuge boundaries.

b. Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?

Any proposed research activities would comply with all applicable laws and regulations and any restrictions or qualifications that are required to comply with law and regulations would be specified in the SUP.

c. Is the use consistent with applicable Executive orders and Department and Service policies?

Through the review of individual projects, the Refuge would ensure that they are consistent with applicable policies, especially Research on Service Lands Policy (803 FW 1).

d. Is the use consistent with public safety?

Through individual project review, the Refuge will ensure that each project is consistent with public safety. If necessary, stipulations to ensure public safety will be included in the project's SUP.

e. Is the use consistent with goals and objectives in an approved management plan or other document?

Research activities are approved in instances where they can provide meaningful data that may contribute to refuge management and public appreciation of natural resources.

g. Is the use manageable within available budget and staff?

The Refuge receives less than 4 requests per year for this activity and it is manageable with available budget and staff.

h. Will this be manageable in the future within existing resources?

The proposed activity at current levels would be manageable in the future with the existing resources (see above).

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?

The proposed use is beneficial to the Refuge's natural and cultural resources because the types of research projects approved are those which have the distinct likelihood to help achieve refuge purposes by providing information useful for the management of trust resources and may contribute to the public's understanding and appreciation of natural and/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?

The Refuge will ensure that the research activities will not impair existing or future wildlife-dependent recreational use of the Refuge during individual project review, prior to issuing a SUP for the project.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Kootenai National Wildlife Refuge

Use: Mowing and Haying

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:______________________________ Date:______________

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:______________

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

FWS Form 3-2319
02/06

Appropriate Uses Justification, Attachment 1

Date:

Refuge: Kootenai National Wildlife Refuge (NWR)

Project: Use of a private cooperator to hay pastures to manage and improve habitat for migratory birds and other wildlife.

Summary: A variety of management strategies including mowing, grazing, disking, shading, flooding and chemical treatment have been used singly or in combination in the context of an integrated pest management plan to control reed canarygrass to promote native plant species diversity and improve wildlife habitat in a variety of geographic locations (Kilbride and Paveglio 1999, Antieau 1998, Forman 1998). As identified in the Kootenai NWR CCP (USFWS 2011) there is a need to control exotic plant species in both the seasonal wetland habitat as well as managed and native grassland sites. Suggested management tools include mowing and haying, as well as other restoration strategies, such as deep flooding, prescribed fire, herbicides, disking, and seeding. The primary objective of using haying is to manage vegetation to maintain or increase its value to wildlife at minimal cost to the government.

The USFWS will employ haying on approximately 200 acres of the Refuge annually. Haying will be used to remove annual growth of reed canarygrass from wet meadows, seasonal wetland, and moist soil habitat. It also may be used to reduce flashy fuels in an effort to reduce wildfire hazards along roadsides, trails, and dikes; and around facilities. Haying after July 15 will be used as needed on appropriate areas in conjunction with other integrated pest management tools. Haying may be conducted by cooperators, contractors, or by refuge staff. A cooperator managed haying program will complement other reed canarygrass control efforts at minimal cost to the USFWS. It is not expected that more than two or three cooperators or permittees will be necessary to meet targeted acres.

The use of haying will be closely monitored to determine its impacts and success before implementation on a larger scale (200-300 acres). Success will be measured as the control of further spread and/or reduction of the exotic plant species. These actions support Kootenai NWR Habitat Objectives 1.1, Managed grassland/shrublands; 1.2, Restore native upland grassland and wet meadow; 3.1, Provide moist soil habitat; and 3.2, Provide seasonal wetlands (USFWS 2011).

For each of the findings listed on FWS Form 3-2319, a justification has been provided below:

a. Do we have jurisdiction over the use?

The proposed use would take place within refuge boundaries and under the supervision of refuge staff.

b. Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?

The proposed use would comply with all applicable laws and regulations.

c. Is the use consistent with applicable Executive orders and Department and Service policies?

The proposed use would assist in control of exotic vegetation (e.g., reed canarygrass, Canada thistle, teasel) in wetland and grassland habitats, and improve habitat quality for migratory birds and other wildlife. The use of a private cooperator to hay refuge pastures removes thatch that would be left behind if mowing was used as the only management technique.

d. Is the use consistent with public safety?

The proposed use is consistent with public safety and would be sited in areas closed to the general public. Haying would occur in hunt areas, but this activity would be concluded prior to the hunt seasons.

e. Is the use consistent with goals and objectives in an approved management plan or other document?

The proposed use is consistent with the 2007 Wildlife and Habitat Management Review conducted by the Service.

f. Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?

A compatibility determination for farming (growing small grains and green forage) was completed in 1994. The compatibility determination did not include the use of haying in the description of use, but noted that haying "had been determined not to benefit wildlife management at Kootenai NWR" and was therefore discontinued in 1976. However the CD did not specifically deny the use.

g. Is the use manageable within available budget and staff?

The proposed use is manageable with available budget and staff. The use of a cooperator may save staff time and resources and increase the quality of wetland and grassland habitats over what could be achieved by only haying with refuge staff.

h. Will this be manageable in the future within existing resources?

The proposed use would be manageable in the future with the existing resources and may save staff time and resources (see above).

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?

The proposed use is beneficial to the Refuge's natural resources because haying would help achieve refuge purposes by controlling invasive and exotic species, improving quality of grassland and wetland habitat used by waterfowl and other migratory birds.

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?

The proposed use will not impair existing or future wildlife-dependent recreational use of the Refuge. As stated above, this activity would be sited in areas closed to the general public.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Kootenai National Wildlife Refuge

Use: Dog walking

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:______________________________ Date:______________

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:______________

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

FWS Form 3-2319
02/06

Appropriate Uses Justification, Attachment 1

Date:

Refuge: Kootenai National Wildlife Refuge (NWR)

Use: Dog Walking

Summary: Dog walking is currently allowed on the Refuge's Auto Tour Road and all trails, which are open year-round during daylight hours, weather permitting. Dog walking occurs year-round on the Refuge with the majority of use observed from spring through fall because of colder weather and variable snowpack in the winter. Based on staff observations, dog walking is a popular (moderate to heavy) use of the Refuge's trails, often occurring in conjunction with other uses including hiking, wildlife observation, photography, and jogging, with a minimal amount of use on the Auto Tour Road. This use is considered appropriate, with stipulations to reduce wildlife disturbance and ensure public safety.

For findings listed on FWS Form 3-2319 and if deemed necessary a justification has been provided below:

d. Is the use consistent with public safety?

Dogs have the potential to present a safety hazard to other visitors. Dogs maintain their instincts to hunt and chase, and they may attempt to chase or attack strangers, especially those that are travelling at a high rate of speed (e.g., bicyclists and joggers) if not kept under physical control. Westgarth et al. (2010) found that negative interactions with dogs are reduced when leashed. Restricting this activity to the Auto Tour Road, requiring that dogs be on a short leash and under control of their owner at all times, and increased law enforcement to increase compliance, should greatly reduce any potential conflicts between user groups and infractions related to this activity.

Vehicles and bicyclists using the same road as pedestrians, including dog walkers, may present a safety hazard to visitors. However, the Auto Tour Road meets Federal Highway Administration standards for shared use path design (Federal Highway Administration 2001). Although user groups are not physically separated, the Auto Tour Road provides sufficient tread width (minimum 12 feet), grade (essentially flat), clearance, and a firm and stable surface for safe, shared use by vehicles, pedestrians, joggers, and bicyclists traveling at a safe speed. The road has been in use for over 40 years and without any accidents reported to the Refuge. Measures to reduce potential conflicts between other user groups would include providing information at the parking lots, refuge headquarters and in the Refuge's brochure that clearly indicates permitted users and rules of conduct. Providing signs that clearly indicate which users have the right of way would help mitigate conflicts (Federal Highway Administration 2001). Signing would clearly state that bicycles should give an audible warning before passing other trail users.

f. Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?

Although on-leash dog walking is allowed on the Refuge, a compatibility determination has not been completed.

g. Is the use manageable within available budget and staff?

The proposed use is manageable with available budget and staff. Direct costs to administer existing levels of dog walking on the Refuge's Auto Tour Route would be minor because costs would already be covered by the existing Complex budget for maintaining wildlife dependent public uses on this road.

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?

Although dog walking is not a wildlife-dependent use, it is likely that dog walkers visit the Refuge to exercise with their dogs and to observe and enjoy wildlife in a natural setting.

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?

Dog walking has the potential to cause increased levels of disturbance to wildlife when compared to walking without dogs. Dogs elicit a greater response from wildlife than pedestrians alone (MacArthur et al. 1982; Hoopes 1993). In the case of birds, the presence of dogs may flush 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 that are 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 a dog. A group of Australian researchers determined that dog-walking can have a significant impact on avian abundance and species diversity, and were quite surprised by the magnitude of the impact. The team found that dog-walking caused bird numbers to drop by an average of 41 percent at each site studied, while the numbers of species counted fell by 35 percent. The results were similar in sites often frequented by dog-walkers and those where the practice was prohibited, suggesting that birds did not get habituated to the dogs' presence, despite frequent encounters (Banks and Bryant 2007).

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).

Dog walking can result in user conflicts with persons engaged in priority public uses (bird watching, photography). Due to increased flushing distance of wildlife when humans are accompanied by dogs, the quality of the other users' experiences may be impaired. Dogs that are not under their owners' control may disrupt other users by barking or other disruptive behavior, and may even pose a threat by attempting to chase or attack people (particularly if they are moving at a faster rate of speed, e.g., bicyclists, joggers.) Dog feces left on trails are an unsightly nuisance to refuge visitors and impact refuge vegetation. Moore (1994) concluded that trail conflicts can occur among different user groups, among users within the same user group, and as a result of factors not related to trail user activities at all. Conflict has been found to related to activity style, focus of trip, expectations, attitudes toward and perceptions of the environment, level of tolerance for others, and different norms held by different users. This loss of expectation of a quality wildlife-dependent experience could result in use avoidance of the Refuge by wildlife watchers and photographers who have encountered dogs using the same or alternate trail(s).

However, restriction of dog walking to the auto tour route, and requiring the use of short leashes (6 feet or less) and removal of feces, would mitigate these undesirable impacts. Westgarth et al. (2010) found that negative interactions with dogs are reduced when leashed. The potential for wildlife and habitat disturbance would be reduced, given the distance of the auto tour route from core wildlife use areas, the enforcement of the short leash rule, and removal of dog feces. Restricting this activity to the Auto Tour Road, requiring that dogs be on a short leash and under control of their owner at all times, and increased law enforcement to increase compliance, should greatly reduce any potential conflicts between user groups and infractions related to this activity.

Measures to reduce potential conflicts between dog walkers and other user groups would include providing information at the parking lots, refuge headquarters and in the Refuge's brochure that clearly indicates permitted users and rules of conduct. Providing signs that clearly indicate which users have the right of way would help mitigate conflicts (Federal Highway Administration 2001). Signing would clearly state that bicycles should give an audible warning before passing other trail users.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Kootenai National Wildlife Refuge

Use: Jogging or running

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:______________________________ Date:________________

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:________________

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

FWS Form 3-2319
02/06

Appropriate Uses Justification, Attachment 1

Date:

Refuge: Kootenai National Wildlife Refuge (NWR)

Project: Jogging on the Refuge

Summary: Jogging or running is currently allowed on the Refuge's Auto Tour Road and all trails, which are currently open during daylight hours, year round, and weather permitting. Vehicles and bicycling are also allowed on the auto tour route. Jogging occurs year-round on the Refuge with the majority of use observed from spring through fall because of colder weather and variable snowpack in the winter. At Kootenai NWR, joggers include individuals, pairs, or individuals with dogs. Track teams from local schools or running clubs are infrequent users of the Refuge. Visual observations indicate that total use by joggers is minor. Exact numbers are currently not available. Jogging is considered to be an appropriate use subject to stipulations necessary to ensure safety and compatibility.

For each of the findings listed on FWS Form 3-2319, a justification has been provided below:

d. Is the use consistent with public safety?

Vehicles and bicyclists using the same road as pedestrians may present a safety hazard to visitors. If the number of road users increases as predicted, the potential for accidents or user group conflicts may also increase. However, the Auto Tour Road meets Federal Highway Administration standards for shared use path design (Federal Highway Administration 2001) and should be able to accommodate increased use. In 2003, the Auto Tour Road was widened and graveled to provide an all weather surface, a project conducted by the Federal Highway Administration. Although user groups are not physically separated, the Auto Tour Road provides sufficient tread width (minimum 12 feet), grade (essentially flat), clearance, and a firm and stable surface for safe, shared use by vehicles, pedestrians, joggers, and bicyclists traveling at a safe speed. The road has been in use for over 40 years and without any accidents reported to the Refuge. Measures to reduce potential conflicts between other user groups would include providing information at the parking lots, refuge headquarters and in the Refuge's brochure that clearly indicates permitted users and rules of conduct. Providing signs that clearly indicate which users have the right of way would help mitigate conflicts (Federal Highway Administration 2001). Signing would clearly state that bicycles should give an audible warning before passing other trail users.

f. Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?

A Compatibility Determination for "Wildland Appreciation," which addressed several activities, including jogging, was completed in 1994. The treatment of jogging was limited to three sentences. The CD stated that jogging was "considered strictly a form of exercise." Jogging was not included in the description of proposed use. However, the use was not specifically denied.

g. Is the use manageable within available budget and staff?

The proposed use is manageable with available budget and staff. Direct costs to administer existing levels of dog walking on the Refuge's Auto Tour Route would be minor because costs would already be covered by the existing Complex budget for maintaining wildlife dependent public uses on this road.

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?

Although jogging is not a wildlife-dependent use and is primarily athletic in nature, it is likely that some joggers observe and enjoy wildlife while on the Refuge.

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?

Jogging has the potential to cause increased levels of disturbance to wildlife when compared to walking or auto touring. It has been determined that animals show greater flight response to humans moving unpredictably than to humans following a distinct path (Gabrielsen and Smith 1995) and that rapid movement by joggers is more disturbing to wildlife than slower moving hikers (Bennett and Zuelke 1999). Burger (1981) examined the effects of human activity on roosting and migrating birds at a coastal bay refuge along the Atlantic coast. Human activities which involved rapid movements or close proximity to roosting birds, such as jogging even when on the pathway, caused the birds to flush; in comparison, slow walking bird watchers and people walking on the path around the ponds did not usually cause birds to flush. Wildlife learn to avoid humans or other stimuli when encounters result in negative interactions. Avoidance is influenced by a number of factors including: 1) type, distance, movement pattern, speed, and duration of the disturbance; 2) time of day, time of year, weather; and 3) food, cover, energy demands, and reproductive status (Knight and Cole, 1991).

Other compatible wildlife-dependent activities such as wildlife watching, photography, and environmental education, may be negatively affected because of the expected responses by wildlife to the fast moving activity associated with jogging. When wildlife react by moving away from jogging activity or alter behavior by hiding they will be less likely to be observed (Bennett and Zuelke 1999).

User groups of shared-use paths often have conflicting needs. Moore (1994) concluded that trail conflicts can occur among different user groups, among users within the same user group, and as a result of factors not related to trail user activities at all. Conflict has been found to related to activity style, focus of trip, expectations, attitudes toward and perceptions of the environment, level of tolerance for others, and different norms held by different users. This loss of expectation of a quality wildlife dependent experience could result in avoidance of refuge trails by wildlife watchers and photographers who encounter joggers using the same trail.

However, restriction of jogging to the auto tour route would not result in these undesirable impacts for several reasons. First, the auto tour route is distant from core wildlife use areas. The presence of a buffer zone reduces the potential for wildlife disturbance.

Second, allowing jogging only on the auto tour route eliminates conflicts between joggers and users of walking trails, who travel at a slower speed than users of the auto tour route. Walking use of the Auto Tour Route is infrequent, and most use is by slow-moving vehicles and bicyclists. The Auto Tour Road meets Federal Highway Administration standards for shared use path design (Federal Highway Administration 2001). In 2003, the Auto Tour Road was widened and graveled to provide an all weather surface, a project conducted by the Federal Highway Administration. Although user groups are not physically separated, the Auto Tour Road provides sufficient tread width (minimum 12 feet), grade (essentially flat), clearance, and a firm and stable surface for safe, shared use by vehicles, pedestrians, joggers, and bicyclists traveling at a safe speed. Measures to reduce potential conflicts between other user groups would include providing information at the parking lots, refuge headquarters and in the Refuge's brochure that clearly indicates permitted users and rules of conduct. Providing signs that clearly indicate which users have the right of way would help mitigate conflicts (Federal Highway Administration 2001). Signing would clearly state that bicycles should give an audible warning before passing other trail users.

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Appendix B. Compatibility Determinations

Introduction

The compatibility determinations (CDs) developed during the CCP planning process evaluate uses projected to occur under Alternative 2, the Preferred Alternative in the Draft CCP/EA for the Kootenai National Wildlife Refuge.

The evaluation of funds needed for management and implementation of each use also assumes implementation as described under Alternative 2. Chapter 7 of the Draft CCP/EA also contains analysis of the impacts related to public use, wildlife, and habitats.

A. Uses Evaluated at This Time

The following section consists of CDs for all refuge uses that are required to be evaluated at this time. According to Service policy, compatibility determinations will be completed for all uses proposed under a CCP. Existing wildlife-dependent recreational uses must also be re-evaluated and new CDs prepared during development of a CCP or every 15 years, whichever comes first. Uses other than wildlife-dependent recreational uses are not explicitly required to be re-evaluated in concert with preparation of a CCP, unless conditions of the use have changed or unless significant new information relative to the use and its effects have become available or the existing CDs are more than 10 years old. However, the Service planning policy recommends preparing CDs for all individual uses, specific use programs, or groups of related uses associated with the proposed action. Accordingly, the following CDs are included in this document for public review.

Refuge Use	Compatible	Next Year Due for Re-evaluation
Environmental Education, Interpretation, Wildlife Observation, and Photography	yes	2026
Waterfowl Hunting	yes	2026
Big Game Hunting	yes	2026
Turkey Hunting	yes	2026
Upland Game Bird Hunting (Grouse Only)	yes	2026
Sport Fishing	yes	2026
Research	yes	2021
Agricultural Practices (Haying)	yes	2021
Dog Walking	yes	2021
Jogging	yes	2021

B. Compatibility—Legal and Historical Context

Compatibility is a tool refuge managers use to ensure that recreational and other uses do not interfere with wildlife conservation, the primary focus of refuges. Compatibility is not new to the Refuge System; the concept dates back to 1918. As policy, it has been used since 1962. The Refuge Recreation Act of 1962 directed the Secretary of the Interior to allow only those public uses of refuge lands that were “compatible with the primary purposes for which the area was established.” If a general public use is determined to be appropriate, the use must then undergo a compatibility review.

A compatibility review is required for all appropriate public uses, including wildlife-dependent recreational uses.

The term "compatible use" is defined as a wildlife dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Refuge Manager, will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge.

The Administration Act defines sound professional judgment as a finding, determination, or decision that is consistent with principles of sound fish and wildlife management and administration, available science and resources, and adherence to other applicable laws. Included in this finding, determination, or decision is a Refuge Manager's field experience and knowledge of the particular Refuge's resources.

Part 603 FW 2 of the Fish and Wildlife Service Manual sets forth the policy and guidelines for determining compatibility of proposed uses and provides procedures for documentation and periodic review of existing uses. In addition, the policy requires an opportunity for public review and comment on all compatibility determinations. When prepared in conjunction with a CCP, compatibility determinations are distributed for public review along with the draft CCP and environmental impact statement (EA).

Under compatibility policy, uses are defined as recreational, economic/commercial, or management use of a refuge by the public or a non-Refuge System entity. Uses generally providing an economic return (even if conducted for the purposes of habitat management) are also subject to compatibility determinations. The Service does not prepare compatibility determinations for uses when the Service does not have jurisdiction. For example, the Service may have limited jurisdiction over refuge areas where property rights are vested by others; where legally binding agreements exist; or where there are treaty rights held by tribes. In addition, aircraft over-flights, emergency actions, some activities on navigable waters, and activities by other Federal agencies on "overlay Refuges" are exempt from the compatibility review process.

New compatibility policy, developed in response to the 1997 amendments to the National Wildlife Refuge System Administration Act (Administration Act), was adopted by the Service in October 2000 (http://refuges.fws.gov/policymakers/nwrpolicies.html). The policy requires that a use must be compatible with both the mission of the System and the purposes of the individual refuge. This standard helps to ensure consistency in application across the Refuge System.

The Service recognizes that compatibility determinations are complex. For this reason, refuge managers are required to consider "principles of sound fish and wildlife management" and "best available science" in making these determinations (House of Representatives Report 105-106). Evaluations of the existing uses on Kootenai NWR are based on the professional judgment of refuge personnel including observations of refuge uses and reviews of appropriate scientific literature.

The Refuge Manager has the authority to determine, by exercising sound professional judgment, what is a compatible use. In addition to determining if a use would materially interfere with or detract from the fulfillment of the System mission or the purposes of the Refuge, the Refuge Manager must also evaluate the direct and indirect impacts of a use on refuge resources. Further, the cumulative impacts of the use when conducted in conjunction with other existing or planned uses of the Refuge must also be considered. After evaluating the anticipated impacts of a proposed use and determining if any stipulations (terms or conditions) are needed to avoid or minimize potential adverse impacts, the Refuge Manager will determine whether or not the use is compatible. This determination is documented in writing and is available for review by the public.

A proposed use can be denied without determining compatibly under certain circumstances, such as instances in which:

1. A proposed use would conflict with other applicable laws or regulations;
2. The use would result in conflicts with the goals or objectives of an approved CCP; or
3. A use is determined to be inconsistent with public safety.

Refuges are closed to all public uses until officially opened. Regulations require that adequate funds be available for administration and protection of refuges before opening them to any public uses. However, wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation) are to receive enhanced consideration and cannot be rejected simply for lack of funding resources unless the Refuge has made a concerted effort to seek out funds from all potential partners. Once found compatible, wildlife-dependent recreational uses are deemed the priority public uses at a refuge. If a proposed use is found not compatible, the use must be modified to be compatible or if the use cannot be modified to be compatible, then the use may not be allowed. Economic uses that are conducted by or authorized by the Refuge also require compatibility determinations.

References

House of Representatives Report 105-106 (on NWRSIA):
http://refuges.fws.gov/policyMakers/mandates/HR1420/part1.html

Compatibility regulations, adopted by the Service in October 2000:
http://refuges.fws.gov/policymakers/nwrpolicies.html

B.1 Draft Compatibility Determination for Wildlife Observation and Photography, Interpretation, and Environmental Education on Kootenai National Wildlife Refuge

RMIS Database Uses: Wildlife Observation, Wildlife Photography, Interpretation, Environmental Education, Snowshoeing, Cross Country Skiing, and Bicycling on Kootenai NWR

Refuge Name: Kootenai National Wildlife Refuge (NWR)

Location: Boundary County, Idaho

Date Established: 1964

Establishing and Acquisition Authorities:
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715 et seq.)
- Executive Order 7681, dated July 30, 1937
- Refuge Recreation Act as amended [16 U.S.C. 460k-460k-4]
- Fish and Wildlife Act of 1956, as amended [16 U.S.C. 742a-742j, not including 742l]

Refuge Purpose(s):

"for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715 et seq. (Migratory Bird Conservation Act of 1929).

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

Description of Use:

Conduct and allow access for four non-consumptive wildlife-dependent priority public uses (Wildlife observation and Photography, Interpretation, and Environmental Education) as provided for under the NWRS Improvement Act of 1997 (Public Law 105-57). These priority uses can enhance the users' appreciation of the Refuge, the National Wildlife Refuge System, wildlife, their habitats, and the human environment.

Location: The Refuge will provide opportunities for these wildlife-dependent activities on an existing 4.5-mile Auto Tour Route, and five pullouts and two parking lots associated with the tour route. Additional refuge parking lots and pullouts for recreational users include two parking lots located along Riverside Road, four lots located near the refuge office including the Myrtle Falls Trailhead lot, two parking lots on the southern portion of the Refuge, pullouts along Lions Den Road, and a parking area for the Cascade Pond observation blind. (Specific parking lots that have been designated as hunter parking areas will be available for use only by hunters during the hunting season.)

Four existing trails will provide access for these non-consumptive uses including the Deep Creek Trail (2.2 miles), Myrtle Creek Trail (0.25 mile), Old Humpback Trail (1.0 mile), and the Chickadee Trail (1000 feet). The Cascade Pond observation blind accessed via a short trail from a parking lot off of Westside Road, and a photography blind located on Greenwing Pond that may be accessed via a short trail from the Environmental Education Center parking lot will also provide opportunities for non-consumptive uses. Greenwing Pond has been designated as an environmental study site and will be primarily used for educational programs. An additional photography blind will be provided near the northwest corner of Island Pond, and an elevated viewing platform will be constructed along the northeast end of the auto tour route.

In addition to these areas and facilities, non-consumptive uses will also be conducted in the renovated barn that serves as the Environmental Education building, and on the grounds immediately adjoining the refuge headquarters and Environmental Education building.

At times users engaged in these activities may require off-trail access. Users engaged in off-trail activities would either be accompanied by refuge staff or managed through the use of Special Use Permits. All activities will avoid sensitive areas prone to disturbance or degradation, and will be designed to minimize impacts to nesting birds or other breeding wildlife.

Timing: The auto tour route, trails, and other facilities will be available for use by visitors engaged in these four wildlife-dependent activities year round. The auto tour route, parking lots/pullouts, the 3.7 miles of trails, the observation/photography blinds, and the Greenwing Pond environmental education site will be open during daylight hours throughout the year.

Some refuge public use programs and activities may require access to the Refuge between sunset and sunrise. These activities will be managed by the refuge staff and may require Special Use Permits.

Management: These four priority public uses will largely be self-guided and will be allowed on the tour route, trails, and facilities described above, and in areas that are least sensitive to human intrusion. Users would include the general public, as well as organized groups, including schools and youth groups.

Environmental interpretation is a process that forges emotional and intellectual connections between the interests of the audience and the resource. Interpretation includes those activities and infrastructure that explain management activities, fish and wildlife resources, ecological processes, and cultural history to the visiting public. This information will be provided through interpretive signs, kiosks, a refuge auto tour route CD, printed information, exhibits, and infrequent scheduled tours or talks led by refuge staff and/or volunteers.

Environmental education is a more formal process with activities conducted by refuge staff, volunteers, teachers, or other leaders. Environmental education strives to increase people’s knowledge and awareness about the refuge environment, resource management challenges, wildlife and their habitats, the human environment, and human impacts on wildlife and habitats. Environmental education programs assist in the development of the necessary skills and understanding to make informed decisions regarding natural resource management, and encourage participation in resource management and protection. Environmental education classes will be scheduled by the refuge staff.

Wildlife observation and photography will be self-conducted and facilitated through the availability of the auto tour route, trails, parking areas/pullouts, observation/photography blinds, and informational materials.

Access to these to these non-consumptive use activities will generally be achieved through walking, snowshoeing, or cross-country skiing on the auto tour route and trails. The use of street legal vehicles, as defined under Idaho regulation, and bicycles will be allowed on the auto tour route. The auto tour road is not plowed during the winter months and is normally passable to passenger vehicles from March to early December. When the road is impassable to vehicles it would remain open to cross country skiers, snowshoers, walkers, and joggers. Jogging will be allowed on the refuge auto tour route as described in a separate Compatibility Determination. Dog walkers visit the Refuge to exercise with their dogs and to observe and enjoy wildlife in a natural setting. Dog walking will be allowed the Auto Tour Route as described in a separate Compatibility Determination.

Availability of Resources:

The following funds will be required to administer interpretation, environmental education, wildlife observation, and photography programs as described in the CCP.

Project	One Time Expense	Recurring Expenses
Construction of a Photography Blind	2,500	
Construction of an elevated viewing platform	20,000	
Additional interpretive and administrative signs	5,000	
Construction of two additional pull offs	2,000	
Maintenance of public use facilities		20,000
Program Operation		40,000
Totals	**29,500**	**60,000**

Although a portion of the programs and associated projects could be accomplished through the use of existing staff, resources, and facilities, existing refuge resources are not adequate to fully and safely administer the uses as envisioned in the CCP. Increased volunteer assistance, strengthened existing partnerships, and new partnerships will be sought to support these programs in an effective, safe, and compatible manner. Refuge staff will increase volunteer recruit efforts. Volunteers, interns, and various user groups when provided appropriate training can assist the Refuge with monitoring, education and interpretation programs, and maintenance projects. Kootenai NWR is part of the Inland Northwest Refuge Complex and staff from the other refuges within the complex can be available to assist with projects and development of programs. With additional assistance as described above, staffing and funding is expected to be sufficient to manage these uses.

Anticipated Impacts of Described Use:

Wildlife observation and photography, interpretation, and environmental education engaged in by the public can result in negative impacts to wildlife and habitat. Direct impacts are those that have an immediate effect on wildlife, and indirect or cumulative impacts are those that would affect habitat, wildlife access to resources, or those that collectively or ultimately affect wildlife.

Direct Impacts (Wildlife Disturbance): Anticipated direct impacts include disturbance to wildlife by human presence which typically results in a temporary displacement of individuals or groups. Immediate responses by wildlife to recreational activity can range from behavioral changes including nest abandonment or change in food habits, physiological changes such as elevated heart rates due to flight, or even death (Knight and Cole 1995). The long-term effects are more difficult to assess but may include altered behavior, vigor, productivity, or death of individuals; altered population abundance, distribution, or demographics; and altered community species composition and interactions. Knight and Cole (1991) found that wildlife responses to human disturbance include avoidance, habituation, and attraction. The magnitude of the avoidance response may depend on a number of factors including the type (e.g., autos, bicycles, walkers), distance, movement pattern, speed, and duration of the disturbance, as well as the time of day, time of year, weather; the animal's access to food and cover, energy demands, and reproductive status (Knight and Cole 1991, Gabrielsen and Smith 1995). Knight and Cole (1991) also suggested that sound may elicit a much milder response from wildlife if animals are visually buffered from the disturbance.

Habituation is defined as a form of learning in which individuals stop responding to stimuli that carry no reinforcing consequences for the individuals that are exposed to them (Alcock 1993). A key factor in predicting how wildlife would respond to disturbance is its predictability. Often, when a use is predictable, following a trail or boardwalk or at a viewing deck, wildlife will accept human presence (Oberbillig 2001). Gabrielsen and Smith (1995) suggest that most animals seem to have a greater defense response to humans moving unpredictably in the terrain than to humans following a distinct path. Resident waterbirds tend to be less sensitive to human disturbance than migrants, and migrant ducks are particularly sensitive when they first arrive (Klein 1993). In areas where human activity is common, birds tolerated closer approaches than in areas receiving less activity.

Conflicts arise when migratory birds and humans are present in the same areas (Boyle and Samson 1985). Response of birds to human activities includes departure from site (Owens 1977, Burger 1981, Korschgen et al. 1985, Henson and Grant 1991, Klein 1993, Taylor and Knight 2003), use of suboptimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior (Burger 1981, Korschgen et al. 1985, Morton et al. 1989, Ward and Stehn 1989, Havera et al. 1992, Klein 1993), and increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990). McNeil et al. (1992) found that many waterfowl species avoid disturbance by feeding at night instead of during the day. Wildlife photographers tend to have larger disturbance impacts than those viewing wildlife since they tend to approach animals more closely (Klein 1993, Morton 1995).

The location and timing of recreational activities can impact species in different ways. Stolen (2003) found that the proximity of wading birds to a roadway influenced the probability that a given bird would flush. Migratory waterfowl at J.N. "Ding" Darling NWR remained more than 80 meters from the auto tour route, even when human visitation was low (Klein 1995). Miller et al. (1998) found that nesting success was lower near recreational trails, where human activity was common, than at greater distances from the trails. A number of species have shown greater reactions when pedestrian use occurred off trail (Miller et al., 1998, Taylor and Knight 2004). In regard to waterfowl, Klein (1989) found migratory dabbling ducks to be the most sensitive to disturbance and migrant ducks to be more sensitive when they first arrived, in the late fall, than later in winter. She also found gulls and sandpipers to be apparently insensitive to human disturbance, with Burger (1981) finding the same to be true for various gull species.

Burger (1999 as cited by Oberbillig 2001) suggests that viewing distances that minimize disturbance can serve as useful guides for managers lacking good site-specific information and serve as a starting point in determining what is appropriate elsewhere. Some factors that affect viewing distances include the numbers of viewers, the time of day, and noise level. When exposing nonbreeding waterbirds to four types of human disturbances (walking, all-terrain vehicle, automobile, and boat), Rodgers and Smith (1997) concluded that a buffer zone of 100 m would minimize disturbance to most species of waterbirds. Vos et al. (1985) recommended buffer zones of 250 m on land and 150 m in water for great blue herons. Miller et al. (1998) found that the trail zone of influence for forest and grassland birds appears to be approximately 75-100 m. Beyond this distance, bird abundance, species composition, and nest predation was not affected by even heavily used recreational trails.

Use of the auto tour route, trails, and associated facilities provides potential avenues for human disturbance of wildlife and habitat on the Refuge. Impacts from non-consumptive uses can be controlled most effectively, mitigating the effect on refuge wildlife, by managing these uses in time and space. To minimize disturbance to wildlife and their habitats, the Refuge will only be open from sunrise to sunset, and visitors engaging in recreational activities must stay on designated hiking trails and roads. The existing auto tour route and trails are located at a sufficient distance from important wildlife areas that minimal disturbance will occur, while providing the public with good opportunities to participate in recreational activities. To minimize disturbance during formal education programs the refuge staff will manage group size, timing, and locations. Enforcement to ensure visitors follow the rules, and public education that informs users of ethical and least intrusive methods will also be available.

Indirect Impacts (Habitat and Physical Environment): The indirect impacts of these activities depend upon a number of variables including the season of use, duration of the activity, location, and number of users. These activities may result in trampling of vegetation, soil compaction, incidences of littering, potential removal of vegetation, and potential vandalism. Visitors may occasionally pull their vehicle off the auto tour route onto roadside vegetation, and visitors may also stray of trails trampling vegetation. These off road/trail activities could cause soil compaction, erosion, and alterations in vegetative structure and composition. Visitors could also act as vectors for invasive plants by moving seeds or other propagules from one area to another. Overall, these adverse impacts on the Refuge are expected to be short-term and limited to locations along the auto tour route, trails, and associated facilities open to non-consumptive uses. The Greenwing Pond environmental education study site may be prone to habitat degradation if overused. Refuge staff will monitor this location and provide rest (closed) periods and minor restoration if needed. Enforcement will be required to ensure users stay on designated roads and trails, and educational material will be provided that informs the visitor of proper use of facilities and the environmental consequences of inappropriate activity. Construction and maintenance of visitor use facilities will also affect vegetation and could potentially increase localized soil compaction and erosion. These activities will be timed to minimize disturbance to wildlife and habitat.

Potential Conflicts between User Groups: Shared-use paths attract a variety of user groups who often have conflicting needs. People with disabilities may be particularly affected by trail conflicts if they do not have the ability to quickly detect or react to hazards or sudden changes in the environment. The number of encounters that create conflict is unknown. Vehicles and bicycles using the same road as pedestrians may present a safety hazard to visitors. If the number of road users increases as predicted, the potential for accidents or user group conflicts may also increase. However, the Auto Tour Road meets Federal Highway Administration standards for shared use path design (Federal Highway Administration 2001) and should be able to accommodate increased use. In 2003, the Auto Tour Road was widened and graveled to provide an all weather surface, a project conducted by the Federal Highway Administration. Although user groups are not physically separated, the Auto Tour Road provides sufficient tread width (minimum 12 feet), grade (essentially flat), clearance, and a firm and stable surface for safe, shared use by vehicles, pedestrians, joggers, and bicyclists traveling at a safe speed. The road has been in use for over 40 years without any reported accidents. Providing signs that clearly indicate which users have the right of way would help mitigate conflicts (Federal Highway Administration 2001). Signing would clearly state that bicycles should give an audible warning before passing other trail users.

Hunting (especially gunshot noise) has the potential to disturb refuge visitors engaged in other wildlife-dependent recreational uses. To minimize this potential conflict, the Refuge has designated defined hunting areas that will be separated spatially from hiking trails, the Auto Tour Route, and associated facilities. To further prevent user conflicts, designated hunter parking lots will be closed to non-hunting users during the hunting season. The Refuge will still provide ample parking areas for non-hunting wildlife-dependent users during this period.

Measures to reduce potential conflicts between user groups would include providing information at the parking lots, refuge headquarters and in the Refuge's brochure (available both at headquarters and kiosks, and on the refuge website) that clearly indicates permitted uses and rules of conduct.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2011) in order to comply with the National Environmental Policy Act and with Service policy. Appendix M of the CCP (USFWS 2011) contains a summary of the comments and Service Responses.

Determination:

____ Use is Not Compatible
__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

User Stipulations:

- Activities associated with the proposed uses are restricted to the auto tour, trails, observation blinds/platforms, photography blinds, parking lots/pullouts, and educational study sites during daylight hours throughout the year.
- Street legal vehicles, as defined under Idaho regulation, and bicycles would only be allowed on the auto tour route.
- Collection of plants and animals would be prohibited unless a Special Use Permit is obtained from the Refuge.
- Harassment of wildlife or excessive damage to vegetation would be prohibited.
- Activities requiring off road/trail access or access between sunset and sunrise would require a Special Use Permit or be managed by refuge staff.
- The environmental education building could be scheduled for use seven days a week for activities; during both daytime and evening.

Justification:

Interpretation, environmental education, wildlife observation and photography are priority wildlife-dependent uses for the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife (Executive Order 12996, March 25, 1996 and the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). The Service's policy is to provide expanded opportunities for these wildlife-dependent uses when compatible and consistent with sound fish and wildlife management and ensure that they receive enhanced attention during planning and management. Although, these activities can result in disturbance to wildlife and habitat, disturbances on the Refuge are expected to be intermittent and minor, and are not expected to diminish the value of the Refuge for its stated purposes. Disturbances to wildlife and habitat will be minimized by limiting uses to the auto tour, trails, and associated facilities, and opening these facilities to the public during daylight hours only. The stipulations above also will ensure proper control of the uses and provide management flexibility should detrimental impacts develop. Facilitating these uses on the Refuge will increase visitor knowledge and appreciation of fish and wildlife resources. This enhanced understanding will foster increased public stewardship of natural resources and support for the Service's management actions in achieving the refuge purposes and the mission of the National Wildlife Refuge System.

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 interpretation, environmental education, wildlife observation and photography to occur as described. The relatively limited number of individuals expected to be adversely affected by these uses will not cause wildlife populations to materially decline, the physiological condition and production of 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, these uses will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the Refuge was established.

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Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

__2026_ Mandatory 15-year Re-evaluation date (for priority public uses)
______ Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
__X__ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Signatures:

Prepared by:	______________________ (Signature)	__________ (Date)
Refuge Manager/ Project Leader Approval:	______________________ (Signature)	__________ (Date)

<u>Concurrence</u>

Refuge Supervisor:	______________________ (Signature)	__________ (Date)
Regional Chief, National Wildlife Refuge System:	______________________ (Signature)	__________ (Date)

B.2 Draft Compatibility Determination for Waterfowl Hunting on Kootenai National Wildlife Refuge

RMIS Database Uses: Waterfowl Hunting

Refuge Name: Kootenai National Wildlife Refuge (NWR)

Location: Boundary County, Idaho

Date Established: 1964

Establishing and Acquisition Authorities:
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715 et seq.)
- Executive Order 7681, dated July 30, 1937
- Refuge Recreation Act as amended [16 U.S.C. 460k-460k-4]
- Fish and Wildlife Act of 1956, as amended [16 U.S.C. 742a-742j, not including 742l]

Refuge Purpose(s):

"for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715 et seq. (Migratory Bird Conservation Act of 1929).

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

Description of Use:

The Refuge has provided a public waterfowl hunting area since it was established. The Refuge's waterfowl hunting program represents one of a limited number of public waterfowl hunting opportunities in northern Idaho. Other public hunting is available at Idaho Fish and Game (IDFG) wildlife management areas (McArthur Lake WMA, Boundary-Smith Creeks WMA, and Pend Oreille WMA) as well as The Nature Conservancy's Ball Creek Ranch. Currently, the Refuge's waterfowl hunting program permits the hunting of ducks, geese, and coot on approximately 770 acres. Duck and Goose hunting is allowed during the State youth waterfowl hunt (last weekend in September) and 4 days per week (Tuesday, Thursday, Saturday and Sunday) during the State duck and goose seasons (Oct 2-Jan 14). Shooting hours correspond to State regulations (½ hour before sunrise until sunset). Hunters are allowed entry to the hunt units after 3:00 am on hunt days. Eighteen spaced blinds are provided; free-roam hunting is also allowed in the hunt area. Two blinds are ADA accessible and must be reserved in advance. Staff takes reservations for the two ADA blinds, unlocks the gate to the blinds, and puts up reserved signs. No advance notice is required to reserve an ADA blind, but it is preferred to call by noon on the day before requested reservation. All other blinds are occupied on a first-come, first-served basis. Refuge staff conducts annual maintenance on the hunt blinds, including repairing the structures, mowing in areas surrounding the blinds to create open water, and managing water to flood the hunt area.

Supporting access to the hunting blinds are eight parking areas and a network of seasonally mowed trails, covering approximately 1.26 miles, but could be more if the southern hunt blinds become more active or more northern blinds are accessible before higher water levels. These trails are mowed by refuge staff to provide waterfowl hunters access to designated hunting blinds. Secondary maintenance roads and internal dikes are used to reduce annual trail maintenance efforts. The Deep Creek Trail and Island Pond Trail are also used by hunters to access the hunt area and/or blinds. Waterfowl hunters are allowed to use dogs for retrieval of game and non-motorized boats, launched from Center Ditch at Center Parking Lot, to access the hunt areas.

The Proposed Hunting Program: Most of the hunt program and facilities will remain the same as the existing program. Proposed changes increase safety for non-hunting visitors and improve hunt quality for disabled hunters. Waterfowl hunting will be allowed within 610 acres of the Refuge (see Map 8 in CCP). This area encompasses 503 acres (37 percent) of the Refuge fall waterfowl habitat. The reduction in size of the hunt area is the result of establishing a 200 yard no shooting zone adjacent to the Auto-Tour Route and Deep Creek Trail. This buffer consists primarily of grasslands and riparian forest. Only 45 acres of fall waterfowl habitat is included in the buffer area.

Hunting will continue to be allowed during the State youth Waterfowl Hunt and four days per week (Tuesday, Thursday, Saturday, and Sunday) during the State Duck and Goose Seasons to allow waterfowl to use habitat undisturbed within the hunt units.

Both free-roam and fixed blind hunting will continue to occur in the same areas, as in the No Action alternative, unless user group conflicts arise in the future. An additional ADA accessible blind will be constructed on the north hunt unit. South Pond will be open to hunting from the ADA blind only. An adaptive management strategy, based upon hunter surveys and data on habitat quality and waterfowl use of wetlands, would determine the location of fixed blinds and free-roam hunt areas. A 200 yard non-shooting area will be established along the west side of the Auto Tour Route (ATR) and the Deep Creek Trail to provide for safety. This should have little effect upon hunting opportunities since these areas contain very little fall waterfowl habitat. Retrieval of game will be allowed in the non-shooting area but weapons must be unloaded when retrieving game within this area.

This use is defined as a wildlife-dependent recreational use under the Improvement Act. See Implementation section (Appendix C of the CCP) to determine priority of projects associated with these uses as funding becomes available.

Availability of Resources:

Although, a great deal of the program and associated projects could be accomplished through the use of existing staff, resources, and facilities, the following funding needs will be required to fully administer the uses as envisioned in the CCP. For the one-time expenses, all available sources will be investigated. Staffing and funding are expected to be sufficient to manage these uses.

Activity	One Time Expense	Recurring Expense
Development and Administration of Hunt Plan and associated documentation	$ 10,000	$500
Development and maintenance of signs, replace hunt blinds	$ 14,500	$ 500
Administration and support costs (include management, law enforcement and maintenance staff costs)	0	$25,000
Biological staff to monitor hunt program	0	$5,500
Development and printing Hunting Leaflet	3,500	500
Totals	**$28,000**	**$32,000**

Anticipated Impacts of Described Use:

The direct effect of hunting on waterfowl is mortality, wounding, and disturbance.

Effect on distribution and use of habitat: Belanger and Bedard (1995) concluded that disturbance caused by hunting can modify the distribution and use of various habitats by birds (Owens 1977; White-Robinson, 1982; Madsen 1985). In Denmark, Madsen (1995) experimentally tested disturbance effects of hunting by the establishment of two experimental reserves where hunting activity was manipulated such that sanctuary areas were created in different parts of the study area in different hunting seasons. In both areas, waterbird numbers increased, most strongly in hunted species (3-40 fold increase), with highest densities found in sanctuary areas, irrespective of where these sanctuaries were sited. At Sacramento National Wildlife Refuge, in California, researchers found statistically significant differences in the densities of northern pintails among hunting units, units adjacent to hunting units, units adjacent to auto tour route, and units isolated from disturbance (Wolder 1993). Prior to the opening of hunting season, pintail used units in proportion to their availability, indicating no preference to particular areas. During the hunting season, 50 to 60 percent of the pintails on the Refuge were located on the isolated units that contained 26 to 28 percent of the refuge wetlands, suggesting a strong waterfowl preference for areas of little human activity. Units along the auto tour route and adjacent to hunting units maintained pintails at similar proportions to their availability. Three to 16 percent of the pintails on the Refuge were located on hunted units (36 to 40 percent of the available habitat) during non-hunt days (4 days per week) and almost entirely absent on days when hunting was taking place, indicating an avoidance of the hunted areas.

Belanger and Bedard (1989) studied the effect of disturbances to staging greater snow geese in a Quebec bird sanctuary over 471 hours of observation. They found that the level of disturbance (defined as any event causing all or part of the goose flock to take flight) that prevailed on a given day in fall influenced goose use of the sanctuary on the following day. When disturbance exceeded two events per hour, it produced a 50 percent drop in the mean number of geese present in the sanctuary the next day.

Effects on energetics and survival: Hunting limits access of waterfowl to food resources and may modify migration timing. Madsen (1988 as cited by Dalgren and Korschgen 1992) suggested that hunting on the coastal wetlands of Denmark modified waterfowl movements and caused birds to leave the area prematurely. However, Kahl (1991) suggested that lack of adequate access to food may decrease survival of canvasbacks by causing birds to remain on a staging site longer and forage under suboptimal conditions, or by causing birds to migrate in shorter flights with more frequent stops.

Disturbance due to hunting has caused waterfowl to cease feeding or resting activities, thus decreasing energy intake and increasing energy expenditure. At Chincoteague NWR, Morton et al. (1989a) found that wintering black ducks experienced reduced energy intake while doubling energy expenditure by increasing the time spent in locomotion in response to disturbance. Belanger and Bedard (1995) in a quantitative analysis, estimated that neither the response to disturbance by flying away and promptly returning to the foraging site to resume feeding, nor the response of flying away (leaving the foraging site for a roosting site—thus interrupting feeding) allowed snow geese to balance their daytime energy budget. At high disturbance rates (>2/hour; these included hunting and transport related disturbance), Belanger and Bedard (1985) estimated that an increase in night feeding as a behavioral compensation mechanism could not counterbalance energy lost during the day. Likewise, geese could not compensate for a loss in feeding time by increasing their daily foraging behavior to maximize food intake during undisturbed periods. Belanger and Bedard suggested mitigation with spatial or temporal buffer zones.

Considerations for design of hunt units: Fox and Madsen (1997) found that mobile hunting activity close to roosting and or feeding areas is more disturbing than hunting from fixed points or where birds are shot moving between such areas. For sanctuary areas, they recommended areas with regular shape, maximum practicable size, and with a diameter of three times the escape flight distance (at a minimum) of the most sensitive species present. Flock size also affects flush distance, larger flocks tending to react at a greater distance. Based on estimated flight distances from boats, Kahl (1991) recommended that sanctuaries should be at least 1.5-2.0 km square and encompass as much of a feeding area as feasible.

Potential impacts to Threatened and Endangered Species: This use may impact the bald eagle, which was recently de-listed from the Federal list of threatened and endangered species, but is still listed as threatened by the State of Idaho. Waterfowl hunting takes place in areas that can be used by bald eagles for perching or foraging. Thus, eagles can potentially be disturbed by being pushed out of roosting/perching areas or temporarily prevented from using certain areas due to the presence of hunters. Eagles are also attracted to areas where there is hunting and habitat management for waterfowl because of increased food sources. Eagles are widely known to feed on waterfowl that is either not retrieved by hunters or wounded during hunting. In some areas, waterfowl hunting has provided a net benefit for eagles.

Potentially, eagles could be shot; however, that is an illegal activity under several Federal laws and has not been documented on the Refuge. Waterfowl hunting is only open four days per week, which provides eagles with access to hunted areas the remaining three days. Further, portions of the Refuge are completely closed to hunting, which provides perching and foraging habitat for displaced eagles. Waterfowl hunting would not have a significant impact on bald eagles.

Impacts to other wildlife-dependent recreational uses*:* Hunting (especially gunshot noise) has the potential to disturb refuge visitors engaged in other wildlife-dependent recreational uses. To minimize this potential conflict, the Refuge has designated defined hunting areas that will be separated spatially from hiking trails and the Auto Tour Route. See Map 8 in Chapter 2 of the CCP (USFWS 2011) for public use locations and facilities.

Summary and application to Kootenai NWR: The studies cited above display the variety and scale of negative impacts to waterfowl from hunting. In full consideration of these studies, a waterfowl hunting program at Kootenai, were it to be implemented as envisioned under the CCP, is not expected to have a major effect on refuge waterfowl populations. The most likely effect of the proposed waterfowl hunt would be a temporary shift in waterfowl populations away from hunted areas to non-hunted areas on the Refuge. There are very few areas of undisturbed fall waterfowl habitat in close proximity to the Refuge to accommodate disturbed birds. The fall waterfowl habitat (grain fields, shallow flooded seasonal and semi-permanent wetland, and moist soil habitat for foraging and permanent open water for loafing) available to migratory birds is estimated at 1,362 acres. Under the proposed CCP, approximately 503 acres (37 percent of the existing fall refuge waterfowl habitat base) will be open to waterfowl hunting 4 days per week. Break out of waterfowl habitat types in hunt and sanctuary units is provided in Table 1. The hunt units contain about 40 percent of the available foraging habitat and 22 percent of the loafing habitat. A better way of looking at the availability of waterfowl habitat is to weight the acres by the number of days they are available during a specific time period. This metric can be referred to as habitat use days. Since the waterfowl hunting season encompasses approximately 105 days, there are a total of 145,734 habitat use days (acres of fall waterfowl habitat X days). With hunting only being allowed on 4 days per week the number of habitat use days affected by hunting equates to 31,186 use days, or only 21.4 percent of the total available habitat use days. The sanctuary area provided for waterfowl is more than 1,000 acres, exceeding the size (0.5-0.7 square miles) recommended by Kahl (1991), and it has a low edge to area ratio. In addition to considerations concerning habitat availability, hunters will be limited to 25 shells per day per hunter, with non-toxic shot permitted only.

Table 1. Distribution of fall waterfowl habitat in hunt units.

	Cropland	Moist Soil	Seasonal Emergent Wetland	Semipermanent Emergent Wetland	Permanent Open Water	Total Fall Waterfowl Habitat
Current	93.7	33.7	137.7	199.5	84.2	548.7
Refuge Total	273.1	34.9	378.4	442.6	293.5	1422.6
Percent of Total	34.3%	96.4%	36.4%	45.1%	28.7%	38.6%
Proposed	81.8	111.6	64.4	183.2	61.9	503.0
Refuge Total	207.3	136.4	318.6	424.4	275.2	1361.9
Percent of Total	39.5%	81.8%	20.2%	43.2%	22.5%	36.9%

Impacts to other wildlife dependent recreational users are expected to be minimal with spatial separation of hunting from non-hunting public use facilities.

Although the proposed Kootenai waterfowl hunt will include a mixture of mobile and hunting from fixed points, the CCP does include consideration of providing only hunting from fixed blinds if an unacceptable level of disturbance and conflict develops between fixed blind and free-roam hunters. The current low use (50-60 on opening weekend, 8-12 on weekend days, and much fewer on weekdays) does not warrant this shift at this time.

The use of moist soil management to improve wetland habitat for waterfowl and other wildlife is a habitat management strategy outlined in the CCP. If moist soil management is implemented and successful there may be the potential for increased disturbance effects to foraging waterfowl due to hunting. If monitoring during the time frame of the CCP (15 years) indicates that a significant amount of disturbance is occurring, changes to the Kootenai waterfowl hunt program may be evaluated.

Although by its very nature, waterfowl hunting has very few if any positive effects on waterfowl and other birds while the activity is occurring, it is well recognized that this activity has given many people a deeper appreciation of wildlife and a better understanding of the importance of conserving their habitat, which has ultimately contributed to the Refuge System mission.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2011) in order to comply with the National Environmental Policy Act and with Service policy. Appendix M of the CCP (USFWS 2011) contains a summary of the comments and Service Responses. Public review of a step down Hunt Plan (see Stipulations) as required under Service policy will be conducted before implementing changes to the refuge waterfowl hunting program.

Determination:

____ Use is Not Compatible
__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

- Hunters must obey all State and Federal hunting regulations.
- Daily limit of 25 shells per hunter, non-toxic shot only.
- Hunting permitted from stationary hunting sites and free roam.
- Hunting limited to Tuesday, Thursday Saturday, and Sunday only. When travelling to and retrieving downed birds in the buffer area all firearms must be unloaded.
- Hunting dogs will be under hunter control at all times.
- Hunt areas will be well separated from other public use areas of the Refuge.
- Hunt areas and no hunting zones will be well posted.
- Refuge/Complex staff will conduct law enforcement, maintain hunting facilities, and monitor wildlife impacts.

Justification:

Waterfowl hunting at Kootenai NWR as described in this CD contributes to the mission of the National Wildlife Refuge System by providing a wildlife-oriented recreational benefit to Americans. By limiting the numbers of hunters and days of hunting as well as always providing sanctuary from human disturbance in other areas of the Refuge, this waterfowl hunting program will not interfere with the Refuge achieving its purposes of providing *sanctuary* and a *breeding ground for migratory birds.* 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 hunting to occur on the Refuge. The relatively limited number of individuals expected to be adversely affected due to hunting will not cause wildlife populations to materially decline, the physiological condition and production of 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 hunting to occur with stipulations will not materially detract or interfere with the purposes for which the Refuge was established or the Refuge System mission.

Hunting is one of the six wildlife-dependent recreational uses of the National Wildlife Refuge System as stated in the National Wildlife Refuge System Improvement Act of 1997. This program as described was determined to be compatible because: hunter use levels on Kootenai NWR are relatively low during most days of the waterfowl hunting season (October through November) and sufficient restrictions will ensure that high-quality feeding and resting habitat would be available in relatively undisturbed areas to accommodate the needs of the waterfowl and other wetland birds.

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U.S. Fish and Wildlife Service. 2011. Comprehensive Conservation Plan for Kootenai National Wildlife Refuge.

Mandatory Re-Evaluation Date (provide month and year for “allowed” uses only):

_2026_ Mandatory 15-year Re-evaluation date (for priority public uses)
______ Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
__X__ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Signatures:

Prepared by:	(Signature)	(Date)
Refuge Manager/ Project Leader Approval:	(Signature)	(Date)

<u>Concurrence</u>

Refuge Supervisor:	(Signature)	(Date)
Regional Chief, National Wildlife Refuge System:	(Signature)	(Date)

B.3 Draft Compatibility Determination for Big Game Hunting on Kootenai National Wildlife Refuge

RMIS Database Uses: Big Game Hunting

Refuge Name: Kootenai National Wildlife Refuge (NWR)

Location: Boundary County, Idaho

Date Established: 1964

Establishing and Acquisition Authorities:
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715 et seq.)
- Executive Order 7681, dated July 30, 1937
- Refuge Recreation Act as amended [16 U.S.C. 460k-460k-4]
- Fish and Wildlife Act of 1956, as amended [16 U.S.C. 742a-742j, not including 742l]

Refuge Purpose(s):

"for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715 et seq. (Migratory Bird Conservation Act of 1929).

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

Description of Use:

According to 50 CFR 32.31 the following big game may be hunted on the Refuge: white-tailed deer, mule deer, elk, black bear, mountain lion, and moose. Big game hunting was initiated throughout the Refuge with its creation in 1965. In 1978 big game hunting was reduced to the area west of Westside Road to prevent serious safety hazards to waterfowl hunters.

Currently hunting of these species would be allowed in accordance with State regulations on those portions of the Refuge that lie west of Lions Den Road. All big game species may be hunted with either firearms or archery equipment.

Kootenai National Wildlife Refuge is part of Idaho Department of Fish and Game big game hunting unit number 1. The following table illustrates the hunting season for each species in big game unit 1 as of 2011:

Species/Tag	Hunting Season	Weapon
Elk "A" Tag	Sep 6-Sep 19 any elk Sep 20-Sep 30 antlered only Oct 25-Oct 29 antlered only Dec 10-Dec 16 any elk	Archery Archery Any Archery
Elk "B" Tag	Sep 6-Sep 12 any elk Oct 10-Oct 24 antlered only Oct 15-Oct 17 any elk Dec 2-Dec 9 spike only	Archery Any Any Muzzleloader
Black bear	Aug 30-Sep 14 Sep 15-Oct 31 Apr 15-May 31	Archery Any Any
Mountain Lion	Sep 15-Feb 16	Any
Moose	Sep 15-Dec 1	Any
White-tailed deer: antlered	Oct 10-31 Aug 30-Sep 30 Dec 10-Dec 24	Any Archery Archery
White-tailed deer: antlerless	Nov 1-Dec 1 Aug 30-Sep 30 Dec 10-Dec 24	Any Archery Archery
Mule deer	Nov 1-Dec 1 Aug 30-Sep 30	Any Archery

Mule deer tend to occupy higher elevations on adjacent lands, and are rarely encountered on the Refuge. Black bear and mountain lions are both widely ranging species that only occasionally occur on the Refuge. Moose are commonly seen in the refuge bottomlands were big game hunting is excluded, and doubtlessly also spend time in the forested uplands. However, their population density is low throughout their range when compared to deer or elk.

Elk and white-tailed deer are the most frequently observed and hunted big game species on the Refuge. White-tailed deer are the most numerous big game species and use most of the Refuge year-round. They tend to stay in the forested cover during the day and venture onto the refuge bottomlands at night. No formal population estimates have been made, but greater than fifty have been seen at one time on the Refuge on numerous occasions. Most elk use the Refuge in the winter, mostly between November and January when they feed on the refuge grain fields at night. Herds of 40-50 animals are not uncommon at that time.

No data are available describing the level of big game hunting use or success rates. The estimated use by big game hunters reported in Kootenai NWR's Refuge Annual Performance Planning (RAPP) Report was 300 visits/year. Anecdotal information points to a relatively robust amount of white-tailed deer hunting occurring. Past compatibility determinations have estimate success at only 3-4 deer harvested per year, current estimates by refuge staff place the harvest closer to 10-20 animals per year. Elk hunting activity on the Refuge has increased with the increasing number of elk using the Refuge. Staff estimate 5-10 elk harvested each season.

Most elk hunting occurs when hunters attempt to harvest elk moving between the forested upland and the refuge bottomlands at dawn or dusk. This has resulted in wounded animals escaping into the closed portions of the Refuge to be either lost to the hunter or requiring effort from the refuge staff to escort hunters attempting to retrieve wounded game. Most of these problems occur along the forested portion of the Refuge west of Westside Road. The long, narrow shape of this parcel and its steep terrain discourages most hunters from venturing very far into the area from the public road. For this and other reasons including safety of other hunters and refuge users as well as vehicle congestion issues along that narrow road, big game hunting has been restricted to the forested portion of the Refuge west of Lions Den Road.

Big game hunters pursing game in the Lion Den Road portion of the refuge uplands will have off-highway parking available so vehicles are not obstructing traffic. This squarish-shaped parcel extends over 0.5 mile away from the road. It is less steep terrain with ridges running perpendicular to the road provides much easier hunter access and greater safety to both hunters and other users from errant bullets. While the potential for wounded game escaping from this parcel into the closed area still exists, refuge staff reports a far lower incident of that happening in this area of the Refuge.

Big game hunting on refuge lands will be an extension of the activity already occurring on adjacent public and private lands. No refuge-specific permits or hunter check-in procedures will be employed. Retrieval of wounded game escaping across Lions Den Road and into the bottom lands will not be allowed due to restrictions that visitors remain on established trails unless hunting waterfowl on waterfowl hunt days; thus maintaining the sanctuary character of these habitats for resident and migratory wildlife on non-waterfowl hunt days. This may result in a wounded animal escaping a hunter, but it will likely be an infrequent occurrence.

This use is defined as a wildlife-dependent recreational use under the Improvement Act. See Implementation section (Appendix C of the CCP) to determine priority of projects associated with these uses as funding becomes available.

Availability of Resources:

The following funds will be required to run a program as designed under the CCP. Many of these expenses are not exclusive to the big game hunting program but will be shared with other Refuge hunting programs. Currently, no funds are being expended on this program, so the funds below represent all new funding needs. These projected expenses will not exceed the Refuge's ability to fund the activity.

Activity	One Time Expense	Recurring Expense
Development and Administration of Hunt Plan and associated documentation	$ 10,000	$500
Biological staff to document significant habitat damage attributable to white-tailed deer and/or elk	$2,000	0
Law Enforcement Staffing	$1,000	0
Biological staff to monitor the effectiveness of the special hunt	$2,000	
Totals	**$16,000**	**$500**

Anticipated Impacts of Described Use:

The direct effect of hunting on big game is mortality, wounding, and disturbance.

Effects of hunting on white-tailed deer: White-tailed deer hunter densities in the Idaho panhandle are relatively high with moderate success rates. Management objectives, including number of hunters, hunter-days of recreation, buck harvest and percent of bucks harvested with 5+ point antlers were all easily met in 2008 (the most recent data available)(Compton 2009). In 2011 the combined archery and any-weapons hunting seasons for white-tailed deer in Unit 1, which includes the Refuge, will run from September 6 through December 16, providing 60 days of hunting. This includes 9 days of any-weapon antlerless hunting and 31 days of archery hunting when antlerless deer are legal (Idaho Fish and Game 2010). The liberal season and inclusion of an antlerless harvest indicates a healthy population of white-tailed deer sufficient to support hunting.

Effects of hunting on elk: A sightability survey conducted during February and March in 2006 (the most recent data available) indicated cow numbers slightly below objectives in the Panhandle Zone Trend Area while bull numbers exceeded objectives (Compton 2009). Although not as liberal as the white-tailed deer season, the archery, any weapon and muzzleloader only seasons combined afford elk hunters 59 days of hunting including opportunities to harvest antlerless and spike bulls along with antlered bulls (Idaho Fish and Game 2010). The liberal season and inclusion of an antlerless harvest indicates a healthy population of elk sufficient to support hunting.

Effects of hunting on mule deer, moose, mountain lion, and black bear: Mule deer comprise less than 10 percent of the deer harvest in the population management unit that includes the Refuge (Rachael 2010). Few mule deer use the Refuge due to its low elevation and lack of suitable habitat. Few if any mule deer are harvested on the Refuge each year. The low number of mule deer and the subsequent lack of hunter pursuit means there is little impact to the species related to hunting on the Refuge.

Moose continue to be one of the most desirable trophy animals in Idaho. The population has steadily increased over the last several decades, but the rate of permits issued has increased faster resulting in better odds of a resident drawing one of the once in a life time permits for an antlered or antlerless moose. A hunter success rate in game hunting unit 1 was 71 percent in 2008 (Toweill 2009). The highly controlled nature of distributing moose permits and the limited number of permits available will preclude any negative effects hunting moose on the Refuge would have on this species.

Overall, the panhandle area likely contains some of the highest-quality black bear habitat in Idaho. Black bear management is heavily influenced by grizzly bear management needs in this big game management unit, as it includes parts of the Selkirk and Cabinet-Yaak Grizzly Bear Recovery areas. Consequently, this area has been closed to use of bait since 1984 and to use of hounds since 1988. The 3-year average of 33 percent females in the harvest is very close to management objective, and appears relatively stable since 1994. Within the male harvest, bears age 5 years and older easily meet management objectives, and are likewise stable since 1994 (White 2009). Since the black bear population is healthy and meeting State management objectives and the incidence of bear harvest on the Refuge is very low due the small amount of suitable habitat available, hunting black bears on the Refuge will not have an adverse effect on the population of black bears in the area.

The 2008 mountain lion season produced a harvest of 74 mountain lions, resulting in a 3-year average of 74, above the management objective of providing for a harvest of at least 61 lions annually. Harvest using hounds is the predominate method of take in the Panhandle big game unit. During the 2008 season, an average of 53 percent of successful mountain lion hunters used hounds to take a mountain lion. While still relatively low, incidental and still/stalk hunting increased and accounted for 30 percent and 15 percent of the harvest, respectively, in the 2008 season. Fifty-three of the 223 mountain lions harvested (24 percent) in the panhandle during the past 3 seasons were taken incidentally, primarily by hunters pursuing other big game animals (White 2008). Since hound hunting is not allowed on the Refuge, any legally harvested lions taken on the Refuge will likely be the result of incidental harvest by hunters pursuing other big game. This minor harvest will have very little impact on the lion population in the panhandle region.

Impacts to Threatened and Endangered Species: The only federally listed species known to occur on the Kootenai National Wildlife Refuge is bull trout (*Salvelinus confluentus*), which is currently listed as threatened. Kootenai River white sturgeon (*Acipenser transmontanus*) is an endangered species that occurs in the Kootenai River adjacent to the Refuge. Since big game hunting occurs in the terrestrial uplands over 0.5 miles from the nearest aquatic habitat (Deep Creek), no impact to these listed fish is expected. Other federally listed species residing in northern Idaho are Canada lynx (*Lynx Canadensis*) and Selkirk Mountain caribou (*Rangifer trandus caribou*). Neither of these species currently inhabits the Refuge nor are they expected to in the future due to a lack of suitable habitat. Any occurrence of these species on the Refuge would be a very rare event associated with a transient animal.

The Refuge is located in close proximity to both the Selkirk and Cabinet/Yaak grizzly bear (*Ursus arctos horribilis*) recovery areas. While grizzlies are not common in the area, the potential exists for a grizzly to wander on to the Refuge during black bear hunting season and being harvested by mistake. However, this potential exists throughout the panhandle region and the Idaho Department of Fish and Game has addressed it with educational materials available on their website alerting hunters to the potential, however slight, of encountering a grizzly and how to distinguish between the two species. Thus possibility of a grizzly being mistakenly harvest on the Refuge is very small and not significant enough to preclude allowing black bear hunting.

Impacts on other wildlife species: The majority of big game hunting happens in the fall, after nesting season for birds and the rearing season for all forms of wildlife. While the presence of hunters can temporary influence resident game and non-game wildlife by increasing their level of stress and possibly causing them to flee in alarm, these occurrences are short lived, relatively rare and not excessively energetically taxing at that time of year.

Black bear hunting occurs in both spring and fall. Spring seasons coincide with nesting season for several other bird species including ruffed grouse (*Bonasa umbellus*) and dark-eyed junco (*Junco hyemalis*). Hunters pursuing black bears may inadvertently damage a ground nest and its eggs. Information on the incident rate of nest trampling by hunters is not available. While this can certainly happen, the event is probably quite rare and the impact on ground nesting birds inconsequential.

The impacts caused by mountain lion, moose, mule deer, and fall black bear hunting are likely inconsequential due to the paucity of those species on the Refuge and the subsequent lack of hunters pursuing those species.

Hunters pursuing white-tailed deer and elk have the greatest potential to disturb other wildlife. The presence of hunters in the forest, movement into and out of hunt areas, and increased vehicular traffic on the adjacent roads can all be construed as disruptive to wildlife other that those being directly pursued. However, the level of this impact has not resulted in a noteworthy negative effect to this point and there is no evidence that continued big game hunting will have a significant negative impact on other wildlife co-habitants.

Impacts to other wildlife-dependent recreational uses: Hunting (especially gunshot noise) has the potential to disturb refuge visitors engaged in other non-hunting wildlife-dependent recreational uses. The infrequent discharge of a firearm during big game hunting will help minimize this impact. The careful delineation of hunting areas and restricting big game hunting to the less popular southern portion of the Refuge along Lions Den Road will help reduce the disruption to other refuge visitors.

Non-hunters hiking the Ole Humpback trail may occasionally encounter a big game hunter. Some non-hunters may be upset by the sight of a hunter or wish to avoid areas hunters may be using. Signs that include the dates of hunting seasons will be placed at the Ole Humpback trailhead advising visitors that hunters may be recreating in the area during those times, providing non-hunters a choice as to when they may wish to hike the trail.

Summary and application to Kootenai NWR: While big game hunting has no positive effects on these species as the activity is occurring, it is well recognized that this activity has given many people a deeper appreciation of wildlife and a better understanding of the importance of conserving their habitat, which has ultimately contributed to the Refuge System mission.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2011) in order to comply with the National Environmental Policy Act and with Service policy. Appendix M of the CCP (USFWS 2011) contains a summary of the comments and Service Responses. Public review of a step down Hunt Plan (see Stipulations) as required under Service policy will be conducted before implementing changes the refuge big game hunting program.

Determination:

____ Use is Not Compatible
__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

User stipulations:
- Hunters must obey all State and Federal hunting regulations.
- Only species designated as huntable species in the refuge hunting leaflet may be hunted. Species including but not limited to coyote and bobcat that are not listed as huntable species may not be pursued.

Administrative stipulations:
- Allowing the use as described is contingent upon finding the full funding to properly manage and administer the use.
- Big game hunting will be restricted to the forested portions of the Refuge along Lions Den Road.
- Hunt areas and no hunting zones will be well posted.

Justification:

Big game hunting will contribute to the mission of the National Wildlife Refuge System by providing a wildlife-oriented recreational benefit to Americans. The use contributes to the purpose of *wildlife-*

oriented recreational development. Hunting is also one of the six wildlife-dependent recreational uses of the National Wildlife Refuge System as stated in the National Wildlife Refuge System Improvement Act of 1997.

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 big game hunting to occur on the Refuge. The relatively limited number of individuals expected to be adversely affected due hunting will not cause wildlife populations to materially decline, the physiological condition and production of 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 big game hunting to occur with stipulations will not materially detract or interfere with the purposes for which the Refuge was established or the Refuge System mission.

References:

Compton, Brad. 2009. Idaho Department of Fish and Game elk progress report.
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U.S. Fish and Wildlife Service. 2011. Environmental Assessment for the Draft Refuge Comprehensive Conservation Plan, Kootenai National Wildlife Refuge.
U.S. Fish and Wildlife Service. 2011. Comprehensive Conservation Plan for Kootenai National Wildlife Refuge.
White, Craig. 2009. Idaho Department of Fish and Game black bear report.
White, Craig. 2009. Idaho Department of Fish and Game mountain lion report.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

_2026_ Mandatory 15-year Re-evaluation date (for priority public uses)
______ Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
__X__ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Signatures:

Prepared by:	(Signature)	(Date)
Refuge Manager/ Project Leader Approval:	(Signature)	(Date)

Concurrence

Refuge Supervisor:	(Signature)	(Date)
Regional Chief, National Wildlife Refuge System:	(Signature)	(Date)

B.4 Draft Compatibility Determination for Turkey Hunting on Kootenai National Wildlife Refuge

RMIS Database Uses: Turkey Hunting

Refuge Name: Kootenai National Wildlife Refuge (NWR)

Location: Boundary County, Idaho

Date Established: 1964

Establishing and Acquisition Authorities:
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715 et seq.)
- Executive Order 7681, dated July 30, 1937
- Refuge Recreation Act as amended [16 U.S.C. 460k-460k-4]
- Fish and Wildlife Act of 1956, as amended [16 U.S.C. 742a-742j, not including 742l]

Refuge Purpose(s):

"for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715 et seq. (Migratory Bird Conservation Act of 1929).

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

Description of Use:

Turkey hunting will be allowed within 173 acres of the Refuge west of Lions Den Road (see Map 8 in CCP) (USFWS 2011). Hunting will be allowed on all days coinciding with the current Idaho Fish and Game turkey seasons. In 2011 those seasons were: youth hunt April 8-14, spring general season April 15-May 25 and fall general season September 15-December 15. Bag limits and lawful methods of take are those documented in the current Idaho Fish and Game Upland Game, Furbearer and Turkey Seasons and Rules brochure. As of 2011 the daily bag limits were 2 bearded turkeys (one general tag and one extra tag) in the spring, and up to 5 either sex turkeys per day in the fall. However, the most tags any one hunter may possess in a year is six (Idaho Fish and Game 2010). Hunting with both archery equipment and firearms will be allowed.

Turkey hunting on refuge lands will be an extension of the activity already occurring on adjacent public and private lands. No refuge-specific permits or hunter check-in procedures will be employed. Hunter access will be from the existing parking areas along Lions Den Road. Retrieval of wounded turkeys escaping across Lions Den Road and into the bottom lands will not be allowed due to restrictions that visitors remain on established trails unless hunting waterfowl on waterfowl hunt days; thus maintaining the sanctuary character of these habitats for resident and migratory wildlife on non-waterfowl hunt days. This may result in a wounded turkey escaping a hunter, but it will likely be a very infrequent occurrence.

This use is defined as a wildlife-dependent recreational use under the Improvement Act. See Implementation section (Appendix C of the CCP) to determine priority of projects associated with these uses as funding becomes available.

Availability of Resources:

The following funds will be required to run a program as designed under the CCP. Many of these expenses are not exclusive to the turkey hunting program but will be shared with other refuge hunting programs. Currently, no funds are being expended on this program, so the funds below represent all new funding needs. These projected expenses will not exceed the Refuge's ability to fund the activity.

Activity	One Time Expense	Recurring Expense
Development and Administration of Hunt Plan and associated documentation	$ 10,000	$500
Placement and maintenance of signs	$ 1,000	$ 500
Law Enforcement Staffing	0	$1,200
Biological staff to monitor hunt program	0	$1,200
Totals	**$11,000**	**$3,400**

Anticipated Impacts of Described Use:

The direct effect of hunting on wild turkey is mortality, wounding, and disturbance.

Effects of hunting on turkey: Previously turkey hunting was not allowed on the Refuge. The limited amount of area available for turkey hunting and the interest in maintaining something of a sanctuary were cited as reasons. However, turkey hunting has grown in popularity in Idaho along with a dramatic increase in turkey numbers until now they have saturated their habitat and have proven to be nuisances in some areas especially during the winter (Knetter 2009).

No estimate of the Refuge's turkey population exists. The Idaho Department of Fish and Game does not conduct population surveys of wild turkeys but considers the population to be stable. The amount of suitable turkey habitat on the Refuge is probably too small to support all life requirements of a turkey population. Turkeys are using these portions of the Refuge as a part of their larger home range, moving on and off the Refuge regularly. Any turkeys harvested on the Refuge are part of a much larger population occupying thousands of acres adjoining the Refuge. Hunters currently have access to the public land adjacent to this portion of the Refuge. Allowing turkey hunting in the Refuge provides hunters an additional opportunity to pursue birds that would otherwise be inaccessible.

The fact that hunting regulations allow Idaho hunters to harvest up to six turkeys a season in this part of the State demonstrates that the population can withstand the slight additional harvest that would result from allowing turkey hunting on this portion of the Refuge.

Impacts to Threatened and Endangered Species: The only federally listed species known to occur on the Kootenai National Wildlife Refuge is bull trout (*Salvelinus confluentus*), which is currently listed as threatened. Kootenai River white sturgeon (*Acipenser transmontanus*) is an endangered species that occurs in the Kootenai River adjacent to the Refuge. Since turkey hunting occurs in the terrestrial uplands over 0.5 mile from the nearest aquatic habitat (Deep Creek), no impact to these listed fish is expected. Other federally listed species residing in northern Idaho are Canada lynx (*Lynx Canadensis*), grizzly bear (*Ursus arctos horribilis*), and Selkirk Mountain caribou (*Rangifer trandus caribou*). None of these species currently inhabit the Refuge nor are they expected to in the future due to a lack of suitable habitat. Any occurrence on these species on the Refuge would be a very rare event associated with a transient animal. Therefore turkey hunting will have no negative effects on any threatened or endangered species.

Impacts on other wildlife species: Turkey hunting occurs in both spring and fall. Spring seasons coincide with nesting season for several other bird species including ruffed grouse (*Bonasa umbellus*) and dark-eyed junco (*Junco hyemalis*). Hunters pursuing turkeys may inadvertently damage a ground nest and its eggs. Information on the incident rate of nest trampling by hunters is not available. While this can certainly happen, the event is probably quite rare and the impact on ground nesting birds inconsequential.

Turkey hunters are allowed to use dogs in fall. Turkey hunting dogs are typically used to flush and break up a flock, then returned to a vehicle or kept under very close control while the hunter attempts to lure birds back into range by calling. Since fall turkey hunting both with and without dogs occurs after the breeding season, and due to the high level of dog control typically exercised by the hunter, impacts from these activities on non-target wildlife will likely be insignificant.

Impacts to other wildlife-dependent recreational uses: Hunting (especially gunshot noise) has the potential to disturb refuge visitors engaged in other wildlife-dependent recreational uses. Unlike waterfowl hunting, when between one to three shots per hunter may be fired when game presents itself within range, turkey hunting usually results in the discharge of only one shot per opportunity. The infrequent discharge of a firearm during turkey hunting will minimize the disturbance it has on other refuge users. Also, turkeys must be hunted with shotguns, which limit the firearm’s range and thus the danger of shot pellets striking refuge visitors.

Non-hunters hiking the Ole Humpback trail may occasionally encounter a turkey hunter. Some non-hunters may be upset by the sight of a hunter or wish to avoid areas hunters may be using. Signs that include the dates of turkey or other hunting seasons will be placed at the Ole Humpback trailhead advising visitors that hunters may be recreating in the area during those times, providing non-hunters a choice as to when they may wish to hike the trail.

Summary and application to Kootenai NWR: Hunting will have no negative impacts on the turkey population either on the Refuge or the surrounding area. This activity can be safely conducted on the forested portion of the Refuge west of Lions Den Road. It is well recognized that this recreational activity has given many people a deeper appreciation of wildlife and a better understanding of the importance of conserving their habitat, which has ultimately contributed to the Refuge System mission.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2011) in order to comply with the National Environmental Policy Act and with Service policy. Appendix M of the CCP (USFWS 2011) contains a summary of the comments and Service Responses. Public review of a step down Hunt Plan (see Stipulations) as required under Service policy will be conducted before implementing changes to the refuge upland game hunting program.

Determination:

____ Use is Not Compatible
__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

User stipulations:

- Hunters must obey all State and Federal hunting regulations.
- Hunting dogs will be under hunter control at all times.

Administrative stipulations:

- Allowing the use as described is contingent upon finding the full funding to properly manage and administer the use.
- Hunt areas and no hunting zones will be well posted.

Justification:

Turkey hunting at Kootenai NWR as described in this CD contributes to the mission of the National Wildlife Refuge System by providing a wildlife-oriented recreational benefit to Americans. The use contributes to the purpose of *wildlife-oriented recreational development*. Hunting is also one of the six wildlife-dependent recreational uses of the National Wildlife Refuge System as stated in the National Wildlife Refuge System Improvement Act of 1997.

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 turkey hunting to occur on the Refuge. The relatively limited number of individuals expected to be adversely affected due hunting will not cause wildlife populations to materially decline, the physiological condition and production of 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 turkey hunting to occur with stipulations will not materially detract or interfere with the purposes for which the Refuge was established or the Refuge System mission.

References:

Idaho Department of Fish and Game. 2010-2011 and 2011-2012 Upland Game, Furbearer and Turkey Seasons and Rules.
Knetter, Jeffery M. 2009. Idaho Department of Fish and Game upland game progress report.
Sime, Carolyn A. 1999. Domestic dogs in wildlife habitats, *in* Effects of recreation on Rocky Mountain wildlife. Montana Chapter of the Wildlife Society.
U.S. Fish and Wildlife Service. 2011. Environmental Assessment for the Draft Refuge Comprehensive Conservation Plan, Kootenai National Wildlife Refuge.
U.S. Fish and Wildlife Service. 2011. Comprehensive Conservation Plan for Kootenai National Wildlife Refuge.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

_2026_ Mandatory 15-year Re-evaluation date (for priority public uses)
______ Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
__X__ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Signatures:

Prepared by:	(Signature)	(Date)
Refuge Manager/ Project Leader Approval:	(Signature)	(Date)

<u>Concurrence</u>

Refuge Supervisor:	(Signature)	(Date)
Regional Chief, National Wildlife Refuge System:	(Signature)	(Date)

B.5 Draft Compatibility Determination for Forest Grouse Hunting on Kootenai National Wildlife Refuge

RMIS Database Uses: Forest Grouse Hunting

Refuge Name: Kootenai National Wildlife Refuge (NWR)

Location: Boundary County, Idaho

Date Established: 1964

Establishing and Acquisition Authorities:

- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715 et seq.)
- Executive Order 7681, dated July 30, 1937
- Refuge Recreation Act as amended [16 U.S.C. 460k-460k-4]
- Fish and Wildlife Act of 1956, as amended [16 U.S.C. 742a-742j, not including 742l]

Refuge Purpose(s):

"for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715 et seq. (Migratory Bird Conservation Act of 1929).

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

Description of Use:

Three species of forest grouse may be hunted on the Refuge: ruffed grouse (*Bonasa umbellus*), spruce grouse (*Falcipennis canadensis*) and dusky (formerly blue) grouse (*Dendragapus obscurus*).

Hunting is allowed on the 173 acre forested upland portion of the Refuge west of Lions Den Road. Refuge forest grouse hunting coincides with the current Idaho Fish and Game season which is usually August 30, through January 31. The current bag limit is 4 grouse per day in an aggregate of species with a possession limit of 8 grouse in an aggregate of species after the opening day. In accordance with Idaho Fish and Game hunting regulations grouse may be harvested using sling shots; handheld or thrown missiles; archery equipment; center fire and rimfire rifles and handguns; muzzleloading rifles, handguns and shotguns; or centerfire shotguns using shotshells not to exceed 3½" in length (Idaho Fish and Game 2011). By dint of Kootenai National Wildlife Refuge rules published in the Federal Register, hunters may possess only approved nontoxic shotshells while in the field.

Forest grouse hunting on refuge lands will be an extension of the activity already occurring on adjacent public and private lands. No refuge-specific permits or hunter check-in procedures will be employed. Hunter access will be from the existing parking areas along Lions Den Road. Retrieval of wounded grouse escaping across Lions Den Road and into the bottom lands will not be allowed due to restrictions that visitors remain on established trails unless hunting waterfowl on waterfowl hunt days; thus maintaining the sanctuary character of these habitats for resident and migratory wildlife on non-waterfowl hunt days. This may result in a wounded grouse escaping a hunter, but it will likely be a very infrequent occurrence.

This use is defined as a wildlife-dependent recreational use under the Improvement Act. See Implementation section (Appendix C of the CCP) to determine priority of projects associated with these uses as funding becomes available.

Availability of Resources: The following funds will be required to run a program as designed under the CCP. Many of these expenses are not exclusive to the forest grouse hunting program but will be shared with other refuge hunting programs. Currently, no funds are being expended on this program, so the funds below represent all new funding needs. For the one-time expenses, all available sources will be investigated.

Activity	One Time Expense	Recurring Expense
Development and Administration of Hunt Plan and associated documentation	$ 10,000	$500
Placement and maintenance of signs	$ 1,000	$ 500
Law Enforcement Staffing	0	$1,200
Biological staff to monitor hunt program	0	$1,200
Totals	**$11,000**	**$3,400**

Anticipated Impacts of Described Use:

The direct effect of hunting on forest grouse is mortality, wounding, and disturbance.

Few hunters hunt grouse exclusively in the panhandle region of Idaho. Most hunter harvested grouse are taken incidental to other activities such as big game hunting or in conjunction with driving on forest roads (Knetter 2009). A telephone survey conducted by the Idaho Department of Fish and Game of upland game hunters estimated that 4,847 hunters harvested 28,222 forest grouse in the Idaho panhandle in 2007. Approximately 85 percent were ruffed grouse, 11 percent blue/dusky grouse, and 4 percent spruce grouse (Knetter 2009). This harvest data and species proportion would be considered typical for most years. No data specifically describing the grouse harvest on the Refuge have been collected. Refuge staff estimates the grouse harvest on the Refuge at less than 10 per year, most of those ruffed grouse.

The small area of the Refuge open to forest grouse hunting, the lack of roads, and the steepness of the terrain limits the intensity of this activity. Hunting has a negligible impact on grouse populations in the panhandle region (Knetter 2009). There is no reason to believe the limited amount of grouse hunting that will occur on the Refuge will seriously impact the grouse population.

Impacts to Threatened and Endangered Species: The only federally listed species known to occur on the Kootenai National Wildlife Refuge is bull trout (*Salvelinus confluentus*), currently listed as threatened. Kootenai River white sturgeon (*Acipenser transmontanus*) is an endangered species that occurs in the Kootenai River adjacent to the Refuge. Since grouse hunting occurs in the terrestrial uplands over 0.5 mile from the nearest aquatic habitat (Deep Creek), no impact to these listed fish is expected. Other federally listed species residing in northern Idaho are Canada lynx (*Lynx*

Canadensis), grizzly bear (*Ursus arctos horribilis*), and Selkirk Mountain caribou (*Rangifer trandus caribou*). None of these species currently inhabit the Refuge nor are they expected to in the future due to a lack of suitable habitat. Any occurrence on these species on the Refuge would be a very rare event associated with a transient animal. Therefore forest grouse hunting will have no negative effects on any threatened or endangered species.

Impacts on other wildlife species: Dedicated grouse hunters often use hunting dogs to detected and retrieve birds. Any dog, particularly when free roaming and not under some type of control, may have a serious impact on non-target wildlife, especially in the spring (Sime 1999). However, grouse hunting is only allowed in the fall, and bird hunting by its nature requires close control of the dog by the hunter. The limited amount of dog-less hunters pursuing forest grouse, including those primarily hunting big game but harvesting grouse opportunistically, is small and probably does not have a significant detrimental impact on other wildlife species during the fall hunting season. Because of the limited number hunters pursuing grouse, the very small percentage of those using dogs and the season of use, any impact to other wildlife would be very small.

Impacts to other wildlife-dependent recreational uses*:* Hunting (especially gunshot noise) has the potential to disturb refuge visitors engaged in other wildlife-dependent recreational uses. The infrequency of discharging a firearm during grouse hunting minimizes this impact.

Dedicated grouse hunters will use shotguns which are inherently short-range weapons. Opportunistic grouse hunters may be using any of a number of weapons depending on the type of big game hunting they are participating in. The rolling terrain of the Lions Den Road parcel provides natural backstops for rifle or handgun bullets, reducing the probability of bullets traveling far and endangering other refuge users. The short range of archery equipment also greatly reduces the potential for endangering other recreationalists.

Non-hunters hiking the Ole Humpback and Myrtle Creek trails might very occasionally encounter a grouse hunter. Some non-hunters may be upset by the sight of a hunter or wish to avoid areas hunters may be using. Signs that include the dates of grouse and other hunting seasons will be placed at the Ole Humpback trailhead advising visitors that hunters may be recreating in the area during those times, providing non-hunters a choice as to when they may wish to hike the trail.

Summary and application to Kootenai NWR: While grouse hunting has no positive effects on these species while the activity is occurring, it is well recognized that this activity has given many people a deeper appreciation of wildlife and a better understanding of the importance of conserving their habitat, which has ultimately contributed to the Refuge System mission. Hunting will have no negative impacts on the forest grouse population either on the Refuge or the surrounding area and can be safely conducted on the forested portion of the Refuge west of Lions Den Road.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2011) in order to comply with the National Environmental Policy Act and with Service policy. Appendix M of the CCP (USFWS 2011) contains a summary of the comments and Service Responses. Public review of a step down Hunt Plan (see Stipulations) as required under Service policy will be conducted before implementing changes the refuge forest grouse hunting program.

Determination:

____ Use is Not Compatible
__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

User stipulations:

- Hunters must obey all State and Federal hunting regulations.
- Hunting dogs will be under hunter control at all times.
- Hunters may possess only non-toxic shotshells while in the field.

Administrative stipulations:

- Hunt areas and no hunting zones will be well posted.
- Refuge/Complex staff will conduct law enforcement, maintain hunting facilities, and monitor wildlife impacts.

Justification:

Forest grouse hunting at Kootenai NWR as described in this CD contributes to the mission of the National Wildlife Refuge System by providing a wildlife-oriented recreational benefit to Americans. The use contributes to the purpose of *wildlife-oriented recreational development*. Hunting is also one of the six wildlife-dependent recreational uses of the National Wildlife Refuge System as stated in the National Wildlife Refuge System Improvement Act of 1997.

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 forest grouse hunting to occur on the Refuge. The relatively limited number of individuals expected to be adversely affected due hunting will not cause wildlife populations to materially decline, the physiological condition and production of 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 forest grouse hunting to occur with stipulations will not materially detract or interfere with the purposes for which the Refuge was established or the Refuge System mission.

References:

Idaho Department of Fish and Game. 2010-2011 and 2011-2012 Upland Game, Furbearer and Turkey Seasons and Rules.

Knetter, Jeffery M. 2009. Idaho Department of Fish and Game upland game progress report.

Sime, Carolyn A. 1999. Domestic dogs in wildlife habitats, *in* Effects of recreation on Rocky Mountain wildlife. Montana Chapter of the Wildlife Society.

U.S. Fish and Wildlife Service. 2011. Comprehensive Conservation Plan for Kootenai National Wildlife Refuge.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

_2026_ Mandatory 15-year Re-evaluation date (for priority public uses)
______ Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
__X__ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Signatures:

Prepared by: ______________________________ __________
(Signature) (Date)

Refuge Manager/
Project Leader
Approval: ______________________________ __________
(Signature) (Date)

<u>Concurrence</u>

Refuge Supervisor: ______________________________ __________
(Signature) (Date)

Regional Chief,
National Wildlife
Refuge System: ______________________________ __________
(Signature) (Date)

B.6 Draft Compatibility Determination for Sport Fishing on Kootenai National Wildlife Refuge

RMIS Database Uses: Sport Fishing

Refuge Name: Kootenai National Wildlife Refuge

Location: Boundary County, Idaho

Date Established: 1964

Establishing and Acquisition Authorities:

- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715 et seq.)
- Executive Order 7681, dated July 30, 1937
- Refuge Recreation Act as amended [16 U.S.C. 460k-460k-4]
- Fish and Wildlife Act of 1956, as amended [16 U.S.C. 742a-742j, not including 742l]

Refuge Purpose(s):

“for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. 715 et seq. (Migratory Bird Conservation Act of 1929).

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

Description of Use:

Sport fishing in Myrtle Creek has been allowed on the Refuge since 1965, with anglers visiting the Refuge in order to pursue salmonids. Salmonids documented in the creek include rainbow trout, brook trout, mountain whitefish, and bull trout (Kruse 2005; Jones and Faler 2010). According to the current regulations as stipulated in 50 CFR 32.3, sport fishing on Myrtle Creek is allowed in accordance with State regulations subject to the following conditions: 1) bank fishing only, and 2) fishing from boats, float tubes, or other personal flotation devices is prohibited. Myrtle Creek enters the Refuge at its western boundary and is wholly contained within refuge boundaries as it flows into the Kootenai River. No fees or special permits are required to fish on the Refuge and based upon staff observations it is believed that there is little fishing pressure although monitoring of angler use has not been conducted within the past decade.

Prior to 2011, the Idaho statewide fishing season for rivers and streams, which would apply to Myrtle Creek, opened the Saturday of Memorial Day weekend and ran through November 30. In 2011, Idaho shifted away from statewide rules toward regional rules and year-round seasons and bag limits. This change reduced the number of exceptions by 33 percent and simplified the rules for the public. As a result, Myrtle Creek is now included in the “All Waters Open All Year” general fishing season (IDFG 2011).

This Compatibility Determination will reassess and evaluate sport fishing on the banks of Myrtle Creek. Continuation of this use on the Refuge in accordance with the State's new year-round fishing season designation could necessitate additional stipulations in order to protect bull trout, which is federally listed as threatened species, if future monitoring shows that fishing is detrimental to bull trout or their habitat in Myrtle Creek.

Kokanee, whose runs into the tributaries of the Kootenai River once numbered into the thousands up to the 1980s, have declined so dramatically during the past several decades that they are now considered to be "functionally extinct" (Ireland 2007). Considered the biological engines of most lake and river ecosystems in the Pacific Northwest, species such as sturgeon, bull trout, burbot, and rainbow trout are highly dependent upon kokanee as forage (Ireland 2007). Within the past decade, the Kootenai Tribe of Idaho has been working to restore kokanee populations through the use of egg plants in some westside tributaries of the Kootenai River including Myrtle Creek. The Kootenai River white sturgeon, an endangered species, and burbot, an imperiled species with an approved Conservation Strategy Plan, are known to inhabit the Kootenai River near the mouth of Myrtle Creek but neither of these species has ever been documented in Myrtle Creek.

The lower reach of Myrtle Creek, approximately 1.6 miles in length, is heavily silted due to backwater from the Kootenai River and is constrained by a steep 37-foot high dike therefore, salmonids typically do not inhabit this section. Rather, it is the upper and middle reaches of the creek, about 0.8 miles in length, which contain prime salmonid habitat and where fishing pressure is the greatest. At this time, due to the light fishing pressure in Myrtle Creek, the Refuge fishing program will be in accordance with state regulations. If future monitoring reveals that fishing has a significant negative impact to Myrtle Creek's bull trout or kokanee populations or habitat, then the Refuge will coordinate with the Idaho Department of Fish and Game (IDFG) to develop stream specific regulations.

Public parking is available on the Refuge at the Myrtle Creek Falls trailhead parking lot. Additional parking is available across Westside Road next to the Headquarters Office and next to the Environmental Education Center.

Availability of Resources:

The following funds will be required to administer the revised fishing program in order to protect bull trout, which is federally listed as threatened and which inhabits Myrtle Creek.

Costs to Administer and Manage Research Program at the Refuge.

Activity or Project	One Time Expenses ($)	Recurring Expenses ($/year)
Interpretive and administrative signs, and kiosk	$ 5,500	
Establishment and maintenance of low impact fishing access trail to creek	$ 3,000	$ 2,000
Fishing brochure	$ 1,500	$ 500
Annual program management—Salaries (creel surveys, LE, etc.)		$ 3,000
Totals	$ 10,000	$ 5,500

Background Information: Angling is an important recreational activity for many Americans generating millions of dollars for State agencies. A 2003 Idaho Sport Fishing Economic Report stated that in 2003, one in four eligible people residing in Idaho purchased a fishing license. Fishing in Idaho generated $437,631,735 in statewide retail sales during 2003 with an additional $12,298,806 generated from the sale of fishing permits and licenses (IDFG 2011). During Fiscal Year 2011, the State of Idaho was apportioned $4,305,939 from the U.S. Fish and Wildlife Service (Service) pursuant to the Dingell-Johnson Sport Fish Restoration Act, as amended (16 U.S.C. 777 et seq.), (USFWS 2010).

Trout fishing is one of the most popular types of fishing in the United States and according to the Service's 1996 National Survey of Fishing, Hunting and Wildlife-Associated Recreation, 31 percent of all freshwater anglers fished for trout (USFWS 1999). Of all of the freshwater anglers in Idaho, 86 percent were trout anglers owing to the presence of this popular game fish throughout the State (USFWS 1999). Thus, this amount of fishing pressure certainly has an impact on native salmonids within the State.

Since anglers visit the Refuge in order to pursue salmonids, the presence of bull trout in Myrtle Creek raises a concern since the Columbia River population of bull trout was listed as threatened by the Service on June 10, 1998. The Kootenai River Recovery Unit forms part of the range of the Columbia River population. While the historic distribution of bull trout within the Kootenai River Recovery Unit is relatively intact, its abundance in portions of the watershed has been reduced with the remaining populations considered fragmented (USFWS 2002).

Believed to be a glacial relict, there are two distinct life-history strategies, migratory and resident, which occur throughout the bull trout's range. Stream-resident (fluvial) bull trout complete their entire life cycle in the tributaries where they spawn and rear whereas migratory (adfluvial) bull trout spawn in tributary streams. The juveniles usually rear in natal streams from one to four years before migrating downstream to either a large river or lake where they spend their adult life, returning to the tributary to spawn. Resident and migratory forms are believed to exist together (50 CFR Part 17). Bull trout spawn from August through November. Eggs may hatch in winter or early spring but the alevins may stay in the gravel for an extended period after their yolks are absorbed. The bull trout's growth, maturation, and longevity vary with the environment but their first spawning typically occurs after age four. Bull trout may live 10 or more years (USFWS 1998).

Bull trout have much more specific habitat requirements than most other salmonids. Throughout their various life stages, bull trout rely on foraging, migration, and overwintering habitat in order to complete the important parts of their life cycle. Habitat characteristics such as water temperature, stream size, substrate composition, cover, and hydraulic complexity are associated with the bull trout's distribution and abundance (USFWS 1998).

The Service revised the designation of critical habitat for bull trout pursuant to the Endangered Species Act of 1973, as amended (Act). Under the Final Rule (50 CFR Part 17) which became effective on November 17, 2010, Deep Creek and Myrtle Creek were included on the list of water bodies designated as critical habitat for bull trout. The Service defines critical habitat as the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the Act, on which are found those physical or biological features essential to the conservation of the species and which **may require special management considerations or protection** (emphasis added).

According to the Final Rule, the "decline of the bull trout is primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, impoundments, dams, water diversions, and the introduction of non-native species. Climate change may exacerbate some of these impacts" particularly since bull trout are critically dependent upon large patches of suitably cold water habitat (50 CFR Part 17).

Brook trout (*Salvelinus fontinalis*) have been "extensively planted" in Idaho (Simpson and Wallace 1982) and occur throughout the drainage. Non-native, brook trout not only compete with bull trout for forage and spawning habitat but also pose a threat of hybridization. During Jones and Faler's

July 2009 fish population assessment of Myrtle Creek, one bull trout/brook trout hybrid was collected. Since both species occur in the Kootenai River basin and are known to hybridize, this specimen provides evidence that hybridization is occurring within the drainage. Other threats to bull trout populations include illegal harvest, an increasing number of anglers, and angler misidentification and incidental take due to hooking mortality (USFWS 2002).

Fishing regulations imposed to protect a particular species are wholly dependent upon the angler's knowledge and understanding of, and willingness to adhere to, the regulations, in addition to their ability to correctly identify various fish species. A study conducted by Schmetterling and Long (1999) in west central Montana examined the ability of anglers to correctly identify six salmonid species found in the area (all six species also inhabit Idaho waters). Comparisons were made based upon the number of years fishing and whether the angler was a resident or nonresident. The study found that while anglers correctly identified salmonid species 63 percent of the time, they frequently confused related species such as bull trout, brook trout, and brown trout. Bull trout were correctly identified by only 44 percent of anglers. Residents were found to be better at identifying bull trout than nonresidents and anglers with more than 10 years of angling experience were significantly better at identifying fish. "Unintentional illegal harvest or angler noncompliance with fishing regulations due to an inability to identify fish species can undermine management goals and significantly affect catch-and-release fisheries" (Schmetterling and Long 1999) leading to continued "taking" of listed species.

This study raises serious questions for an agency responsible for the recovery of a listed species since "the loss of individual fish from small populations such as bull trout can significantly affect recovery efforts due to genetic drift where individuals can enhance populations" (Schmetterling and Long 1999). In addition, angler misidentification, high among nonresidents, is particularly problematic for national wildlife refuges which routinely attract visitors from outside the area to engage in the "Big 6" wildlife dependent activities.

Many managers argue that offering catch-and-release angling is an effective fisheries conservation strategy while still affording anglers a recreational opportunity. This is based upon the assumption that since hooked fish are released (non-consumptive use), the population experiences low mortality and minimal sub-lethal effects. Unfortunately according to the literature, that is not always the case. Studies have shown that most fish that die under catch-and-release regulations do so a while after their release hence, they die unnoticed (Cooke and Suski 2005). Lukacovic's review of recreational catch-and-release mortality found that even if the mortality rate of released fish is low, it still needs to be considered as part of the fishing mortality in order to properly manage the fishery.

Factors influencing fish survival in a catch-and-release fishery are physical injury, water temperature, and stress (Lukacovic). Physical injuries occur due to types of hooks, bait type and size, fish behavior, and angler experience. The location of the hook wound has been shown to be the most important factor influencing mortality in catch-and-release angling. Single hooks, particularly if used with natural baits, result in higher mortalities than treble hooks (Muoneke and Childress 1994) especially since natural baits tend to be swallowed more frequently as opposed to artificial lures/flies. Thus, the restriction of only using single, barbless, non-baited hooks in a catch-and-release fishery would decrease hooking mortality.

Fish experience cumulative stress during the hooking, fighting, and landing process. Stress related mortality can vary with changes in environmental conditions such as air and water temperatures. Higher water temperatures are directly correlated to higher fish mortalities in catch-and-release angling (Lukacovic). Once landed, the length of air exposure especially during hot weather increases stress-related mortality. Since larger fish tend to fight longer and are typically more difficult to handle than smaller fish, they experience greater mortality. "Larger fish have a greater difficulty eliminating carbon dioxide from their bloodstream and re-oxygenating their tissues after extreme physical exertion" (Lukacovic). In addition, during their period of recovery, their ability to respond to other stressors such as predator avoidance or prey capture is reduced (Cooke and Suski 2005).

Fish also experience sub-lethal behavioral disturbances which "include changes in activity patterns, swimming speeds, movement, or habitat use" (Cooke and Suski 2005). "Sub-lethal physiological disturbances associated with catch-and-release angling include osmoregulatory imbalances, depletion of energy stores, build-up of metabolic wastes, tissue damage, hormonal changes and cardiovascular disturbances" (Cooke and Suski 2005).

Based upon research conducted regarding a catch-and-release fishery, Cooke and Suski (2005) provide five generalizations: "(1) the duration of the angling event increases the physiological disturbance, (2) air exposure is harmful to fish and should be minimized, (3) extreme water temperatures magnify the level of disturbance and angling should be avoided at those temperatures, (4) barbless hooks and artificial lures or flies can greatly reduce handling time, hooking injuries, and likelihood of mortality, and (5) angling immediately prior to or during the reproductive period could affect fitness and should be avoided." If these parameters cannot be followed, is it prudent to continue with angling in a small stream, readily accessible by the public, which has been designated as critical habitat for a highly sensitive threatened species?

Parker et al. (2007) found that implementation of restrictive regulations did not necessarily eliminate bull trout mortality. In fact, poaching of bull trout has been identified as a key factor limiting the success of restrictive regulations in Alberta. Also, the ease of angler access to small water bodies has been shown to lead to increased angler effort and has been associated with declines in bull trout abundance (Parker et al. 2007). While small, easily accessible streams or lakes containing highly vulnerable bull trout populations could be well signed to educate anglers and enforcement of restrictive regulations increased, they may not be of enough benefit to recover declining bull trout populations.

The bull trout's Draft Recovery Plan (USFWS 2002) identifies the need to revegetate denuded riparian areas in Deep Creek; restore the stream channel in Myrtle Creek; experimentally remove established brook trout populations in Deep Creek; minimize unintentional bull trout mortality in the Kootenai River and its tributaries; and improve instream habitat in Deep Creek and Myrtle Creek as actions necessary for the recovery of the bull trout. Other ways to minimize the unintentional mortality of bull trout can include offering the public a fishing program in Myrtle Creek under very restrictive catch-and-release guidelines or to discontinue fishing altogether so as to provide bull trout the greatest level of protection. Since fishing pressure is believed to be light at this time, Refuge staff, in coordination with IDFG, will develop a monitoring plan to determine if the bull trout population is negatively impacted by the public fishing program.

In addition, if fishing on the Refuge is to continue to be offered to the public, educational materials in the form of brochures, interpretive signs, and pocket-sized salmonid identification cards will be provided to anglers. All of the various forms of media will provide information on salmonid identification, allowable hook types/bait, and angler ethics.

It is believed that bull trout inhabit Myrtle Creek upstream of the Refuge's pedestrian bridge due to the presence of a plunge pool below the 120 foot tall falls, large boulders and clean gravel, high velocity, and steep canyon walls surrounded by mature riparian vegetation which shade the creek year round. An intensive spawning survey will be conducted during the 2011 field season in coordination with the Service's Idaho Fishery Resource Office to determine whether bull trout are naturally reproducing in Myrtle Creek. If additional monitoring indicates that fishing is having a detrimental effect on bull trout populations, then additional measures to protect bull trout could be stipulated.

Anticipated Impacts of Described Use:

Direct Impacts (Disturbance): Direct impacts are those that have an immediate effect on wildlife, and indirect or cumulative impacts are those that would affect habitat, wildlife access to resources, or those that collectively or ultimately affect wildlife. Immediate responses by wildlife to recreational activity can range from behavioral changes including nest abandonment or change in food habits, physiological changes such as elevated heart rates due to flight, or even death (Knight and Cole 1995). Long-term effects are often more difficult to assess but may include altered behavior, vigor, productivity or death of individuals; altered population abundance, distribution, or demographics; and altered community species composition and interactions. Knight and Cole (1991) found that wildlife responses to human disturbance include avoidance, habituation, and attraction. The magnitude of the avoidance response may depend on a number of factors including the type, distance, movement pattern, speed, and duration of the disturbance, as well as the time of day, time of year, weather; the animal's access to food and cover, energy demands, and reproductive status (Knight and Cole 1991, Gabrielsen and Smith 1995). Knight and Cole (1991) also suggested that sound may elicit a much milder response from wildlife if animals are visually buffered from the disturbance.

Anticipated direct impacts include disturbance to wildlife by human presence which typically results in a temporary displacement of individuals or groups and as previously discussed, fish mortality, which can occur even under the auspices of a catch-and-release angling program. Roberts and White (1992) established that the effects of angler wading on trout eggs and pre-emergent fry in artificial redds was dependent upon wading frequency and the stage of egg or fry development. They found that twice-daily wading killed up to 96 percent of eggs and pre-emergent fry while a single wading episode just before hatching killed up to 43 percent. Wading killed the most eggs and fry from the time of chorion (egg shell) softening to the start of emergence from the gravel. Therefore, restricting wading can protect limited salmonid spawning habitat in small streams such as Myrtle Creek, particularly since the stretch of Myrtle Creek used by anglers contains the greatest potential for salmonid spawning habitat.

Since the exact amount of fishing pressure on Myrtle Creek is unknown at this time but is assumed to be low, perhaps one to two anglers per week, the impact of human presence on non-target wildlife, such as avian species, will be minimal due to the location of where anglers will likely congregate to pursue salmonids (upper reach). American dippers have been observed at various times feeding in the upper reach of Myrtle Creek and the mature stand of riparian vegetation along the upper reach of Myrtle Creek is considered prime habitat for warblers and flycatchers. Waterfowl are not present in the upper reach of Myrtle Creek due to high stream velocity, mature riparian vegetation, and rocky substrate. Waterfowl, particularly Canada geese, typically use the lower reach of Myrtle where the stream channel widens, velocity is significantly decreased, and the substrate is silty; an area which salmonid anglers do not use.

Indirect Impacts (Habitat and Physical Environment): The indirect impacts of angling activities will depend upon a number of variables including the season of use, duration of the activity, location, and number of users. Angling activities may negatively impact littoral and riparian habitats by disturbance, such as trampling and erosion, and pollution, namely littering (O'Toole et al. 2009). O'Toole et al. (2009) found that "terrestrial and aquatic macrophyte density, height, and diversity were lower at high angling-activity sites." Angler education and outreach will be necessary to mitigate these potential impacts.

Potential Conflicts between User Groups: The current Myrtle Creek Parking Lot, located at the Myrtle Creek Falls trailhead would be used by hikers and anglers. There is a designated parking spot for Americans with Disabilities (ADA) in the lot. It is expected that no conflicts between various user groups will arise since anglers will be fishing along the banks of Myrtle Creek whereas hikers will remain on the trail on their way to the Myrtle Creek Falls Overlook. There is ample parking in the Myrtle Creek Falls trailhead parking lot with additional parking available across the road adjacent to the Headquarters Office and adjacent to the Environmental Education Center.

Public Review and Comment:

Public review and comment were solicited in conjunction with the release of the Draft CCP/EA for Kootenai National Wildlife Refuge (USFWS 2011) in order to comply with the National Environmental Policy Act and with Service policy. Appendix M of the CCP (USFWS 2011) contains a summary of the comments and Service Responses.

Determination:

____ Use is Not Compatible
__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

User Stipulations:

- Fishing on the Refuge is restricted bank fishing, during daylight hours (sunrise to sunset) only.

Justification:

Fishing and environmental education and interpretation, are priority wildlife-dependent uses for the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife (Executive Order 12996, March 25, 1996 and the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). The Service's policy is to provide expanded opportunities for wildlife-dependent uses when compatible and consistent with sound fish and wildlife management and to ensure that they receive enhanced attention during planning and management. Although these activities can result in disturbance to wildlife and habitat, disturbances on the Refuge are expected to be intermittent and minor, and are not expected to diminish the value of the Refuge for its stated purposes. Disturbances to wildlife and habitat will be minimized by limiting the use to the public during daylight hours only. The stipulations stated above will ensure proper control of the use and provide management flexibility should detrimental impacts develop. Facilitating this use on the Refuge will increase visitor knowledge and appreciation of fish and wildlife resources. This enhanced understanding will foster increased public stewardship of natural resources and support for the Service's management actions in achieving the refuge purposes and the mission of the National Wildlife Refuge System.

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 fishing along Myrtle Creek. The relatively limited number of individuals expected to be adversely affected due to fishing will not cause wildlife populations to materially decline, the physiological condition and production of 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 fishing will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the Refuge was established.

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Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

_2026_ Mandatory 15-year Re-evaluation date (for priority public uses)
______ Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
__X__ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Signatures:

Prepared by:	______________________ (Signature)	__________ (Date)
Refuge Manager/ Project Leader Approval:	______________________ (Signature)	__________ (Date)

<u>Concurrence</u>

Refuge Supervisor:	______________________ (Signature)	__________ (Date)
Regional Chief, National Wildlife Refuge System:	______________________ (Signature)	__________ (Date)

B.7 Draft Compatibility Determination for Research and Monitoring on Kootenai National Wildlife Refuge

RMIS Database Uses: Research and Monitoring

Refuge Name: Kootenai National Wildlife Refuge (NWR)

Location: Boundary County, Idaho

Date Established: 1964

Establishing and Acquisition Authorities:

- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715 et seq.)
- Executive Order 7681, dated July 30, 1937
- Refuge Recreation Act as amended [16 U.S.C. 460k-460k-4]
- Fish and Wildlife Act of 1956, as amended [16 U.S.C. 742a-742j, not including 742l]

Refuge Purpose(s):

"for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715 et seq. (Migratory Bird Conservation Act of 1929).

National Wildlife Refuge System Mission: "The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).

Description of Use:

The refuge staff receives periodic requests from non-Service entities (e.g., universities, state or territorial agencies, other Federal agencies, nongovernmental organizations) to conduct research, scientific collecting, and surveys on refuge lands. These project requests can involve a wide range of natural and cultural resources as well as public-use management issues including basic absence/presence surveys, collection of new species for identification, habitat use and life-history requirements for specific species/species groups, practical methods for habitat restoration, extent and severity of environmental contaminants, techniques to control or eradicate pest species, effects of climate change on environmental conditions and associated habitat/wildlife response, identification and analyses of paleontological specimens, 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 FW 1.10D(4)) policies indicate priority for scientific investigatory studies that contribute to the enhancement, protection, use, preservation, and management of native wildlife populations and their habitat as well as their natural diversity. Projects that contribute to refuge-specific needs for resource and/or wilderness management goals and objectives, where applicable, would be given a higher priority over other requests.

Availability of Resources:

Refuge staff responsibilities for projects by non-Service entities will be primarily be limited to the following: review of proposals, prepare SUP(s) and other compliance documents (e.g., Section 7 of the Endangered Species Act of 1973, Section 106 of the National Historic Preservation Act), and monitor project implementation to ensure that impacts and conflicts remain within acceptable levels (compatibility) over time. Additional administrative support, logistical and operational support may also be provided depending on each specific request. Estimated costs for one-time (e.g., prepare SUP) and annually re-occurring tasks by refuge staff and other Service employees will be determined for each project. Sufficient funding in the general operating budget of the Refuge(s) must be available to cover expenses for these projects. The terms and conditions for funding and staff support necessary to administer each project on the Refuge(s) will be clearly stated in the SUP(s).

The Refuge has the following staffing and funding to administratively support and monitor research that is currently taking place on refuge lands (see table below). 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.

Category and Itemization	One-time ($)	Annual ($/yr)
Administration and management		$1,000
Maintenance		$1,000
Monitoring		$1,000
Special equipment, facilities, or improvement		$0
Offsetting revenues		$0

Itemized costs in the previous table are current estimates calculated using a 3 percent base cost of a GS-12 Refuge Manager.

Anticipated Impacts of Described Use:

Use of the Refuge(s) 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 National Wildlife Refuge System mission to be compatible (50 C.F.R. 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 would coordinate and share collections to reduce sampling needed for multiple projects. For example, if one investigator collects fish for a diet study and another research examines otoliths, then it may be possible to accomplish sampling for both projects with one collection effort.

Investigator(s) obtaining required State or Territorial, and Federal collecting permits 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.

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 quarantine methods, where necessary **(**see Attachment 4**).** 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 refuge staff and others, as needed, to assess the potential impacts (short-term, long-term, and cumulative) relative to benefits of the investigation to refuge management issues and understanding of natural systems.

At least 6 months before initiation of fieldwork (unless an exception is made by prior approval of the Refuge Manager), project investigator(s) must submit a detailed proposal using the format provided in Attachment 1. Project proposals will be reviewed by refuge staff and others, as needed, to assess the potential impacts (short-term, long-term, and cumulative) relative to 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 which 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 Refuge Manager will issue a SUP(s) with required stipulations (terms and conditions) of the project to avoid and/or minimize potential impacts to refuge resources as well as conflicts with other public-use activities and refuge field management operations. After approval, projects also 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 the Refuge(s). As a result, these projects will help fulfill refuge purpose(s); contribute to the Mission of the NWRS; and maintain the biological integrity, diversity, and environmental health of the Refuge(s).

Projects which are not covered by the CCP objectives under Goal 7 **[**Conduct inventory, monitoring and research in support of adaptive management, habitat restoration, and fisheries restoration efforts], will require additional NEPA documentation.

Public Review and Comment:

This CD was prepared concurrent with the Kootenai NWR CCP/EA. Public notice was provided and open houses were held and written comments were solicited from the public during the scoping period for the CCP/EA. Public review and comment were solicited during the draft CCP/EA comment period.

Determination:

____ Use is Not Compatible
__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Each project will require a SUP. 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 Refuge Manager review and approval based timely submission of and content in progress reports, compliance with SUP stipulations, and required permits.

- Projects will adhere to scientifically defensible protocols for data collection, where available and applicable.
- Investigators must possess appropriate and comply with conditions of State or Territorial and Federal permits for their projects.
- If unacceptable impacts to natural resources or conflicts arise or are documented by the refuge staff, then the Refuge Manager can suspend, modify conditions of, or terminate an on-going project already permitted by SUP(s) on a refuge(s).

- 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 Attachment 2).
- Final reports are due one year after completion of the project unless negotiated otherwise with the Refuge Manager.
- Continuation of existing projects will require approval by the Refuge Manager.
- The refuge staff will be given the opportunity to review draft manuscript(s) from the project before being submitted to a scientific journal(s) for consideration of publication.
- The refuge staff will be provided with copies (reprints) of all publications resulting from a refuge project.
- The refuge staff will be provided with copies of raw data (preferably electronic database format) at the conclusion of the project.
- Upon completion of the project or annually, all equipment and markers (unless required for long-term projects), must be removed and sites must restored to the Refuge Manager's satisfaction. Conditions for clean-up and removal of equipment and physical markers will be stipulated in the SUP(s).
- All samples collected on refuge lands are the property of the Service even while in the possession of the investigator(s). Any future work with previously collected samples not clearly identified in the project proposal will require submission of a subsequent proposal for review and approval. In addition, a new SUP will be required for additional project work. For samples or specimens to be stored at other facilities (e.g., museums), a memorandum of understand will be necessary (see Attachment 3).
- 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 refuge lands to prevent the introduction and/or spread of pests. Where necessary, use quarantine methods (see Attachment 4).
- The NWRS, the specific Refuge, names of refuge staff and other Service personnel that supported or contributed to the project will be appropriately cited and acknowledged in all written and oral presentations resulting from projects on refuge lands.
- At any time, refuge staff may accompany investigator(s) in the field.
- Investigator(s) and support staff will follow all refuge-specific regulations that specify access and travel on the Refuge(s).

Justification:

Research, scientific collecting, and surveys on refuge lands are inherently valuable to the Service because they will 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 the refuge staff providing access to refuge lands and waters along with some support, the project would never occur and less scientific information would be available to the Service to aid in managing and conserving the refuge resources. By allowing the use to occur under the stipulations described above, it is anticipated that wildlife species which could be disturbed during the use would find sufficient food resources and resting places so their abundance and use will not be measurably lessened on the Refuge(s). 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 refuge purpose(s) (including wilderness); contributing to the mission of the NWRS; and maintaining the biological integrity, diversity, and environmental health of the Refuge(s).

Mandatory Re-evaluation Date: (provide month and year for "allowed" uses only)

__X__ Mandatory 15-year Re-evaluation date (for priority public uses)
______ Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
__X__ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Signatures:

Prepared by:	(Signature)	(Date)
Refuge Manager/ Project Leader Approval:	(Signature)	(Date)

<u>Concurrence</u>

Refuge Supervisor:	(Signature)	(Date)
Regional Chief, National Wildlife Refuge System:	(Signature)	(Date)

Attachment 1

FORMAT FOR PROPOSALS TO CONDUCT RESEARCH OR LONG-TERM MONITORING ON NATIONAL WILDLIFE REFUGES

A Special Use Permit (SUP) is required to conduct research and/or long-term monitoring on refuge lands. To receive a SUP, a detailed project proposal using the following format must be submitted to the Refuge Manager approximately 6 months prior to the start of the project.

Title:

Principal Investigator(s):

Provide the name(s) and affiliation(s) of all principal investigator(s) that will be responsible for implementation of the research and/or long-term monitoring described in the proposal. In addition, provide a brief description or attach vitae of expertise for principal investigator(s) germane to work described in the proposal.

Background and Justification:

In a narrative format, describe the following as applicable:

- *The resource management issue (e.g., decline in Pisonia rainforest) and/or knowledge gap regarding ecological function that currently exists with any available background information.*
- *Benefit of project findings (e.g., management implications) to resources associated with the Refuge.*
- *Potential consequences if the conservation issue and/or knowledge gap regarding ecological function is not addressed.*

Objectives:

Provide detailed objective(s) for the proposed project.

Methods and Materials:

Provide a detailed description of the methods and materials associated with field and laboratory work (if applicable) to be conducted for the project. Methods should include the following:

- *study area(s)*
- *number of samples;*
- *sampling dates and locations*
- *sampling techniques*
- *data analyses including **statistical methods** and **significance levels**.*

Previously published methods should be cited without explanation; whereas, new or modified techniques should be described in detail. Include number of personnel as well as all facilities and *equipment (e.g., vehicles, boats, structures, markers) required to collect samples/data. Provide a clear description of the relationships among study objectives, field methods, and statistical analyses.*

Permits:

Identify all State or Territorial and Federal permits required if applicable.

Potential Impacts to Refuge Resources:

Describe potential impacts to threatened or endangered species as well as other refuge plants, wildlife, and fish species that could result from the implementation of project activities on the Refuge. Consider the cumulative impacts associated with this project.

Animal Welfare Plan:

If appropriate, attach a copy of the Institutional Animal Care and Use review and/or animal welfare plans that are required by the principal investigator's affiliation.

Partnerships and Funding Sources:

List other participating institutions, agencies, organizations, or individuals as well as the nature and magnitude of their cooperative involvement (e.g., funding, equipment, personnel).

Project Schedule:

Provide estimated initiation and completion dates for field sampling, laboratory work, data analyses, and report/manuscript preparation. If the project is divided into phases to be accomplished separately provide separate initiation and completion dates for each phase.

Reports and Raw Data:

Establish a schedule for annual progress and final reports; include adequate time for peer review of the final report/manuscript. Draft reports/manuscripts should be submitted to the Refuge Manager for review prior to submission for consideration of publication. At the conclusion of a research study (manuscripts accepted for publication), an electronic copy of the data (e.g., GIS vegetation layers, animal species composition and numbers, genetics) should be provided to the Refuge Manager. For long-term monitoring projects, the Service also requires raw data for management and planning purposes for the Refuge(s).

Publications:

Describe the ultimate disposition of study results as publications in scientific journals, presentation at professional symposiums, or final reports.

Disposition of Samples:

If the project entails the collection of biotic and/or abiotic (e.g., sediment) samples, then describe their storage. Although the samples may be in the possession of scientists for the purposes of conducting the project in accordance with the SUP, the Service retains ownership of all samples *collected on refuge lands. If the samples will be used for subsequent research activities that are not described within the original proposal, a new proposal must be submitted to the Refuge Manager to obtain a SUP before initiation of the follow-up project. After conclusion of the research activities, consult with the Refuge Manager regarding the final disposition of the samples. If specimens will be curated at a museum, then prepare a MOU using the format provided in Attachment 3.*

Attachment 2

ANNUAL PROGRESS REPORTS FOR REFUGE RESEARCH AND LONG-TERM MONITORING PROJECTS

Study title:

Fiscal year:

Progress:

In a narrative format, summarize the work that was completed on the study including the number and types of samples collected and/or data analyses.

Important findings:

In narrative format, generally describe any conclusions and/or management recommendations that may be drawn from the work completed to date.

Describe problems encountered:

In narrative format, describe any problems that were encountered during the year and their effects upon the study.

Proposed resolution to problems:

For each problem encountered, describe the actions that have been taken to remediate it.

Preparer:

Date prepared:

Attachment 3

MEMORANDUM OF UNDERSTANDING
FOR CURATORIAL SERVICES
BETWEEN THE

(Name of the Federal agency)

AND THE

(**Name of the Repository**)

This Memorandum of Understanding is entered into this (**day**) day of (**month and year**), between the United States of America, acting by and through the (**name of the Federal agency**), hereinafter called the Depositor, and the (**name of the Repository**), hereinafter called the Repository, in the State/Territory of (**name of the State/Territory**).

The Parties do witnesseth that

WHEREAS, the Depositor has the responsibility under Federal law to preserve for future use certain collections of paleontological specimens and/or biological samples as well as associated records, herein called the Collection, listed in Attachment A which is attached hereto and made a part hereof, and is desirous of obtaining curatorial services; and

WHEREAS, the Repository is desirous of obtaining, housing and maintaining the Collection, and recognizes the benefits which will accrue to it, the public and scientific interests by housing and maintaining the Collection for study and other educational purposes; and

WHEREAS, the Parties hereto recognize the Federal Government's continued ownership and control over the Collection and any other U.S. Government-owned personal property, listed in Attachment B which is attached hereto and made a part hereof, provided to the Repository, and the Federal Government's responsibility to ensure that the Collection is suitably managed and preserved for the public good; and

WHEREAS, the Parties hereto recognize the mutual benefits to be derived by having the Collection suitably housed and maintained by the Repository;

NOW THEREFORE, the Parties do mutually agree as follows:

1. The Repository shall:

a. Provide for the professional care and management of the Collection from the (**names of the resources**) sites, assigned (**list site numbers**) site numbers. The collections were recovered in connection with the (**name of the Federal or federally authorized project)** project, located in (**name of the nearest city or town**), (**name of the county, if applicable**) county, in the State/Territory of (**name of the State/Territory**)

b. Assign as the Curator, the Collections Manager and the Conservator having responsibility for the work under this Memorandum, persons who are qualified museum professionals and whose expertise is appropriate to the nature and content of the Collection.

c. Begin all work on or about (**month, date and year**) and continue for a period of (**number of years**) years or until sooner terminated or revoked in accordance with the terms set forth herein.

d. Provide and maintain a repository facility having requisite equipment, space and adequate safeguards for the physical security and controlled environment for the Collection and any other U.S. Government-owned personal property in the possession of the Repository.

e. Not in any way adversely alter or deface any of the Collection except as may be absolutely necessary in the course of stabilization, conservation, scientific study, analysis and research. Any activity that will involve the intentional destruction of any of the Collection must be approved in advance and in writing by the Depositor.

f. Annually inspect the facilities, the Collection and any other U.S. Government-owned personal property. Every **(number of years**) years inventory the Collection and any other U.S. Government-owned personal property. Perform only those conservation treatments as are absolutely necessary to ensure the physical stability and integrity of the Collection, and report the results of all inventories, inspections and treatments to the Depositor.

g. Within five (5) days of discovery, report all instances of *and* circumstances surrounding loss of, deterioration and damage to, or destruction of the Collection and any other U.S. Government-owned personal property to the Depositor, and those actions taken to stabilize the Collection and to correct any deficiencies in the physical plant or operating procedures that may have contributed to the loss, deterioration, damage or destruction. Any actions that will involve the repair and restoration of *any of* the Collection and any other U.S. Government-owned personal property must be approved in advance and in writing by the Depositor.

h. Review and approve or deny requests for access to or short-term loan of the Collection (or a part thereof) for scientific and educational uses. In addition, refer requests for consumptive uses of the Collection (or a part thereof) to the Depositor for approval or denial.

i. Not mortgage, pledge, assign, repatriate, transfer, exchange, give, sublet, discard or part with possession of any of the Collection or any other U.S. Government-owned personal property in any manner to any third party either directly or indirectly without the prior written permission of the Depositor, and redirect any such request to the Depositor for response. In addition, not take any action whereby any of the Collection or any other U.S. Government-owned personal property shall or may be encumbered, seized, taken in execution, sold, attached, lost, stolen, destroyed or damaged.

2. The Depositor shall:

a. On or about (month, date and year), deliver or cause to be delivered to the Repository the Collection, as described in Attachment A, and any other U.S. Government-owned personal property, as described in Attachment B.

b. Assign as the Depositor's Representative having full authority with regard to this Memorandum, a person who meets pertinent professional qualifications.

c. Every (number of years) years, jointly with the Repository's designated representative, have the Depositor's Representative inspect and inventory the Collection and any other U.S. Government-owned personal property, and inspect the repository facility.

d. Review and approve or deny requests for consumptively using the Collection (or a part thereof).

3. Removal of all or any portion of the Collection from the premises of the Repository for scientific or educational purposes; any conditions for handling, packaging and transporting the Collection; and other conditions that may be specified by the Repository to prevent breakage, deterioration and contamination.

4. The Collection or portions thereof may be exhibited, photographed or otherwise reproduced and studied in accordance with the terms and conditions stipulated in Attachment C to this Memorandum. All exhibits, reproductions and studies shall credit the Depositor, and read as follows: "Courtesy of the **(name of the Federal agency**)." The Repository agrees to provide the Depositor with copies of any resulting publications.

5. The Repository shall maintain complete and accurate records of the Collection and any other U.S. Government-owned personal property, including information on the study, use, loan and location of said Collection which has been removed from the premises of the Repository.

6. Upon execution by both parties, this Memorandum of Understanding shall be effective on this **(day**) day of **(month and year**), and shall remain in effect for (**number of years**) years, at which time it will be reviewed, revised, as necessary, and reaffirmed or terminated. This Memorandum may be revised or extended by mutual consent of both parties, or by issuance of a written amendment signed and dated by both parties. Either party may terminate this Memorandum by providing 90 days written notice. Upon termination, the Repository shall return such Collection and any other U.S. Government-owned personal property to the destination directed by the Depositor and in such manner to preclude breakage, loss, deterioration and contamination during handling, packaging and shipping, and in accordance with other conditions specified in writing by the Depositor. If the Repository terminates, or is in default of, this Memorandum, the Repository shall fund the packaging and transportation costs. If the Depositor terminates this Memorandum, the Depositor shall fund the packaging and transportation costs.

7. Title to the Collection being cared for and maintained under this Memorandum lies with the Federal Government.

IN WITNESS WHEREOF, the Parties hereto have executed this Memorandum.

Signed: (**signature of the Federal Agency Official**)	**Date:** (**date**)
Signed: (**signature of the Repository Official**)	**Date:** (**date**)

Attachment 3A: Inventory of the Collection

Attachment 3B: Inventory of any other U.S. Government-owned Personal Property

Attachment 3C: Terms and Conditions Required by the Depositor

Attachment 4

ALIEN SPECIES QUARANTINE RESTRICTIONS FOR NATIONAL WILDLIFE REFUGES

A. Introduction

Thank you for your interest in conducting research/monitoring on the Refuge(s). To protect wildlife and habitat communities found on the Refuge, visitation is carefully regulated and requires that each individual, or group, secure a Special Use Permit (SUP) to gain access to the Refuge. Each SUP clearly outlines the responsibilities of each permittee, including specific quarantine policies, which may be more detailed than the policies listed within this document. Details for securing a SUP can be found by contacting the Refuge Manager. Prospective scientific researchers must apply for the SUP at least 6 months prior to their proposed study period.

One of the gravest threats to the Refuge(s) is the introduction of alien plant and animal species. The practices described below are complex, but the Service has found them to be effective at greatly reducing additional introductions of invasive species on Refuge(s).

B. Definitions

1. **Clothing**: all apparel, including shoes, socks, over and under garments.
2. **Soft gear**: all gear such as books, office supplies, daypacks, fannypacks, packing foam, or similar material, camera bags, camera/binocular straps, microphone covers, nets, holding or weighing bags, bedding, tents, luggage, or any fabric or material capable of harboring seeds or insects.
3. **New Clothing/Soft Gear**: new retail items, recently purchased and never used.
4. **Refuge Dedicated Clothing/Soft Gear**: items that have ONLY been used at the Refuge(s), and which have been stored in a quarantined environment between trips to the Refuge(s).
5. **Sensitive Gear:** computers, optical equipment, and other sensitive equipment.
6. **Non-Sensitive Equipment and Construction Materials**: building materials, power and hand tools, generators, misc. machinery, etc.
7. **Suitable Plastic Packing Container:** packing containers must be constructed of smooth, durable plastic which can be easily cleaned and will not harbor seeds or insects. Packing containers may be re-used for multiple trips to the Refuge(s), but must be thoroughly cleaned before each trip and strictly dedicated to refuge-related projects.
    - Examples of APPROPRIATE plastic packing containers are 5 gallon plastic buckets and plastic totes constructed with a single layer and having a smooth surface. All appropriate packing containers must have tight fitting plastic lids.
    - An example of an INAPPROPRIATE plastic packing container is US mail totes. Mail totes are typically constructed of cardboard-like plastic that provides a porous multi-layered surface, allowing seeds and insects to easily hitch-hike.

C. Special Use Permit (SUP)

All persons requesting use of the Refuge(s) must secure a SUP, as described in Section A above, and agree to comply with all refuge requirements to minimize the risk of alien species introductions.

D. Quarantine Inspections

All personal gear, supplies, equipment, machinery, vehicles (e.g., ATVs, trucks, trailers), and vessels (e.g., planes, boats, ships, barges) will be inspected for quarantine compliance by Service staff prior to entering the Refuge(s) and again before departing the Refuge(s). A concerted effort will be made to ensure that alien pests are not transported. Service staff on the Refuge(s) will inspect outbound cargo prior to transport.

E. Prohibited Items (Transport of the following items are strictly prohibited)

1. Rooted plants, cuttings, flowers, and seeds (raw or propagative).
2. Soil, sand, gravel, or any other material that may harbor unwanted plant and animal species.
3. Animals (no exceptions).
4. Cardboard (paper and plastic cardboard harbors seeds and insects).

F. Regulated Items (Transport of the following items are strictly regulated)

1. Food items have the potential to carry alien pests and are therefore selected, packed and shipped with great care for consumption on the Refuge(s). Foods will not be allowed on the Refuge(s) without prior authorization.
2. Because wood products often harbor seeds and insect, only treated wood that has been painted or varnished may be allowed on the Refuge(s). Approved wood products must also be frozen for 48 hours or fumigated as described in Section K below.

G. Packing Procedures

Ensure that the environment selected for packing has been well cleaned and free of seeds and insects. Keep packing containers closed as much as possible throughout the packing process so insects cannot crawl in before the containers have been securely closed. Quarantine procedures should be performed as close to the transportation date as possible to ensure that pests do not return as hitch-hikers on the packing containers.

H. Packing Containers

1. All supplies and gear must be packed and shipped in SUITABLE PLASTIC PACKING CONTAINERS (see Section A for definitions of packing containers). Packing containers must be constructed of smooth, durable plastic that has been thoroughly cleaned prior to use.
2. Packing containers may be re-used for multiple trips to the Refuge(s), but must be thoroughly cleaned before each trip and strictly dedicated to refuge-related projects. Cardboard containers are strictly prohibited because they can harbor seeds and insects.

I. Clothing and Soft Gear

1. All persons entering the Refuge(s) must have NEW or REFUGE DEDICATED clothing and soft gear (including all footwear).
    a. Freeze all clothing and soft gear for 48 hours (including both new and refuge dedicated).
    b. Fumigation under a tarp or in a large container is also an option.

J. Sensitive Equipment

All sensitive gear (e.g., optical equipment, computers, satellite phones, other electronic equipment) must be thoroughly inspected and cleaned.

K. Non-Sensitive Equipment and Construction Materials

1. All non-sensitive equipment, machinery, and construction materials that are water resistant must be steam cleaned or pressure washed to ensure the removal of all dirt, insects, and seeds from external surfaces.
2. All non-water resistant items must be tented and fumigated to kill unwanted pests or frozen for 48 hours.
3. Quarantine procedures should be performed as close to the transportation date as possible to ensure that pests do not return to the equipment or packing containers.

L. Aircraft Quarantine

Aircraft personnel will ensure that the plane has been thoroughly cleaned and free of any alien species prior to flying to the Refuge(s). The aircraft captain will notify the Service at least 10 full working days prior to all flights departing for the Refuge(s) in order to arrange a quarantine inspection of all cargo bound for the Refuge(s). Inspections will take place the scheduled day of departure.

M. Commercial Ships and Barges, and Private Sailing and Motor Vessel Quarantine

1. Ship owners or captains will notify the Service at least 10 full working days prior to all vessels departing for the Refuge(s) in order to arrange a quarantine inspection of all vessels and cargo bound for the Refuge(s). The inspection will be scheduled as close to the departure date as possible.
2. Ship owners or captains will ensure that all ships and barges entering the Refuge(s) have had their hulls cleaned of fouling marine/freshwater organisms. The ships and barges must depart for the Refuge(s) within 14 days of having had the hulls cleaned. All ship and barge hulls must be re-cleaned should the vessel return to a port for greater than 14 days before returning to the Refuge(s). Results of all hull cleanings must be submitted to the Service 2 full working days prior to the vessel departure. Contact the refuge office for additional details.
3. No discharge of ballast water, grey water, sewage, or waste of any kind will be allowed by any vessel within the refuge boundary (e.g., 12-mile territorial sea).

B.8 Draft Compatibility Determination for Agricultural Practices on Kootenai National Wildlife Refuge

RMIS Database Uses: Haying

Refuge Name: Kootenai National Wildlife Refuge (NWR)

Location: Boundary County, Idaho

Date Established: 1964

Establishing and Acquisition Authorities:
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715 et seq.)
- Executive Order 7681, dated July 30, 1937
- Refuge Recreation Act as amended [16 U.S.C. 460k-460k-4]
- Fish and Wildlife Act of 1956, as amended [16 U.S.C. 742a-742j, not including 742l]

Refuge Purpose(s):

"for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715 et seq. (Migratory Bird Conservation Act of 1929).

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

Description of Use:

Under the CCP proposal the USFWS will employ haying on approximately 200 acres of reed canarygrass dominated wet meadows, seasonal wetlands, and moist soil habitat. A July 15 start date is necessary to minimize impacts to nesting grassland birds and to treat invasive species prior to seed set. All haying must be completed by August 15 and bales must be removed from the Refuge by September 15 to avoid flooding and avoid disturbance to fall arriving migrant waterfowl. Haying will be conducted by cooperators. A cooperator managed haying program will complement other reed canarygrass control efforts at minimal cost to the USFWS. It is not expected that more than two or three cooperators or permittees will be necessary to meet targeted acres.

A monitoring protocol will be developed to determine the impacts and success of haying before implementation on a larger scale. Success will be measured as achieving the attributes identified in Kootenai NWR Habitat Objectives 1.2, Restore native upland grassland and wet meadow; 3.1, Provide moist soil habitat; and 3.2, Provide seasonal wetlands (USFWS 2011).

Table 1. Habitats, type of treatment, acres treated and attributes to be achieved.

Habitat Type	Treatment	Acres	Treatment Attributes
Wet Meadows	Haying	50	Mosaic of vegetation heights ranging from 6-36 inches. <5% cover of invasive plants (e.g., Canada thistle, yellow toadflax, spotted knapweed, common mullein, houndstongue) No hawkweed, teasel, poison hemlock
Moist soil	Haying	50	>60% cover of desirable and/or native wetland plants including moist-soil annuals (e.g., smartweeds, wild millet, water plantain) <20% cover of native emergent species (e.g., cattail, hardstem bulrush) that are >5 ft tall <30% cover of undesirable/invasive plants including reed canarygrass
Seasonal Wetlands	Haying	50-100	>60% cover of desirable and/or native wetland plants including moist-soil annuals (e.g., smartweeds, wild millet, water plantain) <20% cover of native emergent species (e.g., cattail, hardstem bulrush) that are >5 ft tall <30% cover of undesirable/invasive plants including reed canarygrass

These uses are not defined as wildlife-dependent recreational uses under the Improvement Act. See Implementation section (Appendix C of the CCP) (USFWS 2011) to determine priority of projects associated with these uses as funding becomes available.

Availability of Resources:

The following funds will be required to run a program as designed under the CCP. Currently, there is zero funding for this program. For the one-time expenses, all available sources will be investigated.

One time expenses:	
Staff-conducted Planning	$1,500
TOTAL ONE TIME EXPENSES	$1,500
Recurring expenses:	
Implementation and monitoring	$3,000
Maintenance Worker WG-8 Salary	$1,800
Permit compliance	$ 500
TOTAL RECURRING EXPENSES:	$5,300

Offsetting revenues: Haying permittees will be charged fair market value for hay.

Anticipated Impacts of Described Use:

Because of the limited nature of this use (100-200 acres per year) it is not anticipated that this activity will have major adverse effects on native refuge flora or fauna or other refuge uses. There will be short-term disturbance to wildlife caused by the presence of people and haying machinery. Cover will be removed as haying is implemented. Nesting by some late ground nesting birds may be disrupted and nests/young could be destroyed. Because of the late mowing date and the small percentage of habitat treated it is expected that this will affect less than 10 percent of the ground nesting population. Agricultural implements will cause some disturbance to soils and plants.

There is a potential for introduction of invasive plant species from private equipment used in haying. To avoid the potential spread of invasive species onto the Refuge all equipment will be cleaned before entering the Refuge. However, it is anticipated that removal of exotic grasses and weeds before they go to seed will reduce the spread of exotics to the Refuge.

Monitoring of reed canarygrass control methods such as haying will allow the Refuge to determine if the strategy is improving conditions for native wetland plants. Early spring and fall browse, when flooded, as a result of these treatments will provide a food source for Canada geese and wigeon.

This compatibility determination is based on the findings and recommendations of Comprehensive Conservation Plan/Environmental Assessment (USFWS 2011).

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2011) in order to comply with the National Environmental Policy Act and with Service policy. Appendix M of the CCP (USFWS 2011) contains a summary of the comments and Service Responses.

Determination:

____ Use is Not Compatible
__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

User stipulations:

- Cooperators' tractors and farming implements will be washed prior to moving onto the Refuge and also be cleaned of all mud, dirt and plant parts between sites within the Refuge to reduce the likelihood of moving noxious weed seeds.
- All haying and mowing activities will be restricted to designated areas.
- Haying and mowing activities will start after July 15 each year and be completed by August 15.
- Baled hay must be removed from the Refuge by September 15 to avoid flooding and disturbance to migrating waterfowl.

Administrative stipulations:

- A Special Use Permit (SUP) or Cooperative Land Management Agreement (CLMA) will be issued to all cooperators associated with haying activities and will require that the above stipulations be met.
- Permits shall be issued annually.
- Permits will be issued through sale by lottery (USFWS 6 RM 9.10B).
- Hay prices will be set annually based on fair market value.
- Harvested hay may remain on the Refuge no longer than necessary to allow sufficient drying for weighing and long-term storage (no longer than 30 days following the end of the haying season).

- A representative sample of the hay bales will be weighted and a bale count received by the Refuge manager prior to all harvested hay being removed.

Justification:

These use as described in this Compatibility Determination, contributes to fulfilling the mission of the National Wildlife Refuge System and to the purposes of Kootenai NWR by managing wet meadows and seasonal wetland plant communities to conserve native plants and their associated wildlife species. A variety of management strategies including mowing, grazing, disking, shading, flooding and chemical treatment have been used singly or in combination in the context of an integrated pest management plan to control reed canarygrass to promote native plant species diversity and improve wildlife habitat in a variety of geographic locations (Kilbride and Paveglio 1999, Antieau 1998, Forman 1998). As identified in the Kootenai NWR CCP (USFWS 2011) there is a need to control exotic plant species in seasonal wetland habitat. The primary objective of using haying is to manage vegetation to maintain or increase its value to wildlife at minimal cost to the government.

Although reed canarygrass (*Phalaris arundinacea* L.), a circumboreal perennial grass species, is native to North America and the Pacific Northwest (Merigliano and Lesica 1998), a more aggressive European cultivar or hybrid has been widely used as a forage grass species. Seed for this cultivar has been commercially available since the late 1920s (Always 1931). Reed canarygrass, probably a non-native cultivar, was planted on the Refuge in the 1960s as a forage grass, and for dike stabilization (Kootenai NWR, Annual Narrative Reports, 1965-67). Once established, however, this aggressive non-native cultivar either displaces native plant species or prevents them from reestablishing on disturbed areas (Maurer et al. 2003, Paveglio and Kilbride 2000, Harrison et al. 1998, Emers 1990, Taylor 1990). Seasonal wetlands and wet meadow areas become a monotypic stand of this species. There are 100 species of native plants that should occur in habitats susceptible to invasion by reed canarygrass.

Reed canarygrass dominated wetlands have fewer food resources, as a result of simplified structure, coarser less digestible detritus, and the density of accumulated plant material. For early spring migrants such as the mallard, northern pintail, and American wigeon, food resources and their availability are limited by a thick thatch layer covering the soil surface. This thatch layer limits wildlife access to important foraging strata and shades the soil surface maintaining cooler temperatures which delays emergence of invertebrates. These shallow flooded areas are also important pairing habitat for many species of dabbling ducks especially the cinnamon and blue-winged teal. Other waterbirds affected by invasion of reed canarygrass include several species of shorebirds: lesser and greater yellow-legs, long-billed dowitchers, Wilson’s snipe, and western, least, and Baird’s sandpipers; and marshbirds such as the sora and Virginia rail.

References:

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Merigliano, M.F., and P. Lesica. 1998. The native status of reed canarygrass (Phalaris arundinacea L.) in the inland Northwest, U.S.A. Natural Areas Journal 18:223-230.

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U.S. Fish and Wildlife Service. 2011. Comprehensive Conservation Plan for Kootenai National Wildlife Refuge.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

______ Mandatory 15-year Re-evaluation date (for priority public uses)
_2021_ Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
__X__ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Signatures:

Prepared by:	______________________ (Signature)	__________ (Date)
Refuge Manager/ Project Leader Approval:	______________________ (Signature)	__________ (Date)

Concurrence

Refuge Supervisor:	______________________ (Signature)	__________ (Date)
Regional Chief, National Wildlife Refuge System:	______________________ (Signature)	__________ (Date)

B.9 Draft Compatibility Determination for Dog Walking on Kootenai National Wildlife Refuge

RMIS Database Uses: Dog walking

Refuge Name: Kootenai National Wildlife Refuge (NWR)

Location: Boundary County, Idaho

Date Established: 1964

Establishing and Acquisition Authorities:
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715 et seq.)
- Executive Order 7681, dated July 30, 1937
- Refuge Recreation Act as amended [16 U.S.C. 460k-460k-4]
- Fish and Wildlife Act of 1956, as amended [16 U.S.C. 742a-742j, not including 742l]

Refuge Purpose(s):

"for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715 et seq. (Migratory Bird Conservation Act of 1929).

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

Description of Use:

Dog walking is currently allowed on the Refuge's Auto Tour Road and all trails. Dog walking occurs year-round on the Refuge with the majority of use observed from spring through fall because of colder weather and variable snowpack in the winter. Visual observations indicate that total use by dog walkers is moderate to heavy. Exact numbers are currently not available. It is likely that dog walkers visit the Refuge to exercise with their dogs and to observe and enjoy wildlife in a natural setting.

Existing Uses: Kootenai National Wildlife Refuge is located in the Kootenai River Valley of Idaho's Panhandle approximately 20 miles south of the Canadian border and 5 miles west of Bonners Ferry, Idaho. The Refuge not only serves as valuable habitat for resident and migratory wildlife, it also provides a nice stopping point for visitors to get out and enjoy some of the vast natural beauty that Boundary County has to offer. The Refuge receives approximately 20,000 visitors annually. Visitors to Kootenai NWR primarily come to view and photograph wildlife, hunt migratory birds and big game, and to exercise in a natural setting.

Currently "best guesses" are being used to estimate visitation and the impact of the public use program on wildlife and habitat because of a lack of baseline data in most program areas. There is no systematic sampling or surveying of public use activities, the distribution of wildlife, or its reaction to activities in the public use program. Because data have not been collected using a systematic study design or protocol, observations of refuge staff provide a rough estimate of common trail uses occurring during certain times of the day and throughout the year. Based on staff observations it appears that refuge visitation has been increasing since 2000. This is substantiated by three comprehensive outdoor recreational studies: Idaho Statewide Comprehensive Outdoor Recreation and Tourism Plan (Idaho SCORTP 2007); International Selkirk Loop Traveler Conversion Study, 2009 (ISL Traveler Conversion Study 2009); 1999 Idaho Resident and Non-resident Motor Vehicle Travel Study.

The Refuge's Auto Tour Road and four of the five trails are currently open during daylight hours, year round, and weather permitting for a variety of public recreational activities. The tour road and trails are not plowed in the winter and are open to cross-country skiing and snowshoeing. Deep Creek Trail, Island Pond Trail, Chickadee Trail, Forest Trail, and Myrtle Creek Falls Trail, currently allow walking/hiking, dog walking, jogging, snowshoeing, and cross country skiing. Island Pond Trail is closed on waterfowl hunt days during the waterfowl hunting season for public safety. In addition to the above public use activities, the Auto Tour Road is also open to licensed vehicles and bicycles. The Auto Tour Road is a 12-15 foot wide, 4.6 mile long gravel road that offers a panoramic view of the Refuge's wetlands, grassland, and riparian habitats. The road consists of approximately 3 miles of roadway located on top of dikes and 1.6 miles located at grade across the floodplain. The dike portions of the Auto Tour Road run parallel with Myrtle Creek and the Kootenai River. The remaining portion of the Auto Tour Road was previously used as a county/drainage district road. The one-way road has 3 pull-outs, and begins at the refuge office and exits on the county road near the mouth of Deep Creek. Automatic gates, located at beginning and end of the tour road, are open ½ before sunrise and close ½ hour after sunset to restrict public access.

Proposed Uses: Based on staff observations, dog walking is a popular use on the Refuge's trails, often occurring in conjunction with other uses including hiking, wildlife observation, photography, and jogging with a minimal amount of use on the Auto Tour Road.

Dog walking is proposed only on the Refuge's Auto Tour Road with stipulations to ensure public safety and compatibility of this use. Based on staff observations, this would be a minimal amount of use on the Tour Road. Dogs would be required to be on a short leash (not longer than 6 ft.) at all times and no more than 2 dogs per walker will be allowed. Extendable or retractable leashes would be prohibited. Dogs would not be allowed off the gravel surface road. Dog walkers must pick up after their dogs(s) and remove the feces from the Refuge. Trailhead parking would be available at refuge headquarters and at the Center or East Parking Lots. Restrictions on this activity will be clearly posted at refuge headquarters, parking lots, and in the refuge brochure and website.

In addition to this non-wildlife dependent refuge use, wildlife-dependent uses such as wildlife observation and photography would occur on the Auto Tour Route, as described in a separate Compatibility Determination.

Dog walking would be monitored annually with other uses of the Refuge Tour Road to ensure compliance, and compatibility with wildlife management and wildlife-dependent recreational activities. If unleashed dogs become a problem, the Service would evaluate the possibility of prohibiting dog walking. This CD would be revised in 10 years or sooner to incorporate additional data and new information.

Availability of Resources:

Maintenance of the Auto Tour Road incurs costs, but costs are not directly related to dog walking. The Auto Tour Road is routinely maintained for vehicle activity and to repair holes made by burrowing wildlife. No additional expense for dog walkers is anticipated. Since dog walking will be restricted to the graveled Auto Tour Road, the major portion of the funds needed to support this activity are in the form of salaries for maintaining the existing road, monitoring public use and biological impacts, enforcing regulations, exotic species control, and providing wildlife cover.

Three studies conducted in Idaho (Idaho SCORTP 2007, ISL Traveler Conversion Study 2009, and the 1999 Idaho Resident and Non-resident Motor Vehicle Travel Study) showed increases in outdoor recreational activities and confirm observations by refuge staff of increased visitation to the Refuge. Public use activities on the Refuge are projected to increase in the future. Statewide, walking, bicycling, and recreation with dogs are increasing in popularity, and this trend is expected to continue.

The refuge staff is dedicated to providing excellent customer service, welcoming and orienting visitors to the Refuge, and providing information and answers to questions. Refuge staff has a good understanding of the local community, and community relations appear to have improved over the years. Taylor and Knight (2004) found that half of recreationists surveyed perceived that recreational activities were not having a negative effect on wildlife. Klein (1993) suggests that visitor contact with refuge staff may help modify behavior and reduce wildlife disturbance. Enforcement of regulations and imposed fines may also minimize visitor disturbance to wildlife (Knight and Gutzwiller 1995). A substantial increase in public use would likely demand more time from an existing small number of refuge staff to manage these uses on the Auto Tour Road.

Kootenai NWR is part of the Inland Northwest National Wildlife Refuge Complex. A law enforcement position was recently added to the complex and is available to assist the Refuge's staff. Emphasis law enforcement and staff patrols would occur once the final CCP is complete. Initially this would require some positive and creative notification to refuge users with signs and fact sheets. Additional staff from the Refuge Complex are available to assist with monitoring. Volunteers and other user groups can assist staff with monitoring and public education. Organizing and directing volunteers could be accomplished with existing staff. Recurring costs for the Refuge to administer these uses would primarily consist of staff and volunteer time which is adequately covered by the existing Complex budget. The level of staffing is adequate to cover the existing uses of the Auto Tour Road. Additional signs may be needed along the Auto Tour Road to remind user groups about allowed uses and road requirements. First year costs for these signs would be approximately $2,000-$3,500 with recurring costs of about $1,000 every five years.

Anticipated Impacts of Described Use:

The impacts of dog walking, as conducted on Kootenai NWR, have not been studied in detail. Dog walking has the potential of impacting shorebird, waterfowl, marsh bird, and other migratory bird populations feeding and resting near trails or roads during certain times of the year. A primary concern in allowing any public use on Kootenai NWR is to maintain adverse impacts within acceptable limits. This section also addresses potential conflicts between user groups that share the Auto Tour Road as well as public safety concerns. Potential impacts of proposed public uses of the Auto Tour Road are summarized below. These consists of 1) impacts to the habitat, 2) wildlife disturbance, and 3) conflicts between user groups.

Impacts to Habitat: Both hikers and dog walkers can cause structural damage to plants and increase soil compaction. The degree of surface compaction is dependent on topography, soil structure, and soil moisture (Whittaker 1978). Impacts of trampling on vegetation and soils commonly noted on trails (Dale and Weaver 1974, Liddle 1975) are unlikely to occur on the well-defined, gravel surface of the Auto Tour Road. The Service repairs, operates, and patrols the Auto Tour Road. Maintenance activities include planting trees, shrubs, and tall vegetation at points along the roadside, herbicide spraying, road grading, and gravel replenishment, as needed. Although motorists, hikers, bicycle riders, joggers, and dog-walkers would be required to remain on the Auto Tour Road, some users may leave the trail to provide drinking water for their dogs, or to observe and photograph wildlife. Plants may be trampled in the process and wildlife disturbed. Currently, there is little evidence of this user group leaving the Auto Tour Road. Dense vegetation and uneven terrain off the Auto Tour Road apparently discourages dog walkers from leaving the road. The well-maintained road provides an appropriate surface for this type of user particularly when off-trail areas are wet or muddy.

Impacts to Wildlife (Disturbance):

General Response of Wildlife to Disturbance. Immediate responses by wildlife to recreational activity can range from behavioral changes including nest abandonment or change in food habits, physiological changes such as elevated heart rates due to flight, or even death (Knight and Cole 1995). The long-term effects are more difficult to assess but may include altered behavior, vigor, productivity or death of individuals; altered population abundance, distribution, or demographics; and altered community species composition and interactions. Knight and Cole (1991) found that wildlife responses to human disturbance include avoidance, habituation, and attraction. The magnitude of the avoidance response may depend on a number of factors including the type, distance, movement pattern, speed, and duration of the disturbance, as well as the time of day, time of year, weather; the animal’s access to food and cover, energy demands, and reproductive status (Knight and Cole 1991, Gabrielsen and Smith 1995). Knight and Cole (1991) also suggested that sound may elicit a much milder response from wildlife if animals are visually buffered from the disturbance.

Habituation is defined as a form of learning in which individuals stop responding to stimuli that carry no reinforcing consequences for the individuals that are exposed to them (Alcock 1993). A key factor in predicting how wildlife would respond to disturbance is its predictability. Often, when a use is predictable, following a trail or boardwalk or at a viewing deck, wildlife will accept human presence (Oberbillig 2001). Gabrielsen and Smith (1995) suggest that most animals seem to have a greater defense response to humans moving unpredictably in the terrain than to humans following a distinct path. Resident waterbirds tend to be less sensitive to human disturbance than migrants, and migrant ducks are particularly sensitive when they first arrive (Klein 1993). In areas where human activity is common, birds tolerated closer approaches than in areas receiving less activity.

Wildlife may also be attracted to human presence. For example, wildlife may be converted to “beggars” lured by handouts (Knight and Temple 1995), and scavengers are attracted to road kills (Rosen and Lowe 1994).

Conflicts arise when migratory birds and humans are present in the same areas (Boyle and Samson 1985). Response of birds to human activities includes departure from site (Owens 1977, Burger 1981, Korschgen et al. 1985, Henson and Grant 1991, Klein 1993, Taylor and Knight 2003), use of sub-optimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior (Burger 1981, Korschgen et al. 1985, Morton et al. 1989, Ward and Stehn 1989, Havera et al. 1992, Klein 1993), and increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990). Mc Neil et al. (1992) found that many waterfowl species avoid disturbance by feeding at night instead of during the day.

The location and timing of recreational activities impacts species in different ways. Miller et al. (1998) found that nesting success was lower near recreational trails, where human activity was common, than at greater distances from the trails. A number of species have shown greater reactions when pedestrian use occurred off trail (Miller, 1998, Taylor and Knight 2004). In regard to waterfowl, Klein (1989) found migratory dabbling ducks to be the most sensitive to disturbance and migrant ducks to be more sensitive when they first arrived, in the late fall, than later in winter. She also found gulls and sandpipers to be apparently insensitive to human disturbance, with Burger (1981) finding the same to be true for various gull species. For songbirds, Gutzwiller et al. (1997) found that singing behavior of some species was altered by low levels of human intrusion.

Burger (1999 as cited by Oberbillig 2001) suggests that viewing distances that minimize disturbance can serve as useful guides for managers lacking good site-specific information and serve as a starting point in determining what is appropriate elsewhere. Some factors that affect viewing distances include the numbers of viewers, the time of day, and noise level. When exposing nonbreeding waterbirds to four types of human disturbances (walking, all-terrain vehicle, automobile, and boat), Rodgers and Smith (1997) concluded that a buffer zone of 100 m would minimize disturbance to most species of waterbirds. Vos et al. (1985) recommended buffer zones of 250 m on land and 150 m in water for great blue herons. Miller et al. (1998) found that the trail zone of influence for forest and grassland birds appears to be approximately 75-100 m. Beyond this distance, bird abundance, species composition, and nest predation was not affected by even heavily used recreational trails.

<u>Wildlife Response to Dog Walking:</u> Among the proposed public uses of the Auto Tour Road, a human with a dog would elicit the greatest stress reaction in wildlife. In the case of birds, the presence of dogs may, reduce bird diversity and abundance in woodlands (Banks and Bryant 2007) and staging areas (Burger, 1986, Lafferty, 2001), flush 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. However, the greatest stress reaction results from unanticipated disturbance. Animals show greater flight response to humans moving unpredictably than to humans following a distinct path (Gabrielsen and Smith 1995).

The effects of human disturbance can be reduced by restricting human activity to an established trail, having disturbance free food areas for wildlife, and requiring dogs to be on a short leash under the control of the owner at all times. Sime (1999) concluded that maintaining control of pets while in wildlife habitats reduces the potential of disturbance, injury, or mortality to wildlife. In a study comparing wildlife responses to human and dog use on and off trails, Miller et al. (2001) recommended prohibiting dogs or restricting use to trails to minimize disturbance and that natural land managers can implement spatial and behavioral restrictions in visitor management to reduce disturbance by such activities on wildlife. Korschgen and Dahlgren (1992) and Fox and Madison (1997) state the importance of disturbance-free food reserves and areas as a management alternative to minimize human disturbances. The Refuge has several farm fields removed from human activity. The majority of the Auto Tour Route is on top of 2 dikes that range from 7 to 31 feet in elevation above ground level. Staff and the review team felt that the Auto Tour Road provides a good opportunity for visitors to observe wildlife and that it is sufficiently elevated and/or distant from key wildlife use areas resulting in negligible behavioral effects to wildlife from human disturbance. Dog walkers would be restricted to an established, well-defined path that is sufficiently distant from wildlife habitat to prevent significant disturbance.

Despite thousands of years of domestication, dogs still maintain instincts to hunt and chase. Given the appropriate stimulus, those instincts can be triggered. Dogs that are 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 a dog. Dog-walkers would be required to maintain physical control of their animal while on the Refuge, thereby reducing the potential and severity of these impacts to wildlife. Special competition or dog training events would not be allowed since dogs function as an extension of their owner, and group size has been found to increase wildlife response to disturbance (Geist et al. 2005, Sime 1999, Yosef, 2000). Educational materials and signs would be available at refuge headquarters, and at the Center or East Parking Lots to encourage responsible outdoor recreation ethics. Restrictions on this activity will be clearly posted at refuge headquarters, parking lots, and in the refuge brochure and website.

The role of dogs in wildlife diseases is poorly understood. However, dogs host endo- and ecto-parasites 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 and to humans (Overgaauw, 2009, Sime 1999). Dog walkers will be required to pick up and remove their dog feces from the Refuge.

Potential Conflicts between User Groups: Shared-use paths attract a variety of user groups who often have conflicting needs. People with disabilities may be particularly affected by trail conflicts if they do not have the ability to quickly detect or react to hazards or sudden changes in the environment. The number of encounters that create conflict is unknown. Vehicles and bicycles using the same road as pedestrians may present a safety hazard to visitors. If the number of road users increases as predicted, the potential for accidents or user group conflicts may also increase. However, the Auto Tour Road meets Federal Highway Administration standards for shared use path design (Federal Highway Administration 2001) and should be able to accommodate increased use. In 2003, the Auto Tour Road was widened and graveled to provide an all weather surface, a project conducted by the Federal Highway Administration. Although user groups are not physically separated, the Auto Tour Road provides sufficient tread width (minimum 12 feet), grade (essentially flat), clearance, and a firm and stable surface for safe, shared use by vehicles, pedestrians, joggers, and bicyclists traveling at a safe speed. The road has been in use for over 40 years and without any accidents reported to the Refuge. Measures to reduce potential conflicts between other user groups would include providing information at the parking lots, refuge headquarters and in the Refuge's brochure that clearly indicates permitted users and rules of conduct. Providing signs that clearly indicate which users have the right of way would help mitigate conflicts (Federal Highway Administration 2001). Signing would clearly state that bicycles should give an audible warning before passing other trail users.

Dog walking can result in conflicts with persons engaged in priority public uses (bird watching, photography). Many dog owners consistently remove their dogs from leashes when they are out of view from refuge personnel. Westgarth et al. (2010) found that negative interactions with dogs are reduced when leashed. Studies have also documented the health and aesthetic impacts of dog feces and the benefits of removal (CDC 1995; Forestry Commission 2004, LEES and Associate, 2004, Macpherson 2005). Restricting this activity to the Auto Tour Road, requiring dogs be on a short leash and under control of their owner at all times, removal of dog feces by the owner, and law enforcement to increase compliance, should greatly reduce any potential conflicts between user groups and infractions related to this activity.

Overall Impact to Kootenai NWR: The studies cited above show that public use activities can and do disturb wildlife. Based on the circumstances described in the scientific literature, it is reasonable to assume similar effects are occurring on Kootenai NWR in most areas where dog walking is allowed. However, we anticipate the impacts of dog walkers will be small, as a result of restricting this use to the Auto Tour Road (a visible, elevated, and distant trail from wildlife), imposing a short leash requirement, removal of dog feces, and educating the public on the effects of recreation on wildlife and habitat. In addition, closure of Island Pond Trail removes nearly 80 acres of wetland habitat from potential human disturbance. The location of more than 60 percent of the 200 acres of croplands outside the hunt units and at least 100 meters from public use facilities will also reduce human disturbance to feeding waterfowl. Restriction of dog walking to the Auto Tour Route and use of vegetative screening will further reduce the potential for human activities to disturb wildlife. Removing dog walking from all trails eliminates the impact of this use on 2 percent of the total refuge waterfowl habitat, 4.4 percent of all the Refuge's forest habitat and 6.7 percent of riparian habitat.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2011) in order to comply with the National Environmental Policy Act and with Service policy. Appendix M of the CCP (USFWS 2011) contains a summary of the comments and Service Responses.

Determination:

____ Use is Not Compatible
__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Stipulations:
- Dog Walking will only be allowed on the Refuge Auto Tour Road. This activity will not be allowed on any other part of the Refuge.
- To ensure safety, use is restricted to daylight hours only.
- Organized training or competition events will be prohibited.
- Dog droppings will be collected and disposed of properly off the Refuge by the responsible party as a courtesy to other trail users. The Refuge will provide dog bins as needed. If domestic animal waste becomes a problem, dog-walking will be reevaluated.
- Dogs must be kept on short leashes (not longer than 6 feet and under the control of their owners at all times. Extendable or retractable leashes would be prohibited.
- Dog owners have the burden to ensure their dog causes no harm to wildlife, the Refuge, or for others visitors on the Refuge.
- Assistant dogs will be allowed on all trails.
- Dog walkers will be limited to 2 leashed dogs or less.

Justification:

Although dog walking is not a wildlife-dependent public use of the Refuge, as defined by statute (16 U.S.C. 668dd et seq.) this occasional use of the Auto Tour Road is expected to have negligible impacts to wildlife habitat when compared to the effects of other public uses (Klein 1993). Potential for wildlife and habitat disturbance is minimal given the indirect approach of this activity, the enforcement of the short leash rule and removal of dog feces. Restricting the disturbance to an established road with appropriate set-back distances (buffers) would increase the predictability of public use on the Refuge, allowing wildlife to habituate to non-threatening activities. Moreover, consolidating compatible recreational activities to the Auto Tour Road, the majority of which is located on the periphery of the refuge boundary, reduces habitat fragmentation, thereby maintaining a core “sanctuary area” of the Refuge for more sensitive species. These impacts would be monitored and if they, or other impacts, are discovered, this compatibility determination would be reevaluated. Direct costs to administer existing levels of dog walking on the Refuges Tour Road would be minor because costs would already be covered by the existing Complex budget for maintaining wildlife dependent public uses on this road.

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 lessoned from allowing dog walking on the Auto Tour Route. The relatively limited number of individuals expected to be adversely affected due to dog walking will not cause wildlife populations to materially decline, the physiological condition and production of 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 dog walking to occur with stipulations will not materially detract or interfere with the purposes for which the Refuge was established or the Refuge System mission.

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Mandatory Re-Evaluation Date (provide month and year for “allowed” uses only):

_______ Mandatory 15-year Re-evaluation date (for priority public uses)
_2021_ Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
__X__ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Signatures:

Prepared by: ______________________________ __________
(Signature) (Date)

Refuge Manager/
Project Leader
Approval: ______________________________ __________
(Signature) (Date)

<u>Concurrence</u>

Refuge Supervisor: ______________________________ __________
(Signature) (Date)

Regional Chief,
National Wildlife
Refuge System: ______________________________ __________
(Signature) (Date)

B.10 Draft Compatibility Determination for Jogging on Kootenai National Wildlife Refuge

RMIS Database Uses: Jogging/Running

Refuge Name: Kootenai National Wildlife Refuge (NWR)

Location: Boundary County, Idaho

Date Established: 1964

Establishing and Acquisition Authorities:

- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715 et seq.)
- Executive Order 7681, dated July 30, 1937
- Refuge Recreation Act as amended [16 U.S.C. 460k-460k-4]
- Fish and Wildlife Act of 1956, as amended [16 U.S.C. 742a-742j, not including 742l]

Refuge Purpose(s):

"for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715 et seq. (Migratory Bird Conservation Act of 1929).

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

Description of Use:

Jogging or running is currently allowed on the Refuge's Auto Tour Road and all trails. Jogging occurs year-round on the Refuge with the majority of use observed from spring through fall because of colder weather and variable snowpack in the winter. Visual observations indicate that total use by joggers is minor. Exact numbers are currently not available. Although jogging is primarily athletic in nature, it is likely that some joggers observe and enjoy wildlife while on the Refuge. At Kootenai NWR, joggers include individuals, pairs, or individuals with dogs. Track teams from local schools or running clubs are infrequent users of the Refuge.

Existing Uses: Kootenai National Wildlife Refuge is located in the Kootenai River Valley of Idaho's Panhandle approximately 20 miles south of the Canadian border and 5 miles west of Bonners Ferry, Idaho. The Refuge not only serves as valuable habitat for resident and migratory wildlife, but provides a nice stopping point for visitors to get out and enjoy some of the vast natural beauty that Boundary County has to offer. The Refuge receives approximately 20,000 visitors annually. Visitors to Kootenai NWR primarily come to view and photograph wildlife, hunt migratory birds and big game, and to exercise in a natural setting.

Currently "best guesses" are being used to estimate visitation and the impact of the public use program on wildlife and habitat because of a lack of baseline data in most program areas. There is no systematic sampling or surveying of public use activities, the distribution of wildlife, or its reaction to activities in the public use program. Because data have not been collected using a systematic study design or protocol, observations of refuge staff provide a rough estimate of common trail uses occurring during certain times of the day and throughout the year. Based on staff observations it appears that refuge visitation has been increasing since 2000. This is substantiated by three comprehensive outdoor recreational studies: Statewide Comprehensive Outdoor Recreation and Tourism Plan (Idaho SCORPT 2007); International Selkirk Loop Traveler Conversion Study 2009 (ISL Traveler Conversion Study 2009); 1999 Idaho Resident and Non-resident Motor Vehicle travel Study.

The Refuge's Auto Tour Road and four of the five trails are currently open during daylight hours, year round, and weather permitting for a variety of public recreational activities. The tour road and trails are not plowed in the winter and are open to cross-country skiing and snowshoeing. Deep Creek Trail, Island Pond Trail, Chickadee Trail, Forest Trail, and Myrtle Creek Falls Trail, currently allow walking/hiking, dog walking, jogging, snowshoeing, and cross country skiing. Island Pond Trail is closed on waterfowl hunt days during the waterfowl hunting season for public safety. In addition to the above public use activities, the Auto Tour Road is also open to licensed vehicles and bicycles. The Auto Tour Road is a 12-15 foot wide, 4.6 mile long gravel road that offers a panoramic view of the Refuge's wetlands, grassland, and riparian habitats. The road consists of approximately 3 miles of roadway located on top of dikes and 1.6 miles located at grade across the floodplain. The dike portions of the Auto Tour Road run parallel with Myrtle Creek and the Kootenai River. The remaining portion of the Auto Tour Road was previously used as a county/drainage district road. The one-way road has 3 pull-outs, and begins at the refuge office and exits on the county road near the mouth of Deep Creek. Automatic gates, located at beginning and end of the tour road, are open ½ before sunrise and close ½ hour after sunset to restrict public access.

Proposed Uses: Jogging is proposed only on the Refuge's Auto Tour Road with stipulations to ensure public safety and compatibility of this use. Based on staff observations, this would be a minimal amount of use. Special events such as competitions and practice meets would not be allowed on the Auto Tour Road. Organized running groups would also be prohibited. Trailhead parking would be available at refuge headquarters and at the Center or East Parking Lots. Restrictions on this activity will be clearly posted at refuge headquarters, parking lots, and in the refuge brochure and website.

In addition to this non-wildlife dependent refuge use, wildlife-dependent uses such as wildlife observation and photography would occur on the Auto Tour Route, as described in a separate Compatibility Determination.

Jogging would be monitored annually with other uses of the Refuge Tour Road to ensure it does not interfere with compatible, wildlife-dependent recreational activities. This CD would be revised in 10 years or sooner to incorporate additional data and new information.

Availability of Resources:

Maintenance of the Auto Tour Road incurs costs, but costs are not directly related to jogging or running. The Auto Tour Road is routinely maintained for vehicle activity and to repair holes made by burrowing wildlife. No additional expense for joggers is anticipated. Since jogging will be restricted to the graveled Auto Tour Road, the major portion of the funds needed to support this activity are in the form of salaries for maintaining the existing road, monitoring public use and biological impacts, enforcing regulations, and providing wildlife cover.

Three studies conducted in Idaho (Idaho SCORTP 2007, ISL Traveler Conversion Study 2009, and the 1999 Idaho Resident and Non-resident Motor Vehicle Travel Study) showed increases in outdoor recreational activities and confirm observations by refuge staff of increased visitation to the Refuge. Public use activities on the Refuge are projected to increase in the future. Statewide, walking, bicycling, and recreation with dogs are increasing in popularity, and this trend is expected to continue.

The refuge staff is dedicated to providing excellent customer service, welcoming and orienting visitors to the Refuge, and providing information and answers to questions. Refuge staff has a good understanding of the local community, and community relations appear to have improved over the years. Taylor and Knight (2004) found that half of recreationists surveyed perceived that recreational activities were not having a negative effect on wildlife. Klein (1993) suggests that visitor contact with refuge staff may help modify behavior and reduce wildlife disturbance. Enforcement of regulations and imposed fines may also minimize visitor disturbance to wildlife (Knight and Gutzwiller 1995). A substantial increase in public use would likely demand more time from an existing small number of refuge staff to manage these uses on the Auto Tour Road.

Kootenai is part of the Inland Northwest National Wildlife Refuge Complex. A law enforcement position was recently added to the complex and is available to assist the Refuge's staff. Emphasis law enforcement and staff patrols would occur once the final CCP is complete. Initially this would require some positive and creative notification to refuge users with signs and fact sheets. Additional staff from the Refuge Complex are available to assist with monitoring. Volunteers and other user groups can assist staff with monitoring and public education. Organizing and directing volunteers could be accomplished with existing staff. Recurring costs for the Refuge to administer these uses would primarily consist of staff and volunteer time which is adequately covered by the existing Complex budget. The level of staffing is adequate to cover the existing uses of the Auto Tour Road. Additional signs may be needed along the Auto Tour Road to remind user groups about allowed uses and road requirements. First year costs for these signs would be approximately $2,000-$3,500 with recurring costs of about $1,000 every five years.

Anticipated Impacts of Described Use:

The impacts of jogging or running, as conducted on Kootenai NWR, have not been studied in detail. Jogging has the potential of impacting shorebird, waterfowl, marsh bird, and other migratory bird populations feeding and resting near trails or roads during certain times of the year. A primary concern in allowing any public use on Kootenai NWR is to maintain adverse impacts within acceptable limits. This section also addresses potential conflicts between user groups that share the Auto Tour Road as well as public safety concerns. Potential impacts of proposed public uses of the Auto Tour Road are summarized below. These consist of 1) impacts to the habitat, 2) wildlife disturbance, and 3) conflicts between user groups.

Impacts to Habitat: Both hikers and jogging can cause structural damage to plants and increase soil compaction. The degree of surface compaction is dependent on topography, soil structure, and soil moisture (Whittaker 1978). Impacts of trampling on vegetation and soils commonly noted on trails (Dale and Weaver 1974, Liddle 1975) are unlikely to occur on the well-defined, gravel surface of the Auto Tour Road. The Service repairs, operates, and patrols the Auto Tour Road. Maintenance activities include planting trees, shrubs, and tall vegetation at points along the roadside, herbicide spraying, road grading, and gravel replenishment, as needed. Although motorists, hikers, bicycle riders, joggers, and dog-walkers would be required to remain on the Auto Tour Road, some users may leave the trail to provide drinking water for their dogs, or to observe and photograph wildlife. Plants may be trampled in the process and wildlife disturbed. Currently, there is little evidence of this user group leaving the Auto Tour Road. Dense vegetation and uneven terrain off the Auto Tour Road apparently discourages joggers from leaving the road. The well-maintained road provides an appropriate surface for this type of user particularly when off-trail areas are wet or muddy.

Impacts to Wildlife (Disturbance):

General Response of Wildlife to Disturbance. Immediate responses by wildlife to recreational activity can range from behavioral changes including nest abandonment or change in food habits, physiological changes such as elevated heart rates due to flight, or even death (Knight and Cole 1995). The long-term effects are more difficult to assess but may include altered behavior, vigor, productivity or death of individuals; altered population abundance, distribution, or demographics; and altered community species composition and interactions. Knight and Cole (1991) found that wildlife responses to human disturbance include avoidance, habituation, and attraction. The magnitude of the avoidance response may depend on a number of factors including the type, distance, movement pattern, speed, and duration of the disturbance, as well as the time of day, time of year, weather; the animal's access to food and cover, energy demands, and reproductive status (Knight and Cole 1991, Gabrielsen and Smith 1995). Knight and Cole (1991) also suggested that sound may elicit a much milder response from wildlife if animals are visually buffered from the disturbance.

Habituation is defined as a form of learning in which individuals stop responding to stimuli that carry no reinforcing consequences for the individuals that are exposed to them (Alcock 1993). A key factor in predicting how wildlife would respond to disturbance is its predictability. Often, when a use is predictable, following a trail or boardwalk or at a viewing deck, wildlife will accept human presence (Oberbillig 2001). Gabrielsen and Smith (1995) suggest that most animals seem to have a greater defense response to humans moving unpredictably in the terrain than to humans following a distinct path. Resident waterbirds tend to be less sensitive to human disturbance than migrants, and migrant ducks are particularly sensitive when they first arrive (Klein 1993). In areas where human activity is common, birds tolerated closer approaches than in areas receiving less activity.

Wildlife may also be attracted to human presence. For example, wildlife may be converted to "beggars" lured by handouts (Knight and Temple 1995), and scavengers are attracted to road kills (Rosen and Lowe 1994).

Conflicts arise when migratory birds and humans are present in the same areas (Boyle and Samson 1985). Response of birds to human activities includes departure from site (Owens 1977, Burger 1981, Korschgen et al. 1985, Henson and Grant 1991, Klein 1993, Taylor and Knight 2003), use of suboptimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior (Burger 1981, Korschgen et al. 1985, Morton et al. 1989, Ward and Stehn 1989, Havera et al. 1992, Klein 1993), and increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990). Mc Neil et al. (1992) found that many waterfowl species avoid disturbance by feeding at night instead of during the day.

The location and timing of recreational activities impacts species in different ways. Miller et al. (1998) found that nesting success was lower near recreational trails, where human activity was common, than at greater distances from the trails. A number of species have shown greater reactions when pedestrian use occurred off trail (Miller, 1998, Taylor and Knight 2004). In regard to waterfowl, Klein (1989) found migratory dabbling ducks to be the most sensitive to disturbance and migrant ducks to be more sensitive when they first arrived, in the late fall, than later in winter. She also found gulls and sandpipers to be apparently insensitive to human disturbance, with Burger (1981) finding the same to be true for various gull species. For songbirds, Gutzwiller et al. (1997) found that singing behavior of some species was altered by low levels of human intrusion.

Burger (1999 as cited by Oberbillig 2001) suggests that viewing distances that minimize disturbance can serve as useful guides for managers lacking good site-specific information and serve as a starting point in determining what is appropriate elsewhere. Some factors that affect viewing distances include the numbers of viewers, the time of day, and noise level. When exposing nonbreeding waterbirds to four types of human disturbances (walking, all-terrain vehicle, automobile, and boat), Rodgers and Smith (1997) concluded that a buffer zone of 100 m would minimize disturbance to most species of waterbirds. Vos et al. (1985) recommended buffer zones of 250 m on land and 150 m in water for great blue herons. Miller et al. (1998) found that the trail zone of influence for forest and grassland birds appears to be approximately 75-100 m. Beyond this distance, bird abundance, species composition, and nest predation was not affected by even heavily used recreational trails.

Wildlife Response to Jogging: Jogging can impact normal behavioral activities, including feeding, reproductive, and social behavior. Studies have shown that ducks and shorebirds are sensitive to jogging activity (Burger 1981, 1986). Rapid movement by joggers is more disturbing to wildlife than slower moving hikers (Bennett and Zuelke 1999). Movement away or at an oblique angle to the animal is less disturbing to wildlife than a direct approach (Knight and Cole 1991). However, joggers tend to spend less time in a particular area than pedestrians and are less likely to directly approach or otherwise disturb wildlife.

The effects of human disturbance can be reduced by restricting human activity to an established trail and having disturbance-free feeding areas for wildlife. Animals show greater flight response to humans moving unpredictably than to humans following a distinct path (Gabrielsen and Smith 1995).The majority of Idaho residents and the majority of resident and non-resident travelers prefer running on trails (Idaho SCORTP). Korschgen and Dahlgren (1992) and Fox and Madison (1997) state the importance of disturbance-free food reserves and areas as a management alternative to minimize human disturbances. The Refuge has several farm fields removed from human activity. The majority of the tour road is on top of the 2 dikes that range from 7 to 31 feet in elevation from ground level. Observations from staff and the review team felt that the Auto Tour Road provides a good opportunity for visitors to observe wildlife and that it is sufficiently elevated and/or distant from key wildlife use areas resulting in negligible behavioral effects to wildlife from human disturbance. Joggers would be restricted to an established, well-defined path that is sufficiently distant from wildlife habitat to prevent significant disturbance. Special running events and team training would not be allowed since group size has been found to increase wildlife response to disturbance (Geist et al. 2005, Yosef, 2000).

Potential Conflicts between User Groups: Shared-use paths attract a variety of user groups who often have conflicting needs. People with disabilities may be particularly affected by trail conflicts if they do not have the ability to quickly detect or react to hazards or sudden changes in the environment. The number of encounters that create conflict is unknown. Vehicles and bicycles using the same road as pedestrians may present a safety hazard to visitors. If the number of road users increases as predicted, the potential for accidents or user group conflicts may also increase. However, the Auto Tour Road meets Federal Highway Administration standards for shared use path design (Federal Highway Administration 2001) and should be able to accommodate increased use. In 2003, the Auto Tour Road was widened and graveled to provide an all weather surface, a project conducted by the Federal Highway Administration. Although user groups are not physically separated, the Auto Tour Road provides sufficient tread width (minimum 12 feet), grade (essentially flat), clearance, and a firm and stable surface for safe, shared use by vehicles, pedestrians, joggers, and bicyclists traveling at a safe speed. The road has been in use for over 40 years and without any accidents reported to the Refuge. Measures to reduce potential conflicts between other user groups would include providing information at the parking lots, refuge headquarters and in the Refuge's brochure that clearly indicates permitted users and rules of conduct. Providing signs that clearly indicate which users have the right of way would help mitigate conflicts (Federal Highway Administration 2001). Signing would clearly state that bicycles should give an audible warning before passing other trail users.

Overall Impact to Kootenai NWR: The studies cited above show that public use activities can and do disturb wildlife. Based on the circumstances described in the scientific literature, it is reasonable to assume similar effects are occurring on Kootenai NWR. Based on the scientific literature, we intend not to allow jogging on trails because the higher speed of joggers, combined with short sight distances on wooded trails, is likely to cause unacceptable levels of disturbance to wildlife adjacent to trails. We propose to allow jogging only on the Auto Tour Route since this trail is elevated and distant from wildlife; therefore, we anticipate the impacts of jogging on the Auto Tour Route to be minor. Restricting group size and organized running events, and educating the public on the effects of recreation on wildlife and habitat would further reduce impacts to wildlife. In addition, closure of Island Pond Trail on non-hunt days removes nearly 80 acres of wetland habitat from potential human disturbance. The location of more than 60 percent of the 200 acres of croplands outside the hunt units and at least 100 meters from public use facilities will also reduce human disturbance to feeding waterfowl. Removing jogging from all trails eliminates the impact of this use on 2 percent of the total refuge waterfowl habitat, 4.4 percent of all the Refuge's forest habitat and 6.7 percent of riparian habitat.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2011) in order to comply with the National Environmental Policy Act and with Service policy. Appendix M of the CCP (USFWS 2011) contains a summary of the comments and Service Responses.

Determination:

____ Use is Not Compatible
__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Stipulations:

- Jogging and running will only be allowed on the Refuge Auto Tour Road. This activity will not be allowed on any other part of the Refuge.
- To ensure safety, use is restricted to daylight hours only.
- Organized running groups and jogging events will be prohibited. Groups will be limited to five people or less.

Justification:

Although jogging is not a wildlife-dependent public use of the Refuge, as defined by statute (16 U.S.C. 668dd et seq.) this occasional use of the Auto Tour Road is expected to have negligible impacts to wildlife habitat when compared to the effects of other public uses (Klein 1993). Potential for wildlife disturbance is minimal given the non-threatening, indirect approach of this activity. Restricting the disturbance to an established road with appropriate set-back distances (buffers) would increase the predictability of public use on the Refuge, allowing wildlife to habituate to non-threatening activities. Moreover, consolidating compatible recreational activities to the Auto Tour Road, the majority of which is located on the periphery of the refuge boundary, reduces habitat fragmentation, thereby maintaining a core “sanctuary area” of the Refuge for more sensitive species. These impacts would be monitored and if they, or other impacts, are discovered, this compatibility determination would be reevaluated. Direct costs to administer existing levels of jogging on the Refuge’s Tour Road would be minor because costs would already be covered by the existing Complex budget for maintaining wildlife dependent public uses on this road.

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 jogging on the Auto Tour route. The relatively limited number of individuals expected to be adversely affected due to jogging will not cause wildlife populations to materially decline, the physiological condition and production of 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 jogging to occur with stipulations will not materially detract or interfere with the purposes for which the Refuge was established or the Refuge System mission.

Finally, Kootenai NWR is very important to the community and is an increasingly well-known destination for wildlife watchers, photographers, and waterfowl hunters in northern Idaho. In addition, many local residents visit the Refuge on a regular basis to observe wildlife, walk, bike, and they feel a sense of “ownership” of the Refuge. The Refuge is a source of community pride, and many local residents feel that having a National Wildlife Refuge nearby contributes significantly to their quality of life.

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Signatures:

Prepared by:	______________________ (Signature)	__________ (Date)
Refuge Manager/ Project Leader Approval:	______________________ (Signature)	__________ (Date)

Concurrence

Refuge Supervisor:	______________________ (Signature)	__________ (Date)
Regional Chief, National Wildlife Refuge System:	______________________ (Signature)	__________ (Date)

Appendix C. Implementation

C.1 Overview

Implementation of the CCP will require increased funding, which will be sought from a variety of sources. This plan will depend on 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.

Many of the infrastructure and facility projects will be eligible for funding through construction or Federal Lands Highway Program funds (i.e., refuge roads).

The Comprehensive Conservation Plan proposes several projects to be implemented over the next 15 years. All of these projects are included in the Refuge Management Information System (RONS—Refuge Operational Needs System or SAMMS—Service Asset Maintenance Management System) which is used to request funding from Congress. Currently, a large backlog of maintenance needs exists on the Refuge. An attempt at reducing this backlog needs to be addressed and is included here in the analysis of funding needs. RONS documents or SAMMS databases are used to propose new projects to implement the CCP to meet Refuge goals and objectives and legal mandates.

Annual revenue sharing payments to Boundary County will continue. If the Refuge undergoes a boundary expansion, additional in lieu of tax payments will be made to the county. See Draft CCP/EA Chapter 7 for a summary of the economic effects.

Monitoring activities will be conducted on a percentage of all new and existing projects and activities to document wildlife populations and changes across time, habitat conditions, and responses to management practices. Actual monitoring and evaluation procedures will be detailed in step-down management plans.

C.2 Step-Down Plans

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

Step Down Management Plan	Status (Date Completed and/or Date to be Prepared/Updated)
IPM Plan	2010 (prepared concurrently with CCP, Appendix F)
Habitat Management Plan	2011 (CCP meets requirements for HMP)
Fish and Wildlife Monitoring Plan	2012
Occupational Safety and Health Plan	2012
Fire Management Plan	2012
Revise Waterfowl Hunt Plan	Within 1 year of CCP completion
Big game and upland game hunt plans	Within 1 year of CCP completion
Fishing Plan	2013
Visitor Services Plan	2013
Environmental Education Plan	2013
Step Down Plans Identified in CCP Strategies:	
Land Protection Plan to analyze alternatives for expansion of refuge boundary to the south	Initiate by 2012

C.3 Costs to Implement CCP

The following sections detail both one time and recurring costs for various projects. Onetime costs reflect the initial costs associated with a project, such as the purchase of equipment, contracting services, construction, purchase of land, etc. Recurring costs reflect the future operational and maintenance costs associated with the project.

C.3.1 One-Time Costs

Onetime costs are project costs that have a startup 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 3 years or less. Onetime costs can include the cost of temporary or term salary associated with a short-term project. Salary for new positions and operational costs are reflected in operational or recurring costs.

Funds for onetime costs will be sought through increases in Refuge base funding, special project funds, grants, etc. Some projects also might require land acquisition funds, or other special appropriations or grants. Some costs listed below as one time may be distributed through the 15 year life of the CCP and a portion of the total project completed yearly.

Projects listed below in Tables C-1 and C-2 show onetime costs, such as those associated with building and facility needs such as offices, public use facilities, road improvements, and new signs. Onetime costs are also associated with habitat restoration and protection projects such as specific forestry and wetland projects, research and land acquisition. New research projects, because of their short-term nature, are considered one time projects, and include costs of contracting services or hiring a temporary for the short-term project. Some project costs are displayed as ranges since there are many factors that will influence the number of acres managed per year.

These data are separated into two tables, Wildlife and Habitat (Table C-1) and Public Use (Table C-2). Each is organized by goals and objectives.

Table C-1. Estimates of One Time Costs under the CCP Alternatives for Wildlife and Habitat Projects.

Goal 1. Grasslands	**Provide and manage a mixture of secure, diverse, productive grassland habitats for foraging and nesting migratory waterfowl and grassland-dependent wildlife.**			
1.2 Restore native upland grassland and wet meadow				
	Alt 1	**Alt 2**	**Priority**	**Funding**
Acres of Non-Native Pasture Converted to Native Grassland	0	50-75		
Acres of Cropland Converted to Native Grassland	0	75-100		
Total One-time Restoration Cost	$5000	$37,500-52,500 (300/acre)	H	1260, RONS
Goal 3. Wetlands	**Provide, manage, and enhance a diverse assemblage of wetland habitats characteristic of the Kootenai River Valley.**			
3.1-3.4 Provide Moist Soil, Seasonal, Semi-permanent, and Permanent Wetlands				
	Alt 1	**Alt 2**	**Priority**	**Funding**
Number of Acres	1,172-1,192 Total wetland acs	996-1,195 Total wetland acs		
Engineering assessment/design of water control infrastructure (also see Obj. 7.1, HGM study)	$0	$100,000	H	1260
Repair Kootenai River Dike, est. 10,000 ft.	$2,651,121	$2,651,121	H	1260
Repair Deep Creek Dike	$214,953	$214,953	H	1260
Repair dikes between wetland cells and the Center Ditch in the North Unit.	$0	$1,423,750	H	1260
Isolate Center Ditch from ponds in the South Unit and extend the distribution ditch from the Deep Creek pump to include Heron Ponds	$0	$790,000	M	1260
Rehabilitate cross dikes (est. 7,124 ft) between ponds in south unit	$0	$1,145,484	M	1260
Rehabilitate Curlew and West River S Bend dikes	$0	$405,140	M	1260
Reconfigure Myrtle	$0	$96,000	H	1260

Creek outlet to allow N&S water movement				
Replace Myrtle Creek Pump with min 10 cfs pump.	$300,000	$300,000	H	1260
Place new water control structures to move water from Myrtle-Center, Myrtle-New, Frog-New	$0	$45,000	H/M	1260
2-3 drawdowns of permanent wetlands over lifetime of CCP	$7,500 using existing pumps	$8,500	H	1260
Total One-time Cost	$3,173,574	$7,179,948		
Goal 4. Low-Elevation Forest	**Provide, manage, and enhance a diverse assemblage of forest habitats characteristic of the lower elevation sites in the Selkirk Mountains.**			
4.1 Protect/Maintain Moist Mixed Coniferous Forest				
	Alt 1	**Alt 2**	**Priority**	**Funding**
4.2 Protect/Maintain Late Seral Dry Forest				
Hand thin, limb, and pile slash on 50 acres, refuge provides paper	$0	$22,350-36,250 based on $447-725 per acre contract based on recent LPO contracts	M	9131, 1260
4.3 Protect/Maintain Moist Mixed Deciduous Forest				
Hand thin, pile on 10 acres	$0	$7,000	M	9131, 1260
Total One-time cost	$0	$29,350-43,250		
Goal 5. Riparian Habitat	**Provide, manage, and enhance a diverse assemblage of riparian habitats characteristic of the Kootenai River Valley.**			
5.1 Protect/Maintain/Restore Mid-to Late-Successional Alluvial Riparian woodland				
	Alt 1	**Alt 2**	**Priority**	**Funding**
Total Acres	149	164-169		
Acres Restored	0	15-21*	*Actual acres	
Fence naturally regenerating cottonwoods	$1,000	Cost and acres included in estimate below	M	1260
Create seed beds and seed, irrigate. **Seeds would be from natural dispersal or collected from existing plants.**	$2,000	~$3,000 $140/ac × 21 acres (Initial soil prep + "intense irrigation")	M	1260
Riparian plantings, fencing, temp irrigation (15-21* ac)	$2,000	$80,482-105,682 (Cost to prep site=3,000, plant = 8,400-33,600 fence w/ hog panels stacked 2	M	

		high 67,082, and irrigate 15-20 ac. $2,000 volunteer with ATV mounted water tank) Fence: Patch sizes range from .3 ac to 13.3 ac; total acreage = 21; linear ft = 19,850 divide by 16' (size of cattle panels) = 1241 × 2 = 2482 × $18.50/panel = 45,917 for panels + 21,165 (2490 posts × $8.50/post) = $67,082 fencing or $3.38 per ft. Cost per plant = $1-4 (range depends on whip vs. container grown); 21 acres × 400 plants per acre = 8400 plants Range of $8,400-33,600		
Increase cottonwood recruitment within existing mature stands by top killing selected mature trees or root plowing	$0	$1,500	M	
Develop Special Hunt Program (hunt plan and compliance)	$0	$10,000	M	1260
Restoration technique comparison-research project	$0	$30,000	M	
Total One-time Restoration Cost	$5,000	$124,982-150,182		
5.1 Protect/Maintain Riparian Scrub-Shrub				
Total Acres	64	84-94		
Acres Restored	0	20-30		
Total One-time Restoration Cost (plant shrubs, fence, irrigate 2-3 years)	$0	$121,140-157,140 (Cost to prep site $4,000, plant 12,000-48,000 fence w/ hog panels stacked 2 high $102,640, and irrigate 20-30 ac. 2,500) Linear ft = 30367 × $3.38/ft = 102,640 for fence; plant 30 acres with 400 tpa = 12,000 (1-4/t) = 12000-48000	M	1260, RONS

Goal 6. Instream Habitat	Protect, maintain, and where feasible restore in-stream habitats on the Refuge to benefit native fishes and the species that depend on them.			
6.1 Protect/Maintain In-stream Riverine Habitat-upper Myrtle Creek, upper Cascade Creek 6.2 Restore in-stream habitat—lower Myrtle Creek 6.3 Improve water quality in Deep Creek 6.4 Restore in-stream habitat—lower Cascade Creek				
	Alt 1	**Alt 2**	**Priority**	**Funding**
Stream Miles, Upper Myrtle and Cascade Creeks (on refuge)	0.37 0.52	0.37 0.52		
Stream Miles, Lower Myrtle and Cascade Creeks (on refuge)	2.1 0.1	2.1 0.1		
Stream Miles, Deep Creek (on refuge)	2.0 (west bank only) 0.3 (both banks)	2.0 (west bank only) 0.3 (both banks)		
Place large woody debris—Upper Cascade, Myrtle Creeks	$0	$8,900-17,800 (.89 miles × $10,000/ mile)-(.89 mi × $20,000/mi) Cost depends on if we use engineered logs jams or place LWD; smaller streams (1-100 cfs) assumes some materials cost	M	
Restore lower Myrtle Creek (2.1 miles) (also see Obj. 7.2 below)	$0	$959,280-22,470,000 (4.2 × $70,000 = 294,000) + (665,280-22,176,000) $70,000/linear mile of habitat improved + infrastructure ($158,400-5,280,000/mi) #http://www.sharedsalmonstrategy.org/files/PrimeronHabitatProjectCosts.pdf	M	FONS, COE, Challenge Grants, matching funds with partners (e.g., KTOI, IDFG, USFWS FRO)
Acquire 120 acres of Deep Creek floodplain from Idaho Dept. of Lands (purchase or lease).	$0	$720,000-1,440,000 ($6,000-12,000/ac)	L	
Support Deep Creek habitat restoration projects w/partners	$0	$ 57-135/ft	M	Partners for Fish and Wildlife Program, FONS, Challenge Grants
Restore lower Cascade Creek (Replace road culverts, reconfigure diversion)	$0	$149,000 ($100,000 for bottomless culvert + $49,000 for diversion) screen costs below Bottomless culvert cost may be too low. Could	M	FONS, Challenge Grants, matching funds with partners (e.g.,

		also build a bridge.		Boundary County, KTOI, IDFG, USFWS FRO)
Install 4 fish screens (Myrtle Creek diversion, MC pump, Deep Creek pump, Old Kootenai River pump)	$200,000 Needed to retain water rights	$200,000	H	1260
Total One-time Cost	$200,000	$2,037,180-24,276,800		
Goal 7. Research	**Conduct inventory, monitoring, and research in support of adaptive management, habitat restoration, and fisheries restoration efforts.**			
7.1 Inventory, Monitoring and Research—Wetlands and Riparian Habitat Conduct inventory, monitoring and research projects that support adaptive habitat management and habitat restoration efforts on the Refuge.				
	Alt 1	**Alt 2**	**Priority**	**Funding**
Baseline inventory of wetland plant communities	$2,000	$20,000	H	1260
Wetland basin assessment and topographic mapping (RTK)	$0	$1,200,000 (1,000/acre X ~ 1200 acres) could do for much cheaper using digitally available data layers	H	
Hydrogeomorphic (HGM) study of Refuge wetlands (also see Obj. 3.1)	$100,000	$100,000	H	
Total One-Time Cost	$102,000	$1,320,000		
7.2 Inventory, Monitoring and Research—Fisheries Conduct and support cooperative inventory, monitoring and research projects that support native fisheries restoration in the Kootenai River watershed.				
Baseline aquatic resource inventory of fish and aquatic habitat	$2,000	$30,000	H	FONS, Cross program recovery, RONS
Survey Refuge portion of Deep Creek for bank stability and shading	$0	$5,000	M	
Myrtle Creek Resto. Feasibility Study	$0	$100,000	M	RONS
Total One-time Cost	$2,000	$135,000		
Total One-Time Cost by Alternative (Wildlife and Habitat Projects)	**$3,487,574**	**$11,007,450-33,351,070* *higher figure reflects maximum cost of Myrtle Creek restoration**		

Table C-2. Estimates of One Time Costs under the CCP Alternatives for Public Use Projects

<table>
<tr><td>Goal 1. Wildlife Observation, Photography, and Interpretation</td><td colspan="4">Provide opportunities for visitors to safely observe and photograph a diversity of wildlife in a natural setting. Interpretation and education will enhance visitors' appreciation for and understanding of the Refuge's natural resources and increase their success in observing and photographing wildlife. Rewarding experiences ultimately build support for Kootenai NWR and the National Wildlife Refuge System.</td></tr>
<tr><td colspan="5">1.1 Improve the <u>4.5 mile</u> Auto Tour Route so that it provides visitors numerous opportunities to view and photograph wildlife and supports an average of 200 vehicles per week, spring through fall.</td></tr>
<tr><td></td><td>Alt 1 (Current Management)</td><td>Alt 2 (Preferred Alternative)</td><td>Priority</td><td>Funding</td></tr>
<tr><td>Miles of auto tour road</td><td>4.5</td><td>4.5</td><td></td><td></td></tr>
<tr><td>Construct 2 Pullouts/passing areas</td><td>$0</td><td>$5,000
$2,500 per pullout if feasible on dike</td><td>H</td><td>1260, Refuge Roads</td></tr>
<tr><td>Construct elevated viewing platform</td><td>$0</td><td>$55,000-120,000</td><td>M</td><td>Refuge Roads, Special Project Funding</td></tr>
<tr><td>Interpretive signage on ATR</td><td>$0</td><td>$30,000-$75,000</td><td>M</td><td>1260, 1260,</td></tr>
<tr><td>Develop alternative interp.</td><td>$0</td><td>$50,000</td><td>M</td><td>Special Project Funding</td></tr>
<tr><td>Install new traffic and trail counters at the entrance of the Auto Tour Route (1) and on refuge trails (4)</td><td>$0</td><td>$3,000-5,000 depending on type used
http://www.stratalink.com/trafx/default.htm</td><td>H</td><td>1260</td></tr>
<tr><td>Road improvements (other than maint.)</td><td>$2,000</td><td>$15,000 (from 2007 FHWA condition assessment)</td><td>M</td><td>Refuge Roads</td></tr>
<tr><td>Total One-Time Cost</td><td>$2,000</td><td>$158,000-270,000</td><td></td><td></td></tr>
<tr><td colspan="5">1.2 Provide opportunities for wildlife observation and photography that minimize disturbance to wildlife and are sustainable with a small refuge staff.</td></tr>
<tr><td>Construct photo blind</td><td>1,000</td><td>Add 1 blind
$5,000</td><td>M</td><td></td></tr>
<tr><td colspan="5">1.3 Improve visitor contact and orientation facilities, signage, website, and interpretation.</td></tr>
<tr><td>Develop virtual Web tour of Refuge</td><td>$0</td><td>$10,000</td><td>L</td><td></td></tr>
<tr><td>Bald Eagle webcam</td><td>$2,000
Friends grant supporting, refuge match $2,000</td><td>$0</td><td>M</td><td></td></tr>
</table>

Revise/reprint refuge brochure	$2,000	$5,000	H	
Improve visitor contact and orientation facilities, signage, and interpretation.	$0	$50,000	M	1260, 1260
Improve public facilities (access, parking, comfort stations, kiosks, paint ed. center)	$4,000	$55,000 (includes AM announcing system-$30,000; $18,000 for parking imp. based on 2007 FHWA estimate Paint barn $7,000)	M	1260, Refuge Roads
Total One-Time Cost	$9,000	$120,000		
1.4. Provide <u>3.7 miles</u> of safe, maintained trails (<u>Deep Creek Trail, Ole Humpback Trail, Myrtle Falls Trail, and Chickadee Trail</u>) for year round use by visitors of all ages and abilities.				
Interp. signs, Ole Humpback Trail	$0	$2,000	L	
Total One-Time Cost	$0	$2,000		
Goal 2. Waterfowl Hunting	**Provide waterfowl hunters of all ages and abilities the opportunity to participate in a safe, enjoyable, high-quality waterfowl hunt program that encourages a tradition of wildlife conservation and ethical sportsmanlike behavior. The waterfowl hunt program will provide opportunities to observe and hunt a variety of waterfowl species with clear and enforced regulations, easy access, minimal crowding, and minimal hunter conflicts.**			
2.1 Provide a quality, safe waterfowl hunt program on <u>605 acres</u> of the Refuge, with an additional retrieving zone of <u>226 acres</u>, capable of supporting up to 1,600 hunter visits per season, including youth, adults, and disabled hunters, with minimal conflicts between hunters and other user groups.				
	Alt 1	**Alt 2**	**Priority**	**Funding**
Number of Acres—Waterfowl Hunting	831 (740 ac open to hunting, 91 ac non-shooting retrieval zone)	831 (605 ac open to hunting, 226 ac non-shooting retrieval zone)		
Number of blinds	18	18		
Construct ADA blind, N hunt unit	$0	$2,500	M	1260, 1260
Replace/modify hunt blinds	$9,500	$10,500	H	1260, 1260
Sign 200-yard non-shooting zone adjacent to the Auto Tour Route and Deep Creek Trail	$0	$1,500	H	1260

Provide numbered parking spaces corresponding to blind numbers	$0	$2,500	H	
Update informational signage	$1,000	$4,000	H	
Revise/reprint hunting and fishing leaflet	$0	$3,000	H	
Total One-Time Cost	$10,500	$24,000		
Goal 3. Fishing, Big Game, and Upland Game Hunting	**Fishing and hunting enthusiasts will enjoy opportunities to fish and hunt big game and upland game on the Refuge. Fishing and/or hunting programs will provide a reasonable chance of success with little or no interference by others; minimize impacts to non-target species and habitats; promote compliance with laws and regulations; and promote ethical behavior.**			
3.1. Provide big game hunters with hunting opportunities that have a reasonable chance of success; allow hunters to retrieve down or wounded game; and do not compromise the safety of Refuge employees, visitors, adjacent landowners, and passing vehicles.				
	Alt 1	**Alt 2**	**Priority**	**Funding**
Update informational signage	$0	$1,500	H	
3.2. Provide hunters with quality upland game hunting opportunities that have a reasonable chance of success; allow hunters to retrieve down or wounded game; and do not compromise the safety of Refuge employees, visitors, adjacent landowners, and passing vehicles.				
Update informational signage	$0	$1,500	H	
3.3. Provide fishing opportunities in Myrtle Creek for anglers of all ages and abilities.				
Update informational signage	$0	$5,500	H	
Goal 4. Environmental Education	**Students from area schools will participate in quality environmental education and interpretation programs that provide memorable experiences, fosters an appreciation for the natural world around them and a strong conservation ethic, and develops into a life-long relationship with the Refuge.**			
4.1. Provide environmental education and interpretation facilities and programs for use by local educators and refuge visitors.				
	Alt 1	**Alt 2**	**Priority**	**Funding**
Develop refuge specific EE Curriculum	$0	$8,000	M	1260, Grants
Develop interp. program	$1,000	$10,000	L	
Develop self-guided interpret. modules/activities	$1,000	$2,000	L	

(e.g., backpacks, GeoAdventure)				
Expand/upgrade EE facilities (improve one EE study site)	$0	$10,000	M	1260, Grants
Total One-Time Cost	$2,000	$30,000		
Goal 5. Friends Groups and Volunteers	**An active and committed Kootenai NWR Friends Group and volunteer work force will assist Refuge staff in delivering quality visitor services programs, building and maintaining the facilities needed to conduct those programs, and supporting the Refuge's habitat restoration and monitoring efforts. The Friends Group and volunteers will increase support of the Refuge on both a local and State scale through public outreach.**			
5.1. Build a strong, actively engaged Friends Group and volunteer workforce that support the Refuge's goals and objectives.				
Term/seasonal hire to build Friends Group		$8,000 (Salary for term or AmeriCorps)	M	
Total One-Time Costs by Alternative, Public Use Projects	**$24,500**	**$350,500-462,500**		
Total One-Time Costs by Alternative (Wildlife and Habitat, Public Use)	**$3,511,074**	**$11,357,950-33,813,570* *higher figure reflects maximum cost of Myrtle Creek restoration**		

C.3.2 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.

Tables C-3 and C-4 display projected operating costs under the CCP. The CCP reflects increased funding needs for proposed increases in public uses and facilities, new land acquisitions, increased habitat restoration and conservation activities, and new monitoring needs. This table includes such things as salary, operational expenditures such as travel, training, supplies, utilities, and annual maintenance costs.

Tables C-3 and C-4 include costs for permanent and seasonal staff needed year after year. They do not include staff costs associated with special projects; these are summarized in Tables C-1 and C-2.

Tables C-3 and C-4 are also related to the Refuge Annual Performance Plan. These tables do not project costs other than operational. These data are separated into two tables, Wildlife and Habitat (Table C-3) and Public Use (Table C-4). Each is organized by goals.

Table C-3. Wildlife and Habitat Recurring Costs

Goal 1. Grasslands	**Provide and manage a mixture of secure, diverse, productive grassland habitats for foraging and nesting migratory waterfowl and grassland-dependent wildlife.**				
1.1 Enhance/Maintain Managed Grasslands					
	Alt 1 (Current Management)	**Alt 2 (Preferred Alternative)**	**New Staff**	**Priority**	**Funding**
Total Acres	560	435-460			
Acres Treated Annually	450	Up to 30% (130-140 ac.)			
Total Annual Cost (mowing, prescribed fire, herbicide, fertilizer)	$56,250 # acs × $125/acre	$17,500 # acs × $125/acre	Biologist	H	1260
1.2 Restore native upland grassland and wet meadow (post-restoration maintenance)					
Total Acres	Current ac	125-175			
Acres Treated Annually (soil Tx, mowing, seeding, invasives control, other)	0 acres	Up to 175 acres			
Total Annual Cost	$0	$35,000 # acs × $200/acre		M	1260
Goal 2. Crops	**Annually provide agricultural crops as forage for migratory waterfowl.**				
2.1 Provide Crops for Migratory Waterfowl					
	Alt 1	**Alt 2**	**New Staff**	**Priority**	**Funding**
Acres of small grains and green browse planted annually	200	125-200			
Total Annual Cost (salary, seed, soil prep, fertilizer, herbicide, other)	$60,000 # acs × $300/acre	$50,000 # acs × $250/acre		H	1260
Goal 3. Wetlands	**Provide, manage, and enhance a diverse assemblage of wetland habitats characteristic of the Kootenai River Valley.**				
3.1-3.4 Provide Moist Soil, Seasonal, Semi-permanent, and Permanent Wetlands					
	Alt 1	**Alt 2**	**New Staff**	**Priority**	**Funding**
Total Acres Moist Soil Wetlands	10-20	75-100			
Total Acres Seasonal Wetlands	417-427	337-362			

Total Acres Semi-permanent Wetlands	450	355-450			
Total Acres Permanent Wetlands	295	229-283			
Drawdown (Acre-ft drawn down annually)	Moist soil: 100 acre feet from Center Ditch into lower Myrtle Creek	Moist soil: 670-1,000 acre feet from Center Ditch into lower Myrtle Creek			
Annual pumping costs/drawdown	$300 Cost per ac-ft × # ac-ft	$5,100 (based on ave. cost per acre ft for other pumps of $5.10/ac-ft × 1000) Cost per ac-ft × # ac-ft		H	
Floodup (Acre-ft pumped annually)	Moist soil: 1,400 acre feet from the Kootenai River 550 acre feet from Deep Creek.	Moist soil: 1,400 acre feet from the Kootenai River 550 acre feet from Deep Creek.			
Annual pumping costs/floodup	$13,750 Cost per ac-ft × # ac-ft Kootenai River $9,000 Deep Creek $4,750	$9,750 Cost per ac-ft × # ac-ft Kootenai River $7,000 Deep Creek $2,750		H	
Water Diversions (not including pumping)		Seasonal wetlands: Divert 1,100 acre feet from Myrtle Creek Semi-permanent wetlands: Divert 1,365-2,000 acre feet from		H	

		Myrtle Creek and 2,017 acre feet from Cascade Creek Permanent: Divert 1,365-2000 acre feet from Myrtle Creek			
Annual pumping costs/water diversion	$12,000 labor cost for managing water no pumping cost	$12,000 labor cost for managing water no pumping cost		H	
Acres emergent veg. cleared annually	50 acres in 2010	17-88 acres			
Annual cost, clear emergent veg. (burn, disk)	$8,000 $140/ac cost/ac × acs	up to $13,200 cost/ac × acs		H	
Annual seeding cost (moist soil seed varies from $38-480 per acre; see separate spreadsheet)	$300	$2,000 (assumes 10 ac per year at 200/ac; some years more, some less)		H	
Annual maintenance WCS (pumps and water control structures)	$72,000	$72,000		H	
Annual dike maintenance RPI	$11,000	$20,000 Add 6,300' dike		H	
Monitor wetlands for invasive species	$3,550	$4,000	Biologist	H	1260
Monitor wetland vegetation for adaptive mgmt	$2,000	$4,000	Biologist	H	1260
Total Annual Cost, Wetland Management	$122,900	$142,050			
Goal 4. Low-Elevation Forest	**Provide, manage, and enhance a diverse assemblage of forest habitats characteristic of the lower elevation sites in the Selkirk Mountains.**				
4.1 Protect/Maintain Moist Mixed Coniferous Forest					
	Alt 1	**Alt 2**	**New Staff**	**Priority**	**Funding**
Total Acres Moist Mixed Conifer	275	275			

Forest					
Acres Monitored and Treated Annually (Fire Suppression)	0-275	0-275	Asst. Mgr, Biologist	M	1260
Total Annual Cost	$10,000	$10,000			
4.2 Protect/Maintain Late Seral Dry Forest					
Total Acres Dry Forest	50	50			
Acres Monitored and Treated Annually (Fire Suppression)	0-50	5 treated per year after onetime treatment	Biologist	M	1260, 916X
Total Annual Cost	$4,000	$2,500			
4.3 Protect/Maintain Moist Mixed Deciduous Forest					
Total Acres Moist Mixed Deciduous Forest	10	10			
Acres Monitored and Treated Annually (Fire Suppression)	0-10	0-10	Asst Mgr, Biologist	M	1260
Acres Treated Annually (reduce conifer encroachment, increase aspen/cottonwood recruitment)	0	1		M	1260
Total Annual Cost	$3,000	$1,000			
Goal 5. Riparian Habitat	**Provide, manage, and enhance a diverse assemblage of riparian habitats characteristic of the Kootenai River Valley.**				
5.1 Protect/Maintain/Restore Mid-late Successional Alluvial Riparian woodland					
	Alt 1	**Alt 2**	**New Staff**	**Priority**	**Funding**
Total Acres Riparian Woodland	149 ac	164-169 ac			
Riparian restoration project area	0	15-20 ac			
Annually treat riparian restoration areas for invasives/ competing veg. (mow, spray)	$1,000	$3,000	Biologist Partners Bio	M	1260, Partners

Monitor riparian vegetation for adaptive mgmt	$0	$3,000	Biologist	M	1260
Manage Special Permit Hunt	$0	NA (cost included in PU Goal 3 below)			
Total Annual Cost	$1,000	$6,000			
5.2 Protect/Maintain/Restore Riparian Scrub-Shrub					
Total Acres of Scrub-Shrub	64 ac	84-94 ac			
Riparian shrub restoration project area	0	20-30 ac			
Annually treat riparian restoration areas for invasives/ competing veg. (mow, spray)	$1,575	$3,000	Biologist Partners Bio	M	1260, Partners
Total Annual Cost	$1,575	$3,000			
Goal 6. In-stream Habitat	**Protect, maintain, and where feasible restore in-stream habitats on the Refuge to benefit native fishes and the species that depend on them.**				
6.1 Protect/Maintain In-stream Riverine Habitat-upper Myrtle Creek, upper Cascade Creek **6.2 Restore in-stream habitat—lower Myrtle Creek** **6.3 Improve water quality in Deep Creek** **6.4 Restore in-stream habitat—lower Cascade Creek**					
	Alt 1	**Alt 2**	**New Staff**	**Priority**	**Funding**
Stream Miles, Upper Myrtle and Cascade Creeks (on refuge)	0.37 0.52	0.37 0.52			
Stream Miles, Lower Myrtle and Cascade Creeks (on refuge)	2.1 0.1	2.1 0.1			
Stream Miles, Deep Creek (on refuge)	2.0 (west bank only) 0.3 (both banks)	2.0 (west bank only) 0.3 (both banks)			
Annual in-stream habitat maintenance/ improvement	$0	$20,000	Biologist Partners Biotech	M	1260, Partners
Work with partners,	$0	$4,000	Partners Biotech	M	1260, Partners

habitat/fisheries restoration (salary)					
Work with neighboring landowners to improve water quality (salary)	$0	$5,000	Partners Biotech	M	1260, Partners
Total Annual Cost	$0	$29,000			
Goal 7. Research	**Conduct inventory, monitoring, and research in support of adaptive management, habitat restoration, and fisheries restoration efforts.**				
7.1 Inventory, Monitoring and Research—Wetlands and Riparian Habitat					
	Alt 1	**Alt 2**	**New Staff**	**Priority**	**Funding**
Monitor wildlife disturbance on ATR, trails	$6,000	$15,000	Biologist	H	1260, Grants
Annually monitor invasive species for adaptive management	$3,000	$20,500		H	1260, Grants
Monitor wetland vegetation (every 2-3 years) for adaptive management	$4,000	$20,000	Biologist	H	1260, Grants
Total Annual Cost	$13,000	$55,000			
7.2 Inventory, Monitoring and Research—Fisheries					
Conduct aquatic resource inventory of fish and aquatic habitat every 3 years (with FRO)	$0	$3,400 $10,000 per inventory	Biologist	M	1260, Partners
Support ES and KTOI bull trout, white sturgeon, kokanee monitoring and research	$2,000	$1,000		M	
Total Annual Cost	$2,000	$4,400			
Total One Year Recurring Costs by Alternative (Habitat Management)	$273,725	$355,450			

Table C-4. Public Use Alternatives Recurring Costs.

Goal 1. Wildlife Observation, Photography, and Interpretation	**Provide opportunities for visitors to safely observe and photograph a diversity of wildlife in a natural setting. Interpretation and education will enhance visitors' appreciation for and understanding of the Refuge's natural resources and increase their success in observing and photographing wildlife. Rewarding experiences ultimately build support for Kootenai NWR and the National Wildlife Refuge System.**				
1.1 Improve the 4.5 mile Auto Tour Route so that it provides visitors numerous opportunities to view and photograph wildlife and supports an average of 200 vehicles per week, spring through fall.					
	Alt 1	**Alt 2**	**New Staff**	**Priority**	**Funding**
Annual ATR maintenance salary, grading, fuel, rock	$20,000	$20,000	Park Ranger	H	1260
Collect visitation data, including counts/ observations to back up/calibrate traffic and trail counter data	$6,000	$7,000			
Total Annual Cost/ATR	$26,000	$27,000			
1.2 Provide opportunities for wildlife observation and photography that minimize disturbance to wildlife and are sustainable with a small refuge staff.					
Annual program management cost (salaries—photo programs, photo contest)	$2,000	$5,000	Park Ranger	M	1260
Annual facility maintenance (Cascade Pond Overlook, orientation kiosk at HQ, photo blinds, county road pullouts)	$6,000	$7,000		H	1260
Total Annual Cost, Wildlife Observation/ Photography	$8,000	$12,000			
1.3 Improve visitor contact and orientation facilities, signage, website, and interpretation.					
Maintain accessible public facilities (access, parking, personal contact, signs, restrooms)	$30,000	$30,000		H	1260

Recruit and train volunteer to answer phones and provide Refuge information during times of peak demand	$0	$2,000	Park Ranger or AmeriCorps or long-term community volunteer	M	
Total Annual Cost, Visitor Contact, Orientation	$30,000	$32,000			
1.4. Provide 3.7 miles of safe, maintained trails (Deep Creek Trail, Ole Humpback Trail, Myrtle Falls Trail, and Chickadee Trail) for year round use by visitors of all ages and abilities.					
Miles of Trail	5.2	3.7			
Annual Cost of trail maintenance	$6,500 $500 per mile of trail	$3,700 $1,000 per mile of trail	Park Ranger	H	1260
Coordinate with Forest Service on Myrtle Creek Falls trail improvement, maintenance, LE	$0	$2,000		M	
Total Annual Cost, Trails	$6,500	$5,700			
Goal 2. Waterfowl Hunting	**Provide waterfowl hunters of all ages and abilities the opportunity to participate in a safe, enjoyable, high-quality waterfowl hunt program that encourages a tradition of wildlife conservation and ethical sportsmanlike behavior. The waterfowl hunt program will provide opportunities to observe and hunt a variety of waterfowl species with clear and enforced regulations, easy access, minimal crowding, and minimal hunter conflicts.**				
2.1 Provide a quality, safe waterfowl hunt program on 605 acres of the Refuge, with an additional retrieving zone of 226 acres, capable of supporting up to 1,600 hunter visits per season, including youth, adults, and disabled hunters, with minimal conflicts between hunters and other user groups.					
	Alt 1	**Alt 2**	**New Staff**	**Priority**	**Funding**
Number of Acres—Waterfowl Hunt Area	831 (740 ac open to hunting, 91 ac non-shooting retrieval zone)	831 (605 ac open to hunting, 226 ac non-shooting retrieval zone)			
Annual hunt facility maintenance cost	$15,000	$15,000		H	1260
Pumping to flood up hunt area	$10,000	$10,000		H	1260

Evaluate/upgrade ADA Blinds Bi-annually	$0	$2,000		M	1260
Annual program management cost (salaries—permits, ADA blind reservations, LE, monitoring, hunt clinics, hunter surveys, hunter hotline)	$70,000	$85,000	Asst. Mgr, Park Ranger	H	1260
Total Annual Cost, Waterfowl Hunt Program	$95,000	$112,000			
Goal 3. Fishing, Big Game, and Upland Game Hunting	**Fishing and hunting enthusiasts will enjoy opportunities to fish and hunt big game and upland game on the Refuge. Fishing and/or hunting programs will provide a reasonable chance of success with little or no interference by others; minimize impacts to non-target species and habitats; promote compliance with laws and regulations; and promote ethical behavior.**				
3.1. Provide big game hunters with hunting opportunities that have a reasonable chance of success; allow hunters to retrieve down or wounded game; and do not compromise the safety of Refuge employees, visitors, adjacent landowners, and passing vehicles. 3.2. Provide hunters with quality upland game hunting opportunities in areas with minimal human presence.					
	Alt 1	**Alt 2**	**New Staff**	**Priority**	**Funding**
Acres open to big game hunting	295	173-700 Acreage varies annually depending on special permit hunts			
Acres open to upland game hunting	295	173			
Annual program management cost (salaries—LE, manage special deer/elk hunt, facilities)	$22,000 (Capture current cost of dealing with LE issues)	$22,000 (Capture projected cost of LE and managing special permit deer/elk hunt on flats)	Park Ranger	H	1260
3.3. Provide fishing opportunities in Myrtle Creek for anglers of all ages and abilities.					
Annual facility maintenance cost	$2,000	$2,000		L	1260

Annual program management cost (salaries—LE, fishing/creel surveys)	$2,000	$4,000	Park Ranger	L	1260
Total Annual Cost, Big Game, Upland Game and Fishing	$26,000	$28,000			
Goal 4. Environmental Education	**Students from area schools will participate in quality environmental education and interpretation programs that provide memorable experiences, fosters an appreciation for the natural world around them and a strong conservation ethic, and develops into a life-long relationship with the Refuge.**				
4.1. Provide environmental education and interpretation facilities and programs for use by local educators and refuge visitors.					
# Student Visits Annually	250 students visiting annually	1,000 students visiting annually			
Manage EE, conduct teacher training, workshops	$4,000	$7,000	Park Ranger	M	1260, Grants
Provide at least one environmental educational opportunity to the public per month	$4,000	$3,000		M	1260
Deliver interpretive program training to volunteers	$0	$2,000		L	1260
Annual facility maintenance cost	$20,000	$20,000			
Total Annual Cost. EE	$28,000	$32,000			
Goal 5. Friends Groups and Volunteers	**An active and committed Kootenai NWR Friends Group and volunteer work force will assist Refuge staff in delivering quality visitor services programs, building and maintaining the facilities needed to conduct those programs, and supporting the Refuge's habitat monitoring and restoration efforts. The Friends Group and volunteers will increase support of the Refuge on both a local and State scale through public outreach.**				
5.1. Build a strong, actively engaged Friends Group and volunteer workforce that support the Refuge's goals and objectives.					
Recruit, train and manage volunteers and Friends Group	$3,500	$7,000	Park Ranger	H	1260

Total Annual Cost, Volunteer Program	$3,500	$7,000			
Total One Year Recurring Costs by Alternative (Public Use)	**$223,000**	**$255,700**			
Total Recurring Costs by Alternative	**$496,725**	**$611,150**			

C.3.3 Staffing

Staff is needed to conserve and enhance the quality and diversity of indigenous wildlife habitats on the Kootenai NWR. With the proper staffing to implement this plan, habitat management practices can be implemented and monitoring of flora and fauna responses to management can be applied, which will allow us to apply adaptive management strategies that are crucial for long-term success in meeting the mission, goals and objectives of the Refuge.

Staff will interact with the public for education purposes and to provide for public safety. Maintenance staff will maintain facilities and equipment. Training of staff and coordination among staff, volunteers and partners will ensure the mission and guiding principles of the National Wildlife Refuge System endure.

The following proposed full development level staffing plan would achieve CCP goals within 15 years. The rate at which this station achieves its full potential to fulfill the objectives and strategies contained in the plan is totally dependent upon receiving adequate funding and staffing.

Table C-5 below shows the staffing levels needed to fully implement the CCP's Preferred Alternative, and associated staffing costs. Note that these costs are already included (project by project) in the recurring costs. The table simply provides a picture of how the staff structure would look and provides an indication of what percent of the total recurring costs would be allocated toward staff.

Table C-5. Kootenai NWR Staffing Chart—Alternative 2 (Preferred Alternative).			
Refuge Manager	PFT	GS-0485-12	$108,000
Assistant Manager	PFT	GS-0025-9/11	$94,000
Wildlife Biologist	PFT	GS-0486-9	$75,000
Engineering Equipment Operator	PFT	WG-5716-10	$81,000
Engineering Equipment Operator	PFT	WG-5716-8	$75,000
Office Automation Clerk	PFT	GS-0326-4/5	$50,000
Park Ranger/Volunteer Coordinator	.50 FTE	GS-0025-5/7	$30,500
Complex Administrative Officer	.15 FTE	GS-0341-9	$18,000
Complex Budget Technician	.15 FTE	GS-0561-7	$8,000
Complex Law Enforcement Officer	.2 FTE	GL-0025-9	$20,000
YCC Crew	Seasonal Leader and Crew	GS-4/5	$21,500
Totals			**$581,500**

C.3.4 Partnership Opportunities

The Refuge's location next to Bonners Ferry offers opportunities for partnerships with other agencies, interest groups, and schools. Coordinated partnership efforts will focus on habitat restoration, land protection, environmental education, fish and wildlife monitoring, outreach, and quality wildlife-dependent recreation. Current and potential future partners include local schools, Friends of Kootenai Refuge, Idaho Department of Fish and Game, Kootenai Valley Resource Initiative, Ducks Unlimited, The Nature Conservancy, Kootenai Tribe of Idaho, and others. Partnerships like these will increase our effectiveness, knowledge, and community support, as well as reduce Refuge operating costs.

The Refuge will strive to exchange information with neighboring landowners to promote protection of valuable wildlife habitat in the lower Kootenai River valley. Volunteers will continue to assist with various Refuge programs, as detailed in Chapters 2 and 5 of the CCP/EA.

C.3.5 Budget Summary

Table C-6 summarizes the data from the above tables and displays the total funding need, over the 15 year lifetime of the CCP, for Kootenai National Wildlife Refuge to implement the CCP alternatives in full.

Table C-6. Budget Summary: Funding Needed to Implement Alternatives.

Budget Category	Alternative 1 (Current Management)	Alternative 2 (Preferred Alternative)
One Time Expenditures		
Wildlife and Habitat	$3,487,574	$11,007,450-$33,351,070**
Public Use	$24,500	$350,500-$462,500
Subtotal	**$3,511,074**	**11,357,950-33,813,570****
Recurring Costs (Annual costs totaled over 15 year lifetime of CCP)		
Wildlife and Habitat	$4,105,875	$5,331,750
Public Use	$3,345,000	$3,835,500
Subtotal	**$7,450,875***	**$9,167,250**
Total CCP Cost	**$10,962,949**	**$20,525,200-$42,980,820****

*Reflects current expenditure of $500,000 per year
**Higher figures in ranges reflect maximum cost of Myrtle Creek restoration ($22,470,000)

Appendix D. Draft Wilderness Review for Kootenai National Wildlife Refuge

1 Introduction

The Kootenai National Wildlife Refuge (Refuge) is located on the north Idaho panhandle at an elevation ranging from 1,755-2,310 feet. It is situated at the northern end of the Idaho panhandle, approximately 6 miles west of the town of Bonners Ferry, Idaho, and 9 miles south of the Canadian border. The majority of the Refuge lies within the floodplain of the Kootenai River. The Refuge's acquisition boundary encompasses 2,774 acres, all of which has been acquired through fee title, agreement, or lease.

The Refuge consists of wetland impoundments, non-native grasslands, croplands, remnant riparian forests, and coniferous forest on steep slopes. The west side of the Refuge lies on the lower slopes of the Selkirk Range, while the north and east sides of the Refuge are bordered by the Kootenai River and Deep Creek. Portions of two other perennial streams, Myrtle Creek and Cascade Creek, lie within the refuge boundary.

1.1 Policy for Wilderness Reviews

U.S. Fish and Wildlife Service policy (Part 602 FW 3.4 C.(1) (c)) requires that wilderness reviews be completed as part of the Comprehensive Conservation Planning process. This review includes the re-evaluation of refuge lands existing during the initial 10-year review period of The Wilderness Act of 1964, as amended (16 U.S.C. 1131-1136) as well as new lands and waters added to the 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).

1.2 Criteria for Evaluating Lands for Possible Inclusion in the National Wilderness Preservation System

The Wilderness Act of 1964, as amended (16 U.S.C. 1131-1136) 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 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 five thousand 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 4-wheeled, motorized vehicles that are intended for highway use.

1.3 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.

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.

Wilderness Study

During the study phase, WSAs are further analyzed:

1. for all values of ecological, recreational, cultural, economic, symbolic
2. for all resources, including wildlife, vegetation, water, minerals, soils
3. for existing and proposed public uses
4. for existing and proposed refuge management activities within the area,
5. 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 and urbanization, public uses, and safety.

We evaluate at least an "All Wilderness Alternative" and a "No Wilderness Alternative" for each WSA to compare the benefits and impacts of managing the area as wilderness as opposed to managing the area under an alternate set of goals, objectives, and strategies that do not involve wilderness designation. We may also develop "Partial Wilderness Alternatives" that evaluate the benefits and impacts of managing portions of a WSA as wilderness.

In the alternatives, we evaluate:

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 Refuge System 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 Sec 4 (c) prohibited uses

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 should be written that presents the results of the wilderness review, accompanied by a Legislative Environmental Impact Statement (LEIS). The wilderness study report and LEIS that support wilderness designation are then transmitted through the Secretary of Interior to the President of United States, and ultimately to the United States Congress for action. Refuge lands recommended for wilderness consideration by the wilderness study report will retain their WSA status and be managed as "wilderness according to the management direction in the final CCP until Congress makes a decision on the area or we amended the CCP to modify or remove the wilderness recommendation" (610 FW 4.22B). When a WSA is revised or eliminated, or when there is a revision in "wilderness stewardship direction, we include appropriate interagency and tribal coordination, public involvement, and documentation of compliance with NEPA" (610 FW 3.13).

The following constitutes the inventory phase of the wilderness review for the Kootenai National Wildlife Refuge.

1.4 Previous Wilderness Reviews

There have been no previous wilderness reviews conducted for the Refuge.

1.5 Lands Considered Under This Wilderness Review

All Service-owned lands and waters (in fee title) within the Kootenai National Wildlife Refuge acquired boundary were considered during this wilderness review.

2. Wilderness Inventory

2.1 Unit Size: Roadless areas meet the size criteria if any one of the following standards apply

- An area with over 5,000 contiguous acres solely in FWS ownership.
- A roadless island of any size. A roadless island is defined as an area surrounded by permanent waters or an area that is markedly distinguished from the surrounding lands by topographical or ecological features.
- An area of less than 5,000 contiguous Federal acres that is of sufficient size as to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management.

- An area of less than 5,000 contiguous Federal acres that is contiguous with a designated wilderness, recommended wilderness, or area under wilderness review by another Federal wilderness managing agency such as the Forest Service, National Park Service, or Bureau of Land Management.

The Kootenai National Wildlife Refuge does not meet the minimum size requirements for a wilderness area.

2.2 Naturalness and Wildness: the area generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable

This criterion must be evaluated in the context of current natural conditions and societal values and expectations without compromising the original intent of the Wilderness Act. It is well recognized that there are few areas remaining on the planet that could be truly classified as primeval or pristine, with even fewer, if any, existing in the conterminous United States. Likewise, few areas exist that do not exhibit some impact from anthropogenic influences, be it noise, light, or air pollution; water quality or hydrological manipulations; past and current land management practices; 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: 1) natural, 2) untrammeled, 3) undeveloped. These three qualities are cornerstones of wilderness character. For areas proposed or designated as wilderness, wilderness character must be monitored to determine baseline conditions and thereafter be periodically monitored to assess the condition of these wilderness qualities. Proposed and designated wilderness areas by law and policy are required to maintain wilderness character through management and/or restoration in perpetuity.

Defining the first two qualities (natural and untrammeled) requires a knowledge and understanding of the ecological systems which are being evaluated as potential wilderness. Ecological systems consist 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 make up 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, 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.

The Refuge consists predominantly of managed wetland impoundments, managed grasslands, and croplands. Most of the Refuge originally was part of the Kootenai River floodplain, but is now separated from the Kootenai River, Deep Creek, and Myrtle Creek by high dikes. A gravel road on the high dike is used seasonally as an auto tour route. Wetlands are intensively managed through water control structures. In addition, the Kootenai River is heavily managed for hydropower production and flood control. Therefore, the natural hydrological system, where the river flooded and overflowed its banks in spring, is highly altered compared to precontact conditions. Managed grasslands are dominated by introduced “tame” pasture grasses and are intensively managed through mowing, spraying, and/or seeding. Remnants of riparian forest habitat exist, but the understory is dominated by non-native grasses and forbs. Due to altered hydrological conditions, little natural recruitment of cottonwood and other riparian forest species occurs. Wet meadows (seasonally inundated areas at the perimeter of wetlands) are dominated by an introduced cultivar or reed canarygrass. Coniferous forest on the west side of the Refuge is second growth but some have achieved old growth characteristics. The Refuge is roughly bisected by a paved County road. County roads also pass through the west wide of the Refuge. Administrative and public use facilities also exist on the Refuge. The Refuge does not meet the “naturalness and wildness” standards for wilderness designation.

2.3 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 nonmotorized, dispersed outdoor recreation activities that are compatible and do not require developed facilities or mechanical transport. Primitive recreation activities may provide opportunities to experience challenge and risk, self reliance, and adventure.

The Refuge is open to public use. Current public use exceeds 40,000 visits per year. Hunting, fishing, and other wildlife-dependent recreational activities are allowed. The Refuge has extensive public use facilities, including an auto tour route, walking trails, information kiosks, hunting blinds, and a wildlife observation/photography platform. Walking and hiking is allowed on designated roads and trails; camping is not allowed. The Refuge is small in size, the Refuge sits adjacent to an urban area (including an active port area), and the two mainland units are adjacent to an active railroad line. In addition, auto touring is a popular activity, with nearly 15,000 visits annually. The Refuge would not provide any significant amount of solitude, and its recreational value above the current uses is limited. The Refuge does not provide outstanding opportunities for solitude, and does not provide opportunities for a primitive or unconfined type of recreation.

2.4 Inventory Summary and Conclusion

Based on this inventory, the Refuge Unit does not meet the basic criteria for inclusion into the National Wilderness Preservation System. At 2,774 acres, the does not meet the minimum size for wilderness. The refuge lands are actively managed for wetland and upland habitat characteristics using a variety of techniques, including mowing, herbicide use for invasive plants, and mechanical manipulations. Much of the refuge lands have undergone significant degradation due to nearly a century of logging, livestock grazing, farming, hydrologic alterations, and invasions by non-native plant species. These lands do not fulfill the criteria for naturalness and wildness, and therefore do not possess outstanding wilderness character. The Refuge provides wildlife-dependent recreational opportunities, as well as opportunities to walk or hike on trails; however, these opportunities are not considered to be outstanding in terms of solitude, and do not provide a primitive and unconfined type of recreation.

Table D-1. Results of Wilderness Inventory for Kootenai National Wildlife Refuge.

(1) Unit Size: has at least 5000 acres of land or is of sufficient size to make practicable its preservation and use in an unconfined condition, or is a roadless island	**(2) Naturalness and wildness: generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable**	**(3a) Outstanding opportunities for solitude**	**(3b) Outstanding opportunities for primitive and unconfined recreation**	**(4) contains ecological, geological or other features of scientific, educational, scenic, or historical value**	**Area qualifies as a wilderness study area (meets criteria 1,2, and 3a or 3b)**
No	**No**	**No**	**No**	**No**	**No**

Appendix E. Biological Resources of Concern

E.1 Introduction

Early in the planning process, the team cooperatively identified species, species groups, and communities of concern for the Refuge. A comprehensive list of these resources was compiled based upon review of numerous plans (see Section 1.7 of the Draft CCP/EA), many of which highlight priority species or habitats for conservation. The Comprehensive Resources of Concern list is contained in Table E.1.

The Comprehensive Resources of Concern table was further culled in developing a more targeted assemblage of Priority Resources of Concern. Most of the biological emphasis of the CCP is focused on maintaining and restoring these priority resources. Table E.3 contains the Priority Resources of Concern identified for Kootenai National Wildlife Refuge.

Definitions for the column headings in Table E.3 are as follows:

Focal Species: Species selected as representatives or indicators for the overall condition of the conservation target. In situations where the conservation target may include a broad variety of habitat structures and plant associations, several different conservation focal species may be listed. In addition, species with specific "niche" ecological requirements may be listed as a focal species. Management will be focused on attaining conditions required by the focal species. Other species using the conservation target will generally be expected to benefit as a result of management for the focal species.

Habitat Type: The general habitat description used by the focal species.

Habitat Structure: The specific and measurable habitat attributes considered necessary to support the focal species.

Life History Requirement: The general season of use for the focal species.

Other Benefiting Species: Other species that are expected to benefit from management for the selected focal species. The list is not comprehensive; see the Table of Potential Resources of Concern for the Refuge for a more complete list.

Table E.1. Draft Species/Species Groups/Communities

	Refuge Purposes	Biol. Diversity, Integrity, and Envir. Health	Federally listed	State status/Idaho	Flyway Waterfowl Plans	N. American WMP (2004) & IWJV	PIF Prior WF Spp BCRs 9&10	ID PIF BCRs 9&10	ID Bird Cons Plan (2000)--Priority Breeding Spp	IM West Reg Shorebird Plan (2008)	IM West Waterbird Cons Plan BCR 10	Landbird Cons Plan (2004) BCR 10	Idaho CWCS Spp of Greatest Cons Need	Birds of Cons Concern 2002 (USFWS) BCR 10	BCC 2002 (USFWS) National (Table 48)	TNC-Canadian Rocky Mts Plan	Habitats/Notes
FISH																	
Kootenai River white sturgeon		X	LE	SE									G4T1, S1			X	Kootenai River
Kokanee		X											G5, S2				Myrtle Creek. Eggs planted fall 2003-2--5, returns in 2008
Burbot		X	Fco	SE									G5, S1			X	
Lake chub													G5, SNR				On spp list, however predicted distribution south of Refuge
Bull trout		X	LT	ST									G3, S3			X	Myrtle Creek (Class 2 bull trout stream). Deep Cr Class 3/3.5
Inland (Col. R.)Redband trout		X											G5T4, S4				Myrtle Creek, Deep Creek (Class 2 redband trout stream)
Westslope cutthroat trout		X	C										G4T3, S3			X	Refuge within predicted range; Deep Cr Class 2/3 WCT stream, Myrtle Cr Class 2.5
AMPHIBIANS																	
Northern Leopard Frog		X											G5, S2			X	Point location north of Refuge
Wood frog		X											G5, SH				Possibly extinct in ID, no record since 1970. On Refuge sp list; KNWR within predicted distribution.
REPTILES																	
N. Alligator Lizard													G5, S2				
Western painted turtle		X															
BIRDS																	
Migrating waterfowl	X	X															
Nesting waterfowl	X	X															
Tundra Swan		X			X	2								GBADC			Migration, wintering
Trumpeter Swan						1	X	1	X				G5, S1B, S2N	GBBDC			Uncommon migrant, no breeding on Refuge
Greater White-fronted Goose														GBBDC			
Snow Goose [Lesser?]						2								ssp/popn?			which subspecies (greater or lesser), population?
Ross's Goose						X								ssp/popn?			Which population?
Western Canada Goose*	X				X	1(RMP)						I		GBADC			Nesting, migration

Lesser Canada Goose	X				X							I		GBADC			
Wood Duck*	X					1								GBBDC			Nesting
Green-winged Teal*	X					2								GBADC			
Mallard*	X				X	1								GBBDC			Consider for focal species, seasonal wetlands. Nesting, spring and fall migration
Northern Pintail*	X				X	1							G5, S5B, S2N	GBBDC			spring migration
Blue-winged Teal*						2								GBADC			
Cinnamon Teal*						2	X		X					GBADC			1º brd hab occs on Ref (wetlands
Northern shoveler*						2							S2N	GBADC			
Gadwall*						2	X							GBADC			
American Wigeon*	X					2								GBBDC			
Canvasback						2							S2N	GBBDC			
Redhead*	X					1	X		X					GBBDC			Consider for focal species, permanent wetlands. 1º brd hab occs on Ref (wetlands)
Ring-necked Duck*						2								GBBDC			
Common Goldeneye														GBADC			Nesting
Barrow's Goldeneye							X	2	X					GBADC			1º brd hab occs on Ref (riparian) but nesting not documented
Bufflehead														GBADC			
Lesser Scaup						2							G5, S3	GBBDC			
Hooded Merganser*									X				G5, S2B, S3N	GBADC			1º brd hab occs on Ref (riparian)
Common Merganser														GBADC			
Ruddy Duck*						2	X						S2N	GBADC			
Marsh, water and shorebirds		X															species group benefitting from waterfowl/refuge management (1967 refuge prospectus)
Amer. White pelican								2	X		H		G3, S1B				Nonbreeding adults, summer.
Common Loon								2			H		G5, S1B, S2N				
Red-necked grebe*													G5, S2B				Nesting
Horned Grebe													S1				
Eared grebe																	
Western Grebe*									X		M-10		G5, S2B				1º brd hab occs on Ref (wetlands); Nesting documented in [date], rare
Great blue heron		X											X				
[Greater?] Sandhill Crane									X		H	II a	G5, S3B	GBADC			Confirm ssp. GBADC for G. c.tabida, Rocky Mt popn. Nesting not doc on Refuge.
Virginia Rail														GBADC			
Sora														GBADC			
American Bittern											M-10						

Black-bellied plover										2							
Semipalmated plover										2							
Killdeer*		X							X	2							1º brd hab occs on Ref (wetlands)
American avocet									X	2			G5, S5B				Nesting not doc on Refuge
Greater yellowlegs										2							
Lesser yellowlegs										2							
Solitary sandpiper										2				BCC/N	X		
Spotted sandpiper*										2							
Long-billed curlew										1			G5, S2B	BCC/N	X		consider for focal species (mudflats, spring migration)
Marbled godwit										1			S2	BCC/N	X		
Sandpipers		X															species group benefitting from waterfowl/refuge management (1967 refuge prospectus)
Baird's Sandpiper										2							
Sanderling										2				BCC/BCR			
Semipalmated sandpiper										X							
Western sandpiper										2							
Least sandpiper										2							
Pectoral sandpiper										2							
Upland sandpiper								2		1			G5, S1B	BCC	X		Not listed in bird list but mentioned in Dec meeting as possible focal species
Long-billed dowitcher										2							
Common snipe*										2							
Wilson's phalarope								1		2			G5, S3B	BCC/N	X		
Red-necked phalarope										2							
Gulls and terns		X															species group benefitting from waterfowl/refuge management (1967 refuge prospectus)
Franklin's Gull									X		H		G4G5, S2B				nesting not doc on Refuge
California Gull											M-10		G5, S2B, S3N				
Caspian Tern											M-10		G5, S2B				
Forster's Tern											H-10		G5, S1B				
Black Tern*								2			H		G4, S1B				
RAPTORS																	
Osprey*		X															Nesting
Bald Eagle*		X	D	ST				1					G4, S3B, S4N	BMC		X	TNC IDs nest and wintering sites as CTs. Nesting, migration, wintering
Golden Eagle														BCC			
Swainson's Hawk								2				I	G5, S3B	BCC/N	X		
Ferruginous Hawk								1				II a	G4, S3B	BCC/N	X		

Northern harrier*		X										II c		BCC/N	X		
Sharp-shinned hawk									X								1º brd hab occs on Ref (low elev mixed conifer) but nesting not doc
Northern goshawk								2	X			II a					1º brd hab occs on Ref (low elev mixed conifer) but nesting not doc
[American?] Peregrine Falcon			D	ST				1					G4T3, S2B	BCC/BCR	X		which subspecies? BCR status depends on ssp
Prairie falcon								2				II c		BCC/N	X		
Merlin													G5, S2B, S2N				
UPLAND GAME BIRDS		X															species group benefitting from waterfowl/refuge management (1967 refuge prospectus)
Blue Grouse		X						2	X			I					1º brd hab occs on Ref (riparian) but nesting not documented
Ruffed grouse*		X						2				II a					
Spruce grouse		X						2									
Mourning Dove														GBBDC			
UPLAND BIRDS, SONGBIRDS																	
Western screech-owl		X															
Northern saw-whet owl												II a					
Northern pygmy owl*								2									
Short-eared Owl												I	G5, S4		X	X	
Black swift								1				I	G4, S1B	BCC/N	X		
Vaux's swift*								2	X			II b	X				1º brd hab occs on Ref (cedar, hemlock)
Black-chinned hummingbird*									X								1º brd hab occs on Ref (riparian)
Calliope hummingbird*								1	X			I					1º brd hab occs on Ref (riparian)
Rufous hummingbird*		X							X			I		BCC/N	X(D)		1º brd hab occs on Ref (riparian)
Lewis's Woodpecker		X						1	X			I	G4, S3B	BCC/N	X		1º brd hab occs on Ref (low elev mixed conifer; large snags) however breeding not confirmed
Red-naped sapsucker*								1				II a		BCC/N	X		
American Three-toed Woodpecker								2					G5, S2				
Black-backed Woodpecker*								2	X			II c					1º brd hab occs on Ref (low elev mixed conifer)
Pileated woodpecker*		X											X				
Resident and migratory songbirds		X															species group benefitting from waterfowl/refuge management (1967 refuge prospectus)

Olive-sided flycatcher			Fco					2				I		BCC/N	X(D)		
Willow flycatcher*			Fco						X			I					1º brd hab occs on Ref (riparian)
Hammond's Flycatcher*								1				II a					
Dusky Flycatcher*								2	X			II a					1º brd hab occs on Ref (riparian)
Western Kingbird		X															
Eastern Kingbird*		X															
Steller's jay*		X															
Clark's Nutcracker								2									
Mountain chickadee								2									
Red-breasted nuthatch*								2									
Brown creeper*									X								1º brd hab occs on Ref (low elev mixed conifer)
American Dipper*		X						2	X			II a					1º brd hab occs on Ref (riparian)
Mountain bluebird*								2									
Townsend's Solitaire								2				II a					
Varied Thrush*									X								1º brd hab occs on Ref (low elev mixed conifer)
Loggerhead Shrike								2				II c		BCC/N	X(D)		
Yellow warbler*									X								1º brd hab occs on Ref (riparian)
Townsend's warbler								2	X			II b					1º brd hab occs on Ref (low elev mixed conifer) however breeding not conf
MacGillivray's warbler*								2	X								1º brd hab occs on Ref (riparian)
Western tanager*								2	X								1º brd hab occs on Ref (low elev mixed conifer)
Lazuli Bunting*								2				II b					
Sparrows		X															
Brewer's Sparrow								2				I	G5, S3B	BCC/N	X(D)		KNWR not in breeding range (sagebrush obligate)
Grasshopper Sparrow													G5, S2B	BCC/N	X(D)		KNWR not in breeding range (grasslands)
Cassin's Finch								1				II a					
Red crossbill								2									
White-winged Crossbill													G5, S1				
MAMMALS																	
Townsend's big-eared bat (Pacific ssp)			FCo										G4, S3			X	On spp list. Point loc near KNWR. Slopes of Selkirks in predicted range
California myotis													G5, S2				On spp. List. KNWR outside predicted range

Red-tailed chipmunk													G5, S3				On spp list. Typ habitat Coniferous forest, 2,360' elev and higher
Moose		X															
Mule deer		X															
White-tailed deer		X															
Elk		X															
Black bear		X															
Cougar		X															
Beaver		X															
River otter		X															
HABITATS																	
Wetlands--seasonal, fall flooded																X (%?)	Intensively managed, flooded in fall for migrating waterfowl
Wetlands--seasonal, spring flooded (Sedge meadow)																	Sedge community historically occurred, now supplanted by reed canarygrass
Wetlands--semi-permanent emergent																	Persistent and shallow emergent vegetation.
Wetlands--permanent (aquatic bed)																X (%?)	Primary breeding habitat for several ID priority breeding birds, incl. redheads, grebes; brood habitat for ducks, geese; resting areas for migrating waterfowl
Riverine																	Myrtle Creek, Deep Creek, Cascade Creek. Myrtle Creek classif. as Class 2 bull trout stream
Upland grasslands--moderate to tall bunchgrass																	Restored habitat with plantings of native bunchgrasses, however planted spp not native to local area. Nesting cover for ducks
Upland grasslands--short grass																	
Alluvial riparian forest (N. Rocky Mt. Lower Montane Riparian woodland/shrubland)																	Primary breeding habitat for several ID priority breeding birds
Low-elev moist mixed conifer forest																	Primary breeding habitat for several ID priority breeding birds
N. Rocky Mt. W. hemlock/W. redcedar forest																X (%?)	Combine with above? Wetter sites. Primary breeding habitat for Vaux's swift (ID priority breeding bird)
N. Rocky Mt. Ponderosa Pine Woodland and Savanna																	Dry slopes
Agricultural																	Grainfields, managed pasture

PLANTS																	
Swamp willow-weed (*Epilobium palustre*)													G5, S3				State sensitive species

Definition of Resources of Concern table: From approx 12-15 wildlife conservation plans, assessments, and/or lists; species, species groups, or plant communities/habitats that were ranked highly w/in those documents for conservation concern or management action, and occur on the Refuge. (Reference CCP meeting notes)

Category Codes:	
Federal T&E	LE: Endangered
	LT: Threatened
	C:Candidate
	FCo: Federal Species of Concern
	D: Delisted
State Status	SE: Endangered; ST: Threatened; SC: Sensitive, Critical; SP: Sensitive, Peripheral
	SU: Sensitive, Undetermined; SV: Sensitive, Vulnerable; Und: Undetermined
	NR- Naturally rare
Idaho CWCS – Species of Greatest Conservation Need	S1: Critically imperiled in Idaho
	S2: Imperiled in Idaho
	S3: Vulnerable in Idaho
	S4: Apparently secure in Idaho; some cause for long-term concern due to declines or other factors
	S5: Secure in Idaho; common, widespread, abundant
	G4: Apparently secure globally; some cause for long-term concern due to declines or other factors
	G5: Secure globally; common, widespread, abundant
	N: Nonbreeding
	B: Breeding, conservation status refers to breeding populations of this species
	SNR: Unranked: conservation status not yet assessed
IW Reg Shorebird Plan-	1= Cons priority 1 (highest); 2 = cons priority 2
Landbird Conservation Plan (PIF Priority Landbirds, BCR 10)	I= Tier I, high continental importance. Species on the PIF Continental Watch List.
	II= Tier II, High Regional Priority
	II a=High Regional Concern
	II b= High Regional Responsibility
	II c= High Regional Threats

Birds of Management Concern, Region 1 USFWS (BCR 10)	BCC/BCR: BCC/Birds of Conservation Concern/Regional
	BCC/N: BCC/National
	BCC: Birds of Conservation Concern
	GBADC: Gamebirds above desired condition
	GBBDC: Gamebirds below desired condition
N. American Waterfowl Management Plan (2004) and Intermountain Joint Venture; ID Partners in Flight BCRs 9,10	1= Conservation priority 1 (highest)
	2= Conservation priority 2
Canadian Rocky Mountains Ecoregional Assessment (TNC)	Number indicated refuge contribution (as percent) of total known occurrence (EO) score. Species for which the Refuge contributes <10% for either measure are not indicated on this sheet.
Other Plans	X- Addressed in Plan, no specific category

Sources/Criteria for Potential Resources of Concern Table

North American Waterfowl Management Plan, 2004 Strategic Guidance. Long term trends in breeding populations (1970-2003). All species occurring on KNWR with conservation priority of 1(high) or 2.

USFWS Birds of Conservation Concern 2002. Table 48 (National); Table 41, Region 1 (Pacific Region); Table 10. Bird Conservation Region (BCR) 10 (Northern Rockies-U.S. only); USFWS Division of Migratory Bird Management 2007 (Draft), Gamebirds Below Desired Condition (GBBDC). All species occurring on KNWR.

Intermountain West Regional Shorebird Management Plan, January 2008. All species occurring on KNWR with a regional score of 1 or 2

Intermountain West Regional Waterbird Management Plan. Need complete citation. All species occurring on KNWR with a regional priority of H (high) or M (moderate) concern

PIF Continental Priorities and Objectives Defined at the State and BCR Levels: Idaho. April 2004. All landbirds occurring on KNWR with a Tier I or II ranking in BCR 10.

Pacific Flyway Management Plan for the Rocky Mountain Population of Western Canada Goose. Pacific Flyway Council, USFWS. Date.

Idaho Comprehensive Wildlife Conservation Strategy.

Coordinated Implementation Plan for Bird Conservation in Idaho. Idaho Steering Committee, Intermountain West Joint Venture. 2005.

Idaho Bird Conservation Plan, Version 1.0, January 2000. Idaho Partners in Flight. 2000. High priority breeding bird species where breeding habitat occurs on KNWR.

Canadian Rocky Mountains Ecoregional Assessment. The Nature Conservancy, Portland, OR. 2004.

Species with >10% occurrences of each analysis area at Kootenai NWR.

Table E.2. Biological Integrity, Diversity, and Environmental Health (BIDEH). (Draft, v. 10/06/08)

Habitats (plant communities that Represent Existing BIDEH)	Population/Habitat Attributes (Age class, structure, seral stage, species composition)	Natural processes responsible for these conditions	Limiting Factors
Seasonal Wetlands **Subtypes:** • Spring Flooded (=sedge meadows) • Fall Flooded	Spring flooded: Wetland meadow vegetation occupies the transition zone (above mean high gauge) between emergent wetlands and upland vegetation. "Seasonally flooded sedge meadows" were once a common habitat type in the Idaho portion of the Kootenai River subbasin, forming a mosaic with riparian areas and wetlands (KR Subbasin Plan 2004). Original vegetation sedges (e.g., *Carex simulata*), tufted hairgrass (*Deschampsia cespitosa*), bluejoint reedgrass (*Calamagrostis canadensis*) (Jankovsky-Jones 1997); rushes and spikerush; herbaceous plants such as American bistort (*Polygonum bistortoides*), buttercups (*Ranunculus* spp.). In some parts of northern Idaho, camas was a significant element of this plant community although it is not clear this was the case here. *Potential Conservation Species: common snipe, waterfowl (pairing, spring migration), lesser/greater yellowlegs, Wilson's phalarope, sandhill crane, L-B curlew, amphibians, rails, American*	Spring flooded: Level to gently sloping topography; poorly drained soils; snowmelt hydrograph with spring flooding.	Spring flooded: Significant declines in areal extent of this habitat in N. Idaho due to pasture development (draining, introduction of non-native grasses.) (Jankovsky-Jones 1997) Reed canarygrass displaces/outcompetes native plant communities, and dominates the transition zone on the Refuge today. RCG is native, however non-native cultivars were intentionally introduced to the area for hay and forage (was recommended mgmnt practice in 1960s)

Habitats (plant communities that Represent Existing BIDEH)	Population/Habitat Attributes (Age class, structure, seral stage, species composition)	Natural processes responsible for these conditions	Limiting Factors
	bittern, bobolink (drier sites) Fall flooded: Areas inundated during spring but dry by summer; reflooded in fall. Native vegetation includes smartweed (*Polygonum lapathifolium*), dwarf spikerush (*Eleocharis acicularis*), nodding beggar-ticks (*Bidens cernua*) Expected list based on Creston WMA HMP (2004). Also includes desirable non-natives, e.g., proso millet. *Potential Conservation Species: Most species identified in Purpose documents (mallard, Canada goose, American wigeon, northern pintail, green-winged teal, wood duck, gadwall, tundra swan); also bald eagle, peregrine falcon, N. harrier (foraging), fall-migrant shorebirds*		
Permanent and Semi-Permanent Wetlands **Subtypes:** • Permanent, Open Water w/Aquatic Bed • Semi-Permanent, shallow flooded emergent • Semi-permanent, Persistent emergent	Permanent, Aquatic Bed: Submergent vegetation: bladderwort (*Utricularia* spp.), coontail (*Ceratophyllum demersum*), Canada waterweed (*Elodea Canadensis*), and moss (*Fontinalis antipyretica*). Expected list based on Creston WMA HMP (2004). *Potential conservation species: Redhead (nesting); black tern (foraging); red-necked grebe (nesting, brood rearing), western grebe (foraging); American white pelican (feeding); tundra swan*	Periodic flooding/scouring; seasonal fluctuations/drying Historically main channel of Kootenai River migrated across the flood plain by erosion and deposition of streambanks, creating side channels, oxbow lakes, and backwater wetlands. Stream channel changes over time result in a wide range of water regimes through microsites across the flood plain, creating a mosaic of emergent and submergent wetlands and riparian	Levee construction and dams reduce/alter flood events, prevent creation of side channels, oxbow lakes, and backwater wetlands.* Lack of spring flooding/scouring leads to dense emergent stands (esp. cattail) Invasive plants, (e.g., reed canarygrass) especially at

Habitats (plant communities that Represent Existing BIDEH)	**Population/Habitat Attributes (Age class, structure, seral stage, species composition)**	**Natural processes responsible for these conditions**	**Limiting Factors**
	(foraging) Semi-permanent, Shallow-flooded and Persistent Emergent: Flooded throughout the year, dominated by a mix of open water and robust emergent vegetation dominated by cattails, bulrush; also including reed canarygrass, burreed, spikerush, sedges, rushes and meadow grasses *Potential conservation species:* *Shallow-flooded emergent: sora, Virginia rail (nesting, foraging), American bittern, northern harrier (nesting), Columbia spotted frog* *Persistent emergent: Redhead (nesting), ruddy duck, American bittern, northern harrier, yellow-headed blackbird, northern leopard frog, Columbia spotted frog*	vegetation. Melting of snowpack during the spring and summer months produces a characteristic "snowmelt hydrograph" in which peak runoff occurs between April and June. See detailed description of flooding and role in wetland creation/maintenance in KR Subbasin Plan (2004) Frequency of flooding: Historically, overbank flooding occurred frequently in spring. Flood magnitude and frequency variable, contributing to high vegetative diversity. Beaver activity raised the water table and thereby expanded the area of flooded or saturated soils, decreased stream velocity, modified plant species composition, created and maintaining wetlands, retained sediment and organic matter, and changed the annual discharge regime within stream courses. Flooding is the primary natural disturbance regime in lower Kootenai River floodplain wetlands	wetland margins, replacing native sedge community. Water milfoil (potential invasive)

Habitats (plant communities that Represent Existing BIDEH)	Population/Habitat Attributes (Age class, structure, seral stage, species composition)	Natural processes responsible for these conditions	Limiting Factors
Grasslands			
Upland Grasslands--Tall	Moderate to tall bunchgrasses [height] with overarching canopy of residual vegetation that provides cover for nesting waterfowl. Species: Refuge has planted Great Basin wildrye, Magnar Basin wildrye, trailhead wildrye, and non-native wheatgrass. Note: Only small areas of true upland grassland historically occurred in the Idaho portion of the Kootenai River subbasin; therefore species composition is difficult to reconstruct. Virtually all of the valley floodplain was wetland, cottonwood stands, and extensive seasonally flooded wet meadows prior to its draining and conversion to agriculture. (Ref: KR Subbasin Plan 2004). More likely, drier, well drained soils in the KR floodplain were vegetated with mixed conifer or riparian. True grassland may have occurred on south-facing slopes in the Selkirks. *Potential Conservation Species: Mallard, gadwall, teal (nesting), lesser scaup, ring-necked duck, western meadowlark, savannah sparrow, grasshopper sparrow*	Periodic fire cleared organic debris, encouraged perennial grasses, and played key thermal and nutrient cycling roles. Fire frequency must allow development of overarching canopy of residual vegetation. Well drained soils, low grazing pressure.	Fire suppression allows woody species to invade; Invasive species encroachment leading to loss of native species component (esp. wild oats which inhibit germination of other grasses); Overgrazing (which favors non-native grasses); conversion to cropland and other uses.
Upland Grasslands--Short	Rarely-flooded areas dominated by desirable non-native pasture grasses with variable heights of 6-24 inches to provide	Maintenance of short vegetation through native ungulate grazing	Invasive plant species; lack of fertilization, fire, lack of coop farmers (grazing and haying),

Habitats (plant communities that Represent Existing BIDEH)	Population/Habitat Attributes (Age class, structure, seral stage, species composition)	Natural processes responsible for these conditions	Limiting Factors
	habitat for ground nesting birds, small mammals, and their predators. (Note: Only small areas of true upland grassland historically occurred in the Idaho portion of the Kootenai River subbasin; therefore species composition is difficult to reconstruct.) *Potential Conservation Species: Meadow vole, western meadowlark, grasshopper sparrow, savannah sparrow, vesper sparrow, western bluebird, bobolink, great blue heron (foraging), sandhill crane (foraging), long-billed curlew, cinnamon teal, blue-winged teal, northern shoveler, short-eared owl, black-tailed deer, white-tailed deer, elk*		thatch accumulation. Early mowing prevents use by grassland nesting birds; late mowing inhibits use by geese
Riverine			
Riverine (Middle order and small streams)	Open, generally flowing water; potentially supporting rearing anadromous fish; affording fish passage throughout watershed *Potential Conservation Species: bull trout, kokanee, inland redband trout, westslope cutthroat trout (predicted; confirm presence); bald eagle, osprey, American dipper, river otter, beaver. Potential fry rearing areas for KR white sturgeon*	Periodic flooding, open water, perennial water flows. Melting of snowpack during the spring and summer months produces a characteristic "snowmelt hydrograph" in which peak runoff occurs between April and June. Relatively low winter flows and low winter water temps. Adjacent timber stabilizes streambanks, reduces soil erosion/turbidity, provides nutrients, provides shade and large woody debris in streams, prevents water temperature	Forest management practices, including timber harvest and road construction, both past and current, are major contributors to degraded watershed conditions and aquatic habitats on public lands in Idaho. (KR Subbasin Plan, 2004) Levee construction and dams reduce/alter flood events. Lack of seasonal peak flows has allowed delta formation at

Habitats (plant communities that Represent Existing BIDEH)	**Population/Habitat Attributes (Age class, structure, seral stage, species composition)**	**Natural processes responsible for these conditions**	**Limiting Factors**
		fluctuations. In small and middle order streams, beaver activity decreased stream velocity, modified plant species composition, created and maintaining wetlands, retained sediment and organic matter, and changed the annual discharge regime within stream courses. In large rivers (i.e., orders greater than 9) beaver used floodplains and backwaters, where they constructed dams and canals and cut large amounts of wood.	the mouths of some tributaries, and that has impeded fish movement (USFWS 2002) Past grazing, agriculture, invasive species (re reed canarygrass), loss of adjacent riparian habitat affects water quality/temperature Habitat factors limiting resident salmonids in headwater and tributary streams are degraded riparian areas, channel stability, fine sediment, an altered thermal regime, and habitat diversity. Non-native species and/or stocks compete for similar foodbase/habitat or contaminate gene pool Grazing can also affect channel morphology (how) depending on soils and substrate composition; alters water quality by increasing water temperatures, nutrients, suspended sediments, bacterial counts, and by

Habitats (plant communities that Represent Existing BIDEH)	**Population/Habitat Attributes (Age class, structure, seral stage, species composition)**	**Natural processes responsible for these conditions**	**Limiting Factors**
			altering the timing and volume of water flow Improper timber harvest and road building increases runoff and sediment-loading
Riparian			
N. Rocky Mt. Lower Montane Riparian Woodland/Shrubland **(=Alluvial Riparian Woodland – Mid to late Succession and Riparian Scrub-Shrub in Table 4)** **Subtypes:** • Mid-late successional with well developed canopy and snags. • Early successional	General Attributes of Riparian Forest: Mid-late Successional: Large (canopy) trees include black cottonwood, ponderosa pine, Douglas-fir. Subcanopy and shrub understory including aspen, paper birch, willow; native shrub layer dominants include willow, chokecherry, serviceberry, alder, red-osier dogwood, rose, and snowberry (Kootenai River Subbasin Plan 2004). May flood seasonally or be adjacent to ponds or watercourses. Small low-quality occurrence of this habitat on Refuge (Jankovsky-Jones 1997) Early successional: Tree cover < 30%, primarily willow, alder. Dense native shrub including willow, dogwood. Sparse canopy or no canopy. *Potential Conservation Species: Lewis's woodpecker (large snags), red-eyed vireo (canopy), veery (understory), willow flycatcher (dense shrub), cavity nesting ducks (wood duck, hooded merganser,*	Functioning floodplain with major flood events, scouring of trees/herbaceous layers, deposition of silts. Historically main channel of Kootenai River migrated across the flood plain by erosion and deposition of streambanks, creating side channels, oxbow lakes, and backwater wetlands. Stream channel changes over time result in a wide range of water regimes through microsites across the flood plain. Melting of snowpack during the spring and summer months produces a characteristic "snowmelt hydrograph" in which peak runoff occurs between April and June, and recedes slowly. This favors cottonwood recruitment by allowing roots of seedlings to maintain contact with water (Jamieson and Braatne 2001). Extensive forested and shrub/sedge wetlands provided extensive	Non-Functioning Floodplain: Levee construction and dams reduce/alter flood events, prevent creation of side channels, oxbow lakes, and backwater wetlands.* Altered hydrograph due to Libby Dam operation prevents recruitment of cottonwoods (Jamieson and Braatne 2001). Diking has severely restricted hydrological connectivity between the river and the active floodplain. Agricultural conversion (Clearing and draining) Decreased patch size/width due to levees and ag. conversion. Habitat mostly limited to small, linear

Habitats (plant communities that Represent Existing BIDEH)	Population/Habitat Attributes (Age class, structure, seral stage, species composition)	Natural processes responsible for these conditions	Limiting Factors
	common and Barrow's goldeneye—all require tree cavities near water), Swainson's thrush (dense shrub) song sparrow, calliope hummingbird, rufous hummingbird, MacGillivray's warbler, dusky flycatcher (shrub/young seral), red-naped sapsucker	meandering off channel habitat for trout, kokanee, burbot and possibly sturgeon. Frequency of flooding: Historically, overbank flooding occurred frequently in spring. Flood magnitude and frequency variable, contributing to high vegetative diversity in riparian zones. Large patch size and habitat heterogeneity; riparian forest with interspersed wetlands and sedge meadows covered most of KR floodplain Flooding is the primary natural disturbance regime in lower Kootenai River riparian forest.[6]	streamside bands within the levees, and outflow areas of Deep Creek and Myrtle Creek. Even with altered flows to encourage cottonwood recruitment, potential recruitment sites are limited due to the steep banks created by diking. Recruitment will occur on point bars where located below the dikes. Livestock grazing suppresses cottonwood/willow regeneration, decreases growth of riparian shrubs, alters species composition/diversity, influences spacing of plants and the width of the riparian zone. Invasive species (esp. reed canarygrass) inhibits establishment of native shrubs and trees. Plains cottonwood (*P. deltoides*) introduced early 1900s and comprises a significant portion of remaining stands (Braatne and Jamieson 2001)

Habitats (plant communities that Represent Existing BIDEH)	Population/Habitat Attributes (Age class, structure, seral stage, species composition)	Natural processes responsible for these conditions	Limiting Factors
			Browsing by deer, elk prevents reestablishment of new stands—limited riparian habitat combined with relatively high deer/elk populations makes this an issue
Upland Forest			
Low-elevation, moist mixed conifer, late-successional forest	Common trees species at mid-low elevations include Douglas-fir, lodgepole pine, and western larch. Other common tree species include mountain hemlock, western hemlock, western redcedar, grand fir, ponderosa pine, western white pine, and grand fir. Steep, E-W running slopes lead to a variety of site conditions and therefore tree composition varies widely. *Potential Conservation Species: Vaux's swift, varied thrush, Townsend's warbler, MacGillivray's warbler, olive-sided flycatcher*	Historic fire regimes predominantly nonlethal, low severity with 15- to 45-year return intervals. On cooler, northerly slopes, fires nonuniform, mixed severity with 15 to 45 year return interval. Occasionally, lethal, stand-replacing fires can occur at an average fire return interval of 225 years. At mid and higher elevations, cool, moist sites supported fire-dependent, seral old growth trees. Wildlife easily moved across large habitat blocks. (Idaho PIF; Altman 2000)	Chief limiting factors are forest management practices, fire exclusion, exotic species (noxious weeds), roads, and forest insects and diseases. Over the last 100 years, large trees have been harvested and fires have been excluded. Shade tolerant species, more prone to disease and lethal fires have increased. Habitats have been roaded. Stands tend to be overstocked compared to historic conditions, especially on drier sites. Fire regimes have shifted to more lethal fires. Patch sizes are smaller, and the amount of interior habitat is less than historic conditions. Existing forests are more fragmented.

Habitats (plant communities that Represent Existing BIDEH)	Population/Habitat Attributes (Age class, structure, seral stage, species composition)	Natural processes responsible for these conditions	Limiting Factors
Mixed moist deciduous forest	Stands of cottonwood, aspen, and/or birch found at the bottom of the drainages of small perennial or ephemeral streams, above the Kootenai River floodplain. 30-70% canopy closure. Diverse, well developed understory supports high insect populations. Because of their susceptibility to heart rot, aspens and cottonwoods are important to cavity nesters. *Potential conservation species: Insectivorous birds, including red-napped sapsucker, warbling vireo, orange-crowned warbler, ruffed grouse, cavity nesters, deer, elk*		Areas of this habitat type at Kootenai NWR are small, often less than 2 acres. On the scale that most habitat is discussed in sources, these are such a small part of the whole area they are not specially addressed. But given the small scale of the Refuge, this habitat type becomes significant.
N. Rocky Mt. Ponderosa pine woodland (Late seral dry forest in Table 4)	Large, widely spaced ponderosa pine. (Sites examined on Refuge contain a mix of ponderosa pine and Douglas fir on S/W facing slopes)	Forest structure dominated by large, widely spaced trees maintained by frequent, low-intensity fires. Predominant fire regime was nonlethal, low severity at a 5 to 25 year return interval. Wildlife easily moved across large habitat blocks. (Idaho PIF; Altman 2000)	Chief limiting factors are fire exclusion, forest management, and exotic species. Over the last 100 years, large trees have been harvested and fires have been excluded. Shade tolerant species, more prone to disease and lethal fires have increased. Habitats have been roaded. Stands tend to be overstocked compared to historic conditions, especially on drier sites. Fire

Habitats (plant communities that Represent Existing BIDEH)	Population/Habitat Attributes (Age class, structure, seral stage, species composition)	Natural processes responsible for these conditions	Limiting Factors
			regimes have shifted to more lethal fires. Patch sizes are smaller, and the amount of interior habitat is less than historic conditions. Existing forests are more fragmented.
Large flocks of migrating/wintering waterfowl	Seasonal wetlands (fall flooded), permanent and semipermanent wetlands, croplands *Potential conservation species: Mallard, Canada goose, tundra swan, American wigeon, northern pintail, green-winged teal, wood duck, gadwall*	Dynamic flooding regime of lowland areas created a mosaic of habitats: riparian forest/shrubland, seasonal and permanent wetlands.	Diking, draining and leveling of ridges/swales resulting in reduced wetland area; damming; manipulated river hydrology; reduction in beaver populations/activity; development within floodplain
Breeding waterfowl, waterbirds	Permanent and semipermanent wetlands (nesting diving ducks and waterbirds; waterfowl brood habitat), seasonal wetlands (spring flooded), grasslands (nesting dabbling ducks); late successional riparian forest (cavity nesting ducks) *Potential conservation species: Redhead, gadwall, red-necked grebe, wood duck, common goldeneye, Barrow's goldeneye, hooded merganser, black tern, green-winged teal, cinnamon teal, blue-winged teal, northern shoveler*		

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Table E.3. Draft Kootenai NWR Priority Resources of Concern

Suggested Focal Species	Habitat Type	Habitat Attributes	Life History Requirement	Other Benefiting Species
Mallard	**Wetlands**	**Seasonal wetlands, Fall flooded** • Water depths 4"-9" in the fall, covering >75% of the wetland • >40% cover of >10 genera of native (or desirable non-native) short to medium height emergent plants. • Largely native emergent vegetative community (smartweeds, water plantain) but also proso millet. • Wetland Size or buffer zone from human disturbance (250m—check distance) **References:** WMH 13.1.1, Ringelman 1990, Frederickson in Bookout	Foraging/Migration	Refuge purposes spp: Canada goose, American wigeon, mallard, northern pintail, green-winged teal, wood duck, gadwall, and tundra swans. ID PIF moderate priority spp**:** American bittern, wood duck, gadwall, bufflehead, bald eagle, northern harrier (foraging), peregrine falcon (foraging), marsh wren. Other spp: great blue heron, Virginia rail, sora, American coot, common snipe, red-necked phalarope, migrating shorebirds (sandpiper species, long-billed dowitcher, and lesser and greater yellow-legs) red-winged blackbird.
Common snipe		**Seasonal wetlands, spring flooded (=Sedge meadow[1])** • Water depth 0 (moist soil) to 4 inches • Minimal hydroperiod (early Dec. to mid March) Vegetation: water tolerant grasses, sedges, rushes, spikerush. Potential plant species include *Carex obnupta*, *Juncus effusus*,	Nesting, Foraging, Courtship	Waterfowl pairing (Cinnamon and blue-winged teal, northern pintail, and mallards Waterfowl migration foraging (American Wigeon, mallard, northern pintail, gadwall, northern shoveler, tundra swans) Migrating shorebirds (lesser and greater yellow-legs, Wilson's phalarope)

Suggested Focal Species	Habitat Type	Habitat Attributes	Life History Requirement	Other Benefiting Species
		reed canarygrass (mowed)[1]. • Reed Canarygrass cover < 30% • Reed canarygrass, if present, mowed (preseason) to <6 inch • Willow cover < 30%		Other species: sandhill crane (foraging), long-billed curlew (foraging), amphibians breeding (northern leopard frog, Columbia spotted frog, long-toed salamander), rails, common yellowthroat (foraging), American bittern (foraging), bobolink (nesting and foraging on drier sites w/diverse floral component)
Redhead		**Semi-permanent wetland, Persistent emergent vegetation** • Wetland size ≥5 acres (2.0 ha) • Not farther than 0.25 miles (0.4 km) from large permanent or semi-permanent lakes. • Vegetation dense bulrush or cattail with residual stem density of 35-45 bulrush stems/ft^2 (350–450 stems/m^2) or 3–5 cattail stems/ft^2 (32–52 stems/m^2) and interspersed with small (2-3 yd^2 [1.7-2.5 m^2]) areas of open water. • Buffer >122 m radius for harrier nests, residual duff preferred for nesting habitat (ID PIF). • Water depths X in summer	Nesting	Nesting: Ruddy duck, American bittern, American coot, pied-billed grebe, northern harrier, yellow-headed blackbird, common yellowthroat, and marsh wren Foraging: northern leopard frog and Columbia spotted frog
Sora or Virginia Rail		**Semi-permanent wetland, Shallow-flooded emergent vegetation**	Nesting, foraging	American bittern (nesting and foraging,) northern harrier (nesting), Columbia spotted frog (breeding), red-winged

Suggested Focal Species	Habitat Type	Habitat Attributes	Life History Requirement	Other Benefiting Species
		• 40%-70% cover robust emergent vegetation • Maximize interspersion of emergent vegetation and open water or mudflats. • Water depth 0 (moist soil) to 15 cm in summer **References:** Johnson and Dinsmore 1985, Gibbs et al. 1992, Pospichal and Marshall 1954, Tacha 1975, Johnson and Dinsmore 1986, Johnson 1984, Conway 1990, Walkinshaw 1940, Melvin and Gibbs 1994, Krapu and Green 1978.		blackbird (nesting)
Redhead		**Permanent wetlands, Open water w/aquatic bed** • Wetland size >10 acres • Minimum water depth 0.3 m throughout brood rearing period [dates] • Maximum cover of emergent vegetation: X% **References:** Low 1945, Lokemoen 1966, Siegfried 1976, Stoudt 1982.	Pairing, brood rearing, foraging	Gadwall (brood rearing), black tern (foraging), red-necked grebe (nesting brood rearing), western grebe (foraging), pied-billed grebe (brood rearing, foraging), horned grebe (foraging), common loon (foraging), common goldeneye (brood rearing, foraging), common merganser (foraging), tundra swan(foraging). Open water also provides resting areas for migrating waterfowl (mallards, northern pintail, American wigeon, Canada geese). ID PIF high priority spp: western grebe (foraging), Barrow's goldeneye

Suggested Focal Species	Habitat Type	Habitat Attributes	Life History Requirement	Other Benefiting Species
				(foraging), hooded merganser (brood rearing, foraging). ID PIF moderate priority spp: red-necked grebe, eared grebe, canvasback, ring-necked duck, lesser scaup, bufflehead, ruddy duck, osprey (foraging only if fish present), bald eagle, Wilson's phalarope, ring-billed gull, California gull, black tern (nesting near emergent edge and foraging). Other species (all foraging): bank, barn, tree, and cliff swallows; bat species; western painted turtle; blotched tiger salamander.
Mallard or gadwall	**Grasslands**	**Upland grasslands – Tall Moderate to Tall Bunchgrasses** • Mix of tall grasses, forbs and low shrub cover. • Tall, dense residual vegetation (Visual obstruction ≥20 cm) • Optimal distances from wetlands <100 m • Tall shrub cover ≤3% • No haying, minimal or no grazing • Fire interval 5-7 years **References:** Robel et al. 1970, Kirsch et al. 1978, Greenwood et al. 1995, Sugden and Beyersbergen 1986, Higgins et al. 1992,	Nesting cover	Dabbling ducks, including mallard, gadwall, teal; lesser scaup, ring-neck duck, western meadowlark, savannah sparrow, grasshopper sparrow (although not confirmed nester) Other species: meadow vole, badger, northern pocket gopher, coyote (foraging)

Suggested Focal Species	Habitat Type	Habitat Attributes	Life History Requirement	Other Benefiting Species
		Larivière and Messier 1998, Clark and Nudds 1991, Jiminez et.al 2007.		
Meadow vole		**Upland Grasslands—Short Grass** **(**areas for ground nesting birds, voles, and their predators) • Variable heights of 6-24 inches >85% grass/forb cover • Abundant residual cover; litter depths 1.5-2.0 cm • <5% shrub cover • Delay mowing until August 1[2] (Idaho PIF 2000, p. 44) • Minimum patch size >40 acres (see comments below) **References:** Wiens 1973, Sample and Mossman 1997, Wiens 1969, Maher 1973, Owens and Myres 1973, Karuziak et al. 1977.	All life history requirements	Western meadowlark, grasshopper sparrow, savannah sparrow, and vesper sparrow (nesting), western bluebird (foraging), bobolink (foraging late season mowed habitat), great blue heron and sandhill crane (feed on voles), long-billed curlew (potential nester though not confirmed), cinnamon and blue-winged teal (nesting), northern shoveler (nesting), northern harrier (foraging), short-eared owl (foraging and nesting), red-tailed hawk (foraging), elk (foraging).
Western Canada goose	**Croplands (foraging areas for geese, ducks)**	• Short grass (<6"), or winter wheat/barley. • Cropland areas should be buffered by at least **250 meters** to minimize human disturbance.	Foraging/Migration	Mallard, pintail, wood duck, American wigeon, lesser Canada goose, long-billed curlew (early spring)

Suggested Focal Species	Habitat Type	Habitat Attributes	Life History Requirement	Other Benefiting Species
Bull trout	**Riverine/Instream**	**Myrtle Creek** • No measurable increase in max. water temperature (7-day moving average of daily maximum temperature measured as the average of the maximum daily temperature of the warmest consecutive 7-day period) Maximum water temperatures below 59°F (15°C) within adult holding habitat and below 48°F (9°C) within spawning and rearing habitats • >20 pieces/mi of large (>12" diameter and >35 ft long) woody debris in forested streams • 80% of the banks stable in non-forested systems: >75% of the lower banks with <90 degree angle in non-forested systems; a w • Width/depth ratio < 10 (mean wetted width divided by mean depth) • Pool frequency of 96 pools/mi for wetted width of 10 ft, 56 pools/mi if wetted width 20 ft, 47 pools/mi if wetted width is over 25 ft.	Holding, rearing, and spawning; connectivity between spawning habitat/Kootenai river	Kokanee, westslope cutthroat trout, bald eagle (foraging), osprey (foraging), kingfisher, common merganser, American dipper, river otter (foraging), beaver

Suggested Focal Species	Habitat Type	Habitat Attributes	Life History Requirement	Other Benefiting Species
		Reference: INFISH standard		
Redband Rainbow Trout *Comment: Per Joe Dupont, IDFG*[5]		**Deep and Cascade Creek** • In Deep Creek, increase channel shading to 30%; • Reduce bank erosion by about 80% (16 tons/yr to 3 tons/yr) over 30 years.) **Reference:** ID DEQ TMDL		

Suggested Focal Species	Habitat Type	Habitat Attributes	Life History Requirement	Other Benefiting Species
Lewis' woodpecker (large snags) *Comment: Added parameter due to inclusion in PIF plan[4] (Altman 2000)*		• >0.8 snags/ac > 16" dbh • >0.8 snags/ac > 21" dbh (especially cottonwood trees) • Tree canopy cover 10-40% • Shrub cover 30-80%. [4]		Cavity-associated species such as tree swallow, downy woodpecker, house wren and northern flicker.
Red-eyed vireo (canopy)		• Tree canopy closure >60% • Riparian zone of mature deciduous trees > 160 ft wide • >10% of shrub layer should be young cottonwoods. [4]		Western wood pewee, warbling vireo, American redstart, orange-crowned warbler, MacGillivray's warbler, and mountain chickadee
Veery (understory)	**Alluvial Riparian Woodland – Mid to Late Successional**	• Dense, contiguous understory of native vegetation with cover in the shrub layer >40% • Riparian zone width > 100 ft • Unbroken tracts with the aforementioned conditions > 1/8 mi long. [4]	Breeding/Nesting	Swainson's thrush, calliope hummingbird, song sparrow, spotted towhee, and gray catbird <u>Other benefiting species</u>: Wood duck, Barrow's goldeneye, hooded merganser, red-naped sapsucker, rufous hummingbird, black-chinned hummingbird, dusky flycatcher, willow flycatcher, bald eagle, osprey and other raptors (large cottonwoods—roosting, nesting), owls (nesting), great blue heron (cottonwoods, nesting), kingfisher (bank nester), mule deer, white-tailed deer, elk (foraging, thermal cover)
Wood duck		• Large trees, >12 inches (30 cm) dbh (diameter breast height) adjacent to		Burbot (potential rearing habitat in ponds) Common goldeneyes, hooded

Suggested Focal Species	Habitat Type	Habitat Attributes	Life History Requirement	Other Benefiting Species
		waterways or ponds (usually artificially created ponds that cannot grow aquatic veg., or a true lacustrine system)Cavities with an entrance size of >3.5 inches (8.9 cm), an interior basal area of >40 square inches (258 cm^2), and height >6 feet (2 m) above the ground • Nest trees within 0.8 mile of brood habitat (Shallowly flooded habitat with good understory cover, such as shrub-scrub or emergent vegetation)		mergansers, western painted turtle
Willow flycatcher	**Riparian scrub-shrub**	• Dense patches of native vegetation in shrub layer, >35' x 35' in size, and interspersed with openings of herbaceous vegetation • Shrub cover 40%-80% including Sitka willow, aspen, red-osier dogwood, chokecherry, alder, serviceberry, elderberry • Shrub layer height >3 feet • Tree cover <30% • Width of contiguous understory shrubs 100' or more	Breeding landbirds; deer/elk foraging, thermal cover	Willow flycatcher, dusky flycatcher, lazuli bunting, black-cinned hummingbird, rufous hummingbird, white-tailed deer, elk

Suggested Focal Species	Habitat Type	Habitat Attributes	Life History Requirement	Other Benefiting Species
Vaux's swift (large snags)	**Moist mixed coniferous forest (Low-elevation, moist mixed conifer, late-successional forest)**	• Snags > 27 in dbh and > 82 ft tall and in different stages of decay (including some hollow snags) • Recruitment of snags (live trees) with signs of defects (e.g., broken tops). [4]	Breeding landbirds; deer/elk foraging, thermal cover	Pileated woodpecker, Williamson's sapsucker, hairy woodpecker, great gray owl, golden-crowned kinglet, chestnut-backed chickadee, red-breasted nuthatch, flammulated owl, varied thrush, winter wren, and brown creeper.
Varied Thrush (Structurally varied, multi-layered)		• Multiple tree layers with mixes species composition including >25% deciduous vegetative cover for a dense leaf litter layer • High canopy closure (>60%) • Blocks of late-successional forest > 75 ac. [4]		Golden-crowned kinglet, chestnut-backed chickadee, hermit thrush, blue grouse, Townsend's warbler, and winter wren.
Townsend's warbler (Overstory canopy closure and foliage volume)		• Late successional (mature and old-growth) forest dominated by Douglas fir • >50% canopy closure • Patches > 100 acres. [4]		Northern goshawk, great gray owl, pileated woodpecker, golden-crowned kinglet, and chestnut-backed chickadee.
MacGillivray's warbler (Dense shrub layer in forest openings and understory)		• Dense understory shrub layer (includes shrubs, seedlings and saplings) dominated by native species with >40% cover and/or >270 stems/acre • Tree canopy cover < 25% • Herbaceous ground cover < 25%. [4]		Fox sparrow, song sparrow, orange-crowned warbler, spotted towhee, Wilson's warbler.

Suggested Focal Species	Habitat Type	Habitat Attributes	Life History Requirement	Other Benefiting Species
Olive-sided flycatcher (Edges and openings created by wildfire) *<u>Comment</u>: check on occurrence of this habitat in recent burn*		• Where appropriate, through natural events (wildfire) or management (prescribed burning) maintain: ○ >2% of landscape as post-fire habitat; ○ >40% of the post fire landscape unsalvaged.[4] • Where salvage is occurring maintain: ○ In burns >100 ac, salvage less than 505 of standing and dead dow; ○ Retain all trees/snags >20 in dbh and >40% of those 12-20 in dbh; ○ Retain patches of mix live and dead trees/snags to provide nest trees (live) with the context of potential foraging and singing perches (dead). [4]		Western tanager, Cassin's finch, western wood-pewee, mountain bluebird, northern flicker, American kestrel, and American robin.
Ruffed grouse	**Mixed moist deciduous forest (water courses above floodplain)**	• Tree canopy closure 30-70% • Shrub cover >40%, large areas best • >10% of shrub layer should be young cottonwoods or aspens. • >4 trees/ac 40' high and 10" dbh	Breeding landbirds; winter foraging for ruffed grouse; deer/elk foraging, thermal cover	Red-naped sapsucker, warbling vireo, orange-crowned warbler, ruffed grouse (aspen stands); cavity nesters; deer, elk, moose

Suggested Focal Species	Habitat Type	Habitat Attributes	Life History Requirement	Other Benefiting Species
		• >1.5 snags/acre >40' high and >10" dbh		
Brown creeper	**Late seral dry forest (Dry Ponderosa Pine and Douglas Fir series)**	• >10 trees/ac >21" where >2 trees >31" dbh; however, maintain a range of diameters to allow for replacement • 10%-40% tree canopy cover • >1.4 snags/acre with >8" dbh, with >50% >25" dbh • Open understory; Shrub canopy cover of native species, dependent upon the appropriate plant association for the Dry Forest Ponderosa Pine and Douglas Fir Series • Herbaceous canopy cover of native species dependent upon the appropriate plant association for the Dry Forest Ponderosa Pine and Douglas Fir Series	Breeding landbirds	Hammond's flycatcher, hairy woodpecker, brown creeper (ID PIF priority species), white-breasted nuthatch, wild turkey, pygmy nuthatch

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Appendix F. Kootenai NWR CCP/EA Integrated Pest Management (IPM) Program

1.0 Background

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 Service personnel, Service authorized agents, volunteers, and the public. Staff time and available funding would be considered when determining feasibility/practicality of various treatments.

IPM techniques to address pests are presented as CCP strategies (see Chapter 2 of this CCP/EA) in an adaptive management context to achieve refuge resource objectives. In order to satisfy requirements for IPM planning as identified in the Director's Memo (dated September 9, 2004) entitled *Integrated Pest Management Plans and Pesticide Use Proposals: Updates, Guidance, and an Online Database*, the following elements of an IPM program have been incorporated into this CCP:

- Habitat and/or wildlife objectives that identify pest species and appropriate thresholds to indicate the need for and successful implementation of IPM techniques; and
- Monitoring before and/or after treatment to assess progress toward achieving objectives including pest thresholds.

Where pesticides would be necessary to address pests, this Appendix provides a structured procedure to evaluate potential effects of proposed uses involving ground-based applications to refuge biological resources and environmental quality in accordance with effects analyses presented in Chapter 7 (Environmental Consequences) of this CCP/EA. Only pesticide uses that likely would cause minor, temporary, or localized effects to refuge biological resources and environmental quality with appropriate best management practices (BMPs), where necessary, would be allowed for use on the Refuge.

This Appendix does not describe the more detailed process to evaluate potential effects associated with aerial applications of pesticides. Moreover, it does not address effects of mosquito control with pesticides (larvicides, pupacides, or adulticides) based upon identified human health threats and presence of disease-carrying mosquitoes in sufficient numbers from monitoring conducted on a refuge. However, the basic framework to assess potential effects to refuge biological resources and environmental quality from aerial application of pesticides or use of insecticides for mosquito management would be similar to the process described in this Appendix for ground-based treatments of other pesticides.

2.0 Pest Management Laws and Policies

In accordance with Service policy 569 FW 1 (Integrated Pest Management), wildlife and plant pests on units of the National Wildlife Refuge System can be controlled to ensure balanced wildlife and fish populations in support of refuge-specific wildlife and habitat management objectives. Pest control on Federal (refuge) lands and waters also is authorized under the following legal mandates:

- National Wildlife Refuge System Administration Act of 1966, as amended (16 USC 668dd-668ee);
- Plant Protection Act of 2000 (7 USC 7701 *et seq*.);
- Noxious Weed Control and Eradication Act of 2004 (7 USC 7781-7786, Subtitle E);
- Federal Insecticide, Fungicide, and Rodenticide Act of 1996 (7 USC 136-136y);
- National Invasive Species Act of 1996 (16 USC 4701);
- Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (16 USC 4701);
- Food Quality Protection Act of 1996 (7 USC 136);
- Executive Order 13148, Section 601(a);
- Executive Order 13112; and
- Animal Damage Control Act of 1931 (7 USC 426-426c, 46 Stat. 1468).

Pests are defined as “living organisms that may interfere with the site-specific purposes, operations, or management objectives or that jeopardize human health or safety” from Department policy 517 DM 1 (Integrated Pest Management Policy). Similarly, 569 FW 1 defines pests as “…invasive plants and introduced or native organisms, that may interfere with achieving our management goals and objectives on or off our lands, or that jeopardize human health or safety.” 517 DM 1 also defines an invasive species as “a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.” Throughout the remainder of this CCP/EA, the terms pest and invasive species are used interchangeably because both can prevent/impede achievement of refuge wildlife and habitat objectives and/or degrade environmental quality.

In general, control of pests (vertebrate or invertebrate) on the Refuge would conserve and protect the nation’s fish, wildlife, and plant resources as well as maintain environmental quality. From 569 FW 1, animal or plant species, which are considered pests, may be managed if the following criteria are met:

- Threat to human health and well being or private property, the acceptable level of damage by the pest has been exceeded, or State or local government has designated the pest as noxious;
- Detrimental to resource objectives as specified in a refuge resource management plan (e.g., comprehensive conservation plan, habitat management plan), if available; 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; and
  Provide the public with quality, compatible wildlife-dependent recreational opportunities.

In accordance with Service policy 620 FW 1 (Habitat Management Plans), there are additional management directives regarding invasive species found on the Refuge:

- "We are prohibited by Executive Order, law, and policy from authorizing, funding, or carrying out actions that are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere."
- "Manage invasive species to improve or stabilize biotic communities to minimize unacceptable change to ecosystem structure and function and prevent new and expanded infestations of invasive species. Conduct refuge habitat management activities to prevent, control, or eradicate invasive species."

Animal species damaging/destroying federal property and/or detrimental to the management program of a refuge may be controlled as described in 50 CFR 31.14 (Official Animal Control Operations)**.** For example, the incidental removal of beaver damaging refuge infrastructure (e.g., clogging with subsequent damaging of water control structures) and/or negatively affecting habitats (e.g., removing woody species from existing or restored riparian) managed on refuge lands may be conducted without a pest control proposal. We recognize beavers are native species and most of their activities or refuge lands represent a natural process beneficial for maintaining wetland habitats. Exotic nutria, whose denning and burrowing activities in wetland dikes causes cave-ins and breaches, can be controlled using the most effective techniques considering site-specific factors without a pest control proposal. Along with the loss of quality wetland habitats associated with breaching of impoundments, the safety of refuge staffs and public (e.g. auto tour routes) driving on structurally compromised levees and dikes can be threaten by sudden and unexpected cave-ins.

Trespass and feral animals also may be controlled on refuge lands. Based upon 50 CFR 28.43 (Destruction of Dogs and Cats), dogs and cats running at large on a national wildlife refuge and observed in the act of killing, injuring, harassing or molesting humans or wildlife may be disposed of in the interest of public safety and protection of the wildlife. Feral animals should be disposed by the most humane method(s) available and in accordance with relevant Service directives (including Executive Order 11643). Disposed wildlife specimens may be donated or loaned to public institutions. Donation or loans of resident wildlife species 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]**).**

3.0 Strategies

To fully embrace IPM, the following strategies, where applicable, would be carefully considered on the Refuge for each pest species:

Prevention. This would be the most effective and least expensive long-term management option for pests. It encompasses methods to prevent new introductions or the spread of the established pests to un-infested areas. It requires identifying potential routes of invasion to reduce the likelihood of infestation. Hazard Analysis and Critical Control Points (HACCP) planning can be used determine if current management activities on a refuge may introduce and/or spread invasive species in order to identify appropriate BMPs for prevention. See http://www.haccp-nrm.org/ for more information about HACCP planning.

Prevention may include source reduction, using pathogen-free or weed-free seeds or fill; exclusion methods (e.g., barriers) and/or sanitation methods (e.g., wash stations) to prevent re-introductions by various mechanisms including vehicles, personnel, livestock, and horses. Because invasive species are frequently the first to establish newly disturbed sites, prevention would require a reporting mechanism for early detection of new pest occurrences with quick response to eliminate any new satellite pest populations. Prevention would require consideration of the scale and scope of land management activities that may promote pest establishment within un-infested areas or promote reproduction and spread of existing populations. Along with preventing initial introduction, prevention would involve halting the spread of existing infestations to new sites (Mullin et al. 2000). The primary reason 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 methods would prevent the introduction and/or spread of pests on refuge lands:

- Before beginning ground-disturbing activities (e.g., disking, scraping), inventory and prioritize pest infestations in project operating areas and along access routes. Refuge staff would identify pest species on site or within reasonably expected potential invasion vicinity. Where possible, the refuge staff would begin project activities in un-infested areas before working in pest-infested areas.
- The refuge staff would locate and use pest-free project staging areas. They would avoid or minimize travel through pest-infested areas, or restrict to those periods when spread of seed or propagules of invasive plants would be least likely.
- The refuge staff would determine the need for, and when appropriate, identify sanitation sites where equipment can be cleaned of pests. Where possible, the refuge staff would clean equipment before entering lands at on-refuge approved cleaning site(s). This practice does not pertain to vehicles traveling frequently in and out of the project area that will remain on roadways. Seeds and plant parts of pest plants would need to be collected, where practical. The refuge staff would remove mud, dirt, and plant parts from project equipment before moving it into a project area.
- The refuge staff would clean all equipment, before leaving the project site, if operating in areas infested with pests. The refuge staff would determine the need for, and when appropriate, identify sanitation sites where equipment can be cleaned.
- Refuge staffs, their authorized agents, and refuge volunteers would, where possible, inspect, remove, and properly dispose of seed and parts of invasive plants found on their clothing and equipment. Proper disposal means bagging the seeds and plant parts and then properly discarding of them (e.g., incinerating).
- The refuge staff would evaluate options, including closure, to restrict the traffic on sites with on-going restoration of desired vegetation. The refuge staff would revegetate disturbed soil (except travel ways on surfaced projects) to optimize plant establishment for each specific site. Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and weed-free mulching as necessary. The refuge staff would use native material, where appropriate and feasible. The refuge staff would use certified weed-free or weed-seed-free hay or straw where certified materials are reasonably available.

- The refuge staff would provide information, training and appropriate pest identification materials to refuge staffs, permit holders, and recreational visitors. The refuge staff would educate them about pest identification, biology, impacts, and effective prevention measures.
- The refuge staff would require grazing permittees to use preventative measures for their livestock while on refuge lands.
- The refuge staff would inspect borrow material for invasive plants prior to use and transport onto and/or within refuge lands.
- The refuge staff would consider invasive plants in planning for road maintenance activities.
- The refuge staff would restrict off road travel to designated routes.

The following methods would prevent the introduction and/or spread of pests into refuge waters:

- The refuge staff would inspect boats (including air boats), trailers, and other boating equipment. Where possible, the refuge staff would remove any visible plants, animals, or mud before leaving any waters or boat launching facilities. Where possible, the refuge staff would drain water from motor, live well, bilge, and transom wells while on land before leaving the site. If possible, the refuge staff would wash and dry boats, downriggers, anchors, nets, floors of boats, propellers, axles, trailers, and other boating equipment to kill pests not visible at the boat launch.
- Where feasible, the refuge staff would maintain a 100-foot buffer of aquatic pest-free clearance around boat launches and docks or quarantine areas when cleaning around culverts, canals, or irrigation sites. Where possible, the refuge staff would inspect and clean equipment before moving to new sites or one project area to another.

These prevention methods to minimize/eliminate the introduction and/or spread of pests were taken verbatim or slightly modified from Appendix E of US Forest Service (2005).

Mechanical/Physical Methods. These methods would remove and destroy, disrupt the growth of, or interfere with the reproduction of pest species. For plant species, these treatments can be accomplished by hand, hand tool (manual), or power tools (mechanical) and include pulling, grubbing, digging, tilling/disking, cutting, swathing, grinding, sheering, girdling, mowing, and mulching of the pest plants. Thermal techniques such as heating, steaming, super-heated water, and hot foam may also be viable treatments.

For animal species, Service employees or their authorized agents could use mechanical/physical methods (including trapping) to control pests as a refuge management activity. Based upon 50 CFR 31.2, trapping can be used on a refuge 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., disking, plowing) may damage root systems, they may stimulate regrowth producing a denser plant population that may aid in the spread depending upon the target species (e.g., Canada thistle). In addition, steep terrain and soil conditions would be major factors that can limit the use of many mechanical control methods.

Some mechanical control methods (e.g., mowing), which would be used in combination with cultural methods and/or herbicides, can be a very effective technique to control some 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.

Cultural methods. These methods would involve manipulating habitat to increase pest mortality by reducing its suitability to the pest. Cultural methods would include water-level manipulation, mulching, winter cover crops, changing planting dates to minimize pest impact, prescribed burning (facilitate revegetation, increase herbicide efficacy, and remove litter to assist in emergence of desirable species), flaming with propane torches, trap crops, crop rotations that would include non-susceptible crops, moisture management, addition of beneficial insect habitat, reducing clutter, proper trash disposal, planting or seeding desirable species to shade or out-compete invasive plants, applying fertilizer to enhance desirable vegetation, prescriptive grazing, and other habitat alterations.

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 the following: limited availability of agents from their native lands, the dependence of control on target species density, slow rate at which control occurs, biotype matching, the difficulty and expense of conflicts over control of the target pest, and host specificity when host populations are low.

A reduction in target species populations from biological controls is typically a slow process, and efficacy can be highly variable. It may not work well in a particular area although it does work well in other areas. Biological control agents would require specific environmental conditions to survive over time. Some of these conditions are understood; whereas, others are only partially understood or not at all.

Biological control agents would not eradicate a target pest. When using biological control agents, residual levels of the target pest typically are expected; the agent population level or survival would be dependent upon the density of its host. After the pest population decreases, the population of the biological control agent would decrease correspondingly. This is a natural cycle. Some pest populations (e.g., invasive plants) would tend to persist for several years after a biological control agent becomes established due to seed reserves in the soil, inefficiencies in the agents search behavior, and the natural lag in population buildup of the agent.

The full range of pest groups potentially found on refuge lands and waters would include diseases, invertebrates (insects, mollusks), vertebrates, and invasive plants (most common group). Often it is assumed that biological control would address many if not most of these pest problems. There are several well-documented success stories of biological control of invasive weed species in the Pacific Northwest including Mediterranean sage, St. Johnswort (Klamath weed) and tansy ragwort. Emerging success stories include Dalmatian toadflax, diffuse knapweed, leafy spurge, purple loosestrife, and yellow star thistle. However, historically, each new introduction of a biological control agent in the United States has only about a 30 percent success rate (Coombs et al.2006). Refer to Coombs et al.(2006) for the status of biological control agents for invasive plants in the Pacific Northwest.

Introduced species without desirable close relatives in the United States would generally be selected as biological controls. Natural enemies that are restricted to one or a few closely related plants in their country of origin are targeted as biological controls (Center et al. 1997, Hasan and Ayres 1990).

The refuge staff would ensure introduced agents are approved by the applicable authorities. Except for a small number of formulated biological control products registered by USEPA under FIFRA, most biological control agents are regulated by the US Department of Agriculture (USDA)-Animal Plant Health Inspection Service, Plant Protection and Quarantine (APHIS-PPQ). State departments of agriculture and, in some cases, county agricultural commissioners or weed districts, have additional approval authority.

Federal permits (USDA-APHIS-PPQ Form 526) are required to import biocontrols agents from another state. Form 526 may be obtained by writing:

> USDA-APHIS-PPQ
> Biological Assessment and Taxonomic Support
> 4700 River Road, Unit 113
> Riverdale, MD 20737

Or through the internet at URL address:
http://www.aphis.usda.gov/ppq/permits/bioligical/weedbio.html.

The Service strongly supports the development, and legal and responsible use of appropriate, safe, and effective biological control agents for nuisance and non-indigenous or pest species.

State and county agriculture departments may also be sources for biological control agents or they may have information about where biological control agents may be obtained. Commercial sources should have an Application and Permit to Move Live Plant Pests and Noxious Weeds (USDA-PPQ Form 226 USDA-APHIS-PPQ, Biological Assessment and Taxonomic Support, 4700 River Road, Unit 113, Riverdale, MD 20737) to release specific biological control agents in a state and/or county. Furthermore, certification regarding the biological control agent's identity (genus, specific epithet, sub-species and variety) and purity (e.g., parasite free, pathogen free, and biotic and abiotic contaminants) should be specified in purchase orders.

Biological control agents are subject to 7 RM 8 (Exotic Species Introduction and Management). In addition, the refuge staff would follow the International Code of Best Practice for Classical Biological Control of Weeds (http://sric.ucdavis.edu/exotic/exotic.htm) as ratified by delegates to the

X International Symposium on Biological Control of Weeds, Bozeman, MT, July 9, 1999. This code identifies the following:

- Release only approved biological control agents;
- Use the most effective agents;
- Document releases; and
- Monitor for impact to the target pest, nontarget species, and the environment.

Biological control agents formulated as pesticide products and registered by the USEPA (e.g., *Bti*) are also subject to PUP review and approval (see below).

A record of all releases would be maintained with date(s), location(s), and environmental conditions of the release site(s); the identity, quantity, and condition of the biological control agents released; and other relevant data and comments such as weather conditions. Systematic monitoring to determine the establishment and effectiveness of the release is also recommended.

NEPA documents regarding biological and other environmental effects of biological control agents prepared by another Federal agency, where the scope is relevant to evaluation of releases on refuge lands, would be reviewed. Possible source agencies for such NEPA documents include the Bureau of Land Management, US Forest Service, National Park Service, US Department of Agriculture-Animal and Plant Health Inspection Service, and the military services. It might be appropriate to incorporate by reference parts or all of existing document(s) from the review. Incorporating by reference (43 CFR 46.135) is a technique used to avoid redundancies in analysis. It also can reduce the bulk of a Service NEPA document, which only must identify the documents that are incorporated by reference. In addition, relevant portions must be summarized in the Service NEPA document to the extent necessary to provide the decision maker and public with an understanding of relevance of the referenced material to the current analysis.

Pesticides. The selective use of pesticides would be based upon pest ecology (including mode of reproduction), the size and distribution of its populations, site-specific conditions (e.g., soils, topography), known efficacy under similar site conditions, and the capability to use best management practices (BMPs) to reduce/eliminate potential effects to non-target species, sensitive habitats, and potential to contaminate surface and groundwater. All pesticide usage (pesticide, target species, application rate, and method of application) would comply with the applicable Federal (FIFRA) and State regulations pertaining to pesticide use, safety, storage, disposal, and reporting. Before pesticides can be used to eradicate, control, or contain pests on refuge lands and waters, pesticide use proposals (PUPs) would be prepared and approved in accordance with 569 FW 1. PUP records would provide a detailed, time-, site-, and target-specific description of the proposed use of pesticides on the Refuge. All PUPs would be created, approved or disapproved, and stored in the Pesticide Use Proposal System (PUPS), which is a centralized database only accessible on the Service's intranet (https://systems.fws.gov/pups). Only Service employees would be authorized to access PUP records for a refuge in this database.

Application equipment would be selected to provide site-specific delivery to target pests while minimizing/eliminating direct or indirect (e.g., drift) exposure to non-target areas and degradation of surface and groundwater quality. Where practicable, target-specific equipment (e.g., backpack sprayer, wiper) would be used to treat target pests. Other target-specific equipment to apply pesticides would include soaked wicks or paint brushes for wiping vegetation and lances, hatchets, or syringes for direct injection into stems. Granular pesticides may be applied using seeders or other specialized dispensers. In contrast, aerial spraying (e.g., fixed wing or helicopter) would only be used where access is difficult (remoteness) and/or the size/distribution of infestations precludes practical use of ground-based methods.

Because repeated use of one pesticide may allow resistant organisms to survive and reproduce, multiple pesticides with variable modes of action would be considered for treatments on refuge lands and waters. This is especially important if multiple applications within years and/or over a growing season likely would be necessary for habitat maintenance and restoration activities to achieve resource objectives. Integrated chemical and non-chemical controls also are highly effective, where practical, because pesticide resistant organisms can be removed from the site.

Cost may not be the primary factor in selecting a pesticide for use on a refuge. If the least expensive pesticide would potentially harm natural resources or people, then a different product would be selected, if available. The most efficacious pesticide available with the least potential to degrade environment quality (soils, surface water, and groundwater) as well as least potential effect to native species and communities of fish, wildlife, plants, and their habitats would be acceptable for use on refuge lands in the context of an IPM approach.

Habitat restoration/maintenance. Restoration and/or proper maintenance of refuge habitats associated with achieving wildlife and habitat objectives would be essential for long-term prevention, eradication, or control (at or below threshold levels) of pests. Promoting desirable plant communities through the manipulation of species composition, plant density, and growth rate is an essential component of invasive plant management (Masters et al. 1996, Masters and Shelly 2001, Brooks et al. 2004). The following three components of succession could be manipulated through habitat maintenance and restoration: site availability, species availability, and species performance (Cox and Anderson 2004). Although a single method (e.g., herbicide treatment) may eliminate or suppress pest species in the short term, the resulting gaps and bare soil create niches that are conducive to further invasion by the species and/or other invasive plants. On degraded sites where desirable species are absent or in low abundance, revegetation with native/desirable grasses, forbs, and legumes may be necessary to direct and accelerate plant community recovery, and achieve site-specific objectives in a reasonable time frame. The selection of appropriate species for revegetation would be dependent on a number of factors including resource objectives and site-specific, abiotic factors (e.g., soil texture, precipitation/temperature regimes, and shade conditions). Seed availability and cost, ease of establishment, seed production, and competitive ability also would be important considerations.

4.0 Priorities for Treatments

For many refuges, the magnitude (number, distribution, and sizes of infestations) of pest problems is too extensive and beyond the available capital resources to effectively address during any single field season. To manage pests in the Refuge, it would be essential to prioritize treatment of infestations. Highest priority treatments would be focused on early detection and rapid response to eliminate infestations of new pests, if possible. This would be especially important for aggressive pests potentially impacting species, species groups, communities, and/or habitats associated refuge purpose(s), NWRS resources of concern (federally listed species, migratory birds, selected marine mammals, and interjurisdictional fish), and native species for maintaining/restoring biological integrity, diversity, and environmental health.

The next priority would be treating established pests that appear in one or more previously un-infested areas. Moody and Mack (1988) demonstrated through modeling that small, new outbreaks of invasive plants eventually would infest an area larger than the established, source population. They also found that control efforts focusing on the large, main infestation rather than the new, small satellites reduced the chances of overall success. The lowest priority would be treating large infestations (sometimes monotypic stands) of well established pests. In this case, initial efforts would focus upon containment of the perimeter followed by work to control/eradicate the established infested area. If containment and/or control of a large infestation are not effective, then efforts would focus upon halting pest reproduction or managing source populations. Maxwell et al. (2009) found treating fewer populations that are sources represents an effective long-term strategy to reduce of total number of invasive populations and decreasing meta population growth rates.

Although State listed noxious weeds would always of high priority for management, other pest species known to cause substantial ecological impact would also be considered. For example, cheatgrass may not be listed by a state as noxious, but it can greatly alter fire regimes in shrub steppe habitats resulting in large monotypic stands that displace native bunch grasses, forbs, and shrubs. Propagules of many invasive plant species can remain viable in the seedbank for years or decades. Therefore, pest control would likely require a multi-year commitment from the refuge staff. Essential to the long-term success of pest management would be pre- and post-treatment monitoring, assessment of the successes and failures of treatments and development of new approaches when proposed methods do not achieve desired outcomes.

5.0 Best Management Practices (BMPs)

BMPs can minimize or eliminate possible effects associated with pesticide usage to non-target species and/or sensitive habitats as well as degradation of water quality from drift, surface runoff, or leaching. Based upon the Department of Interior Pesticide Use Policy (517 DM 1) and and the Service 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.

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 makeup water in the sprayer tank and applied to treatment areas.
- The refuge staff would follow label recommendations when disposing of empty, triple rinsed pesticide containers.
- All unused pesticides would be properly discarded at a local “safe send” collection.

- Pesticides and pesticide containers would be lawfully stored, handled, and disposed of in accordance with the label and in a manner safeguarding human health, fish, and wildlife and prevent soil and water contaminant.
- The refuge staff would consider the water quality parameters (e.g., pH, hardness) that are important to ensure greatest efficacy where specified on the pesticide label.
- All pesticide spills would be addressed immediately using procedures identified in the refuge spill respond plan.

5.2 Applying Pesticides

- Pesticide treatments would only be conducted by or under the supervision of Service personnel and non-Service applicators with the appropriate state or BLM certification to safely and effectively conduct these activities on refuge lands and waters.
- The refuge staff would comply with all applicable pesticide use laws and regulations as well as Departmental, Service, and NWRS pesticide-related policies. For example, the refuge staff would use application equipment and apply rates for the specific pest(s) identified on the pesticide label as required under FIFRA.
- Before each treatment season and prior to mixing or applying any product for the first time each season, all applicators would review the labels, MSDSs, and Pesticide Use Proposal (PUPs) for each pesticide, determining the target pest, appropriate mix rate(s), PPE, and other requirements listed on the pesticide label.
- Use no-spray buffers as specified on product labels.
- 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 the largest droplet size that results in uniform coverage while minimizing drift and runoff.
- Applicators would use drift reduction technologies such as low-drift nozzles, where practicable.
- Per label recommendations, spraying would occur during low (average<7 mph and preferably 3 to 5 mph) and consistent direction wind conditions with moderate temperatures (typically <85°F).
- Where possible, applicators would avoid spraying during inversion conditions (often associated with calm and very low wind conditions) that can cause large-scale herbicide drift to non-target areas.
- Equipment would be calibrated regularly to ensure that the proper rate of pesticide is applied to the target area or species.
- Spray applications would be made at the lowest height for uniform coverage of target pests to minimize/eliminate potential drift.
- Spray applications would not be conducted on days with >30 percent forecast for rain within 6 hours, except for pesticides that are rapidly rain fast (e.g., glyphosate in 1 hour) to minimize/eliminate potential runoff.
- Where practicable, applicators would use drift retardant adjuvants during spray applications, especially adjacent to sensitive areas.

- Where practicable, applicators would use a non-toxic dye to aid in identifying target area treated as well as potential over spray or drift. A dye can also aid in detecting equipment leaks. If a leak is discovered, the application would be stopped until repairs can be made to the sprayer.
- For pesticide uses associated with cropland and facilities management, buffers, as appropriate, would be used to protect sensitive habitats, especially wetlands and other aquatic habitats as required by the pesticide label.
- When drift cannot be sufficiently reduced through altering equipment set up and application techniques, buffer zones may be identified to protect sensitive areas downwind of applications.
- Applicators would use scouting for early detection of pests to eliminate unnecessary pesticide applications.
- The refuge staff would consider timing of application so native plants are protected to the extent practicable, while effectively treating invasive plants.
- Where practicable, rinsate from cleaning spray equipment after application would be recaptured and reused or applied to an appropriate pest plant infestation.
- Application equipment (e.g., sprayer, ATV, tractor) would be thoroughly cleaned and PPE would be removed/disposed of on-site by applicators after treatments to eliminate the potential spread of pests.

6.0 Safety

6.1 Personal Protective Equipment

All applicators would wear the specific personal protective equipment (PPE) identified on the pesticide label. The appropriate PPE will be worn at all times during handling, mixing, and applying. Because exposure to concentrated product is usually greatest during mixing, extra care should be taken while preparing pesticide solutions.

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, USEPA and OSHA requirements, and Service policy.

If a respirator is necessary, then the following requirements would be met in accordance with Service safety policy: a written Respirator Program, fit testing, physical examination (including pulmonary function and blood work for contaminants), and proper storage of the respirator.

6.2 Notification

The restricted entry interval (REI) is the time period required after the application at which point someone may safely enter a treated area without PPE. Refuge staff, authorized management agents of the Service, volunteers, and members of the public who could be in or near a pesticide treated area within the stated re-entry time period on the label would be notified about treatment areas. Posting would occur at any site where individuals might inadvertently become exposed to a pesticide during other activities on the Refuge within the stated re-entry period. Where required by the label and/or State-specific regulations, sites would also be posted on its perimeter and at other likely locations of entry. The refuge staff would also notify appropriate private property owners of an intended application, including any private individuals who have requested notification. Special efforts would be made to contact nearby individuals who are beekeepers or who have expressed chemical sensitivities.

6.3 Medical Surveillance

Medical surveillance may be required for Service personnel and approved volunteers who mix, apply, and/or monitor use of pesticides (see 242 FW 7 [Pesticide Users] and 242 FW 4 [Medical Surveillance]). In accordance with 242 FW 7.12A, Service personnel would be medically monitoring if 1 or more of the following criteria is met: exposed or may be exposed to concentrations at or above the published permissible exposure limits or threshold limit values (see 242 FW 4); use pesticides in a manner considered "frequent pesticide use"; or use pesticides in a manner that requires a respirator (see 242 FW 14 for respirator use requirements). In 242 FW 7.7A, "**Frequent Pesticide Use** means when a person applying pesticide handles, mixes, or applies pesticides, with a Health Hazard rating of 3 or higher, for 8 or more hours in any week or 16 or more hours in any 30-day period." Under some circumstances, individuals may be medically monitored who use pesticides infrequently (see section 7.7), experience an acute exposure (sudden, short term), or use pesticides with a health hazard ranking of 1 or 2. This decision would consider the individual's health and fitness level, the pesticide's specific health risks, and the potential risks from other pesticide-related activities. Refuge cooperators (e.g., cooperative farmers) and other authorized agents (e.g., State and county employees) would be responsible for their own medical monitoring needs and costs.

Standard examinations (at refuge expense) of appropriate refuge staff would be provided by the nearest certified occupational health and safety physician as determined by Federal Occupational Health.

6.4 Certification and Supervision of Pesticide Applicators

Refuge staff or approved volunteers handling, mixing, and/or applying or directly supervising others engaged in pesticide use activities would be trained and State or federally (BLM) licensed to apply pesticides to refuge lands or waters. In accordance with 242 FW 7.18A, certification is required to apply restricted use pesticides based upon USEPA regulations. For safety reasons, all individuals participating in pest management activities with general use pesticides also are encouraged to attend appropriate training or acquire pesticide applicator certification. The certification requirement would be for a commercial or private applicator depending upon the state. Documentation of training would be kept in the files at the refuge office.

6.5 Record Keeping

6.5.1 Labels and material safety data sheets

Pesticide labels and material safety data sheets (MSDSs) would be maintained at the refuge shop and laminated copies in the mixing area. These documents also would be carried by field applicators, where practicable. A written reference (e.g., note pad, chalk board, dry erase board) for each tank to be mixed would be kept in the mixing area for quick reference while mixing is in progress. In addition, approved PUPs stored in the PUPS database typically contain website links (URLs) to pesticide labels and MSDSs.

6.5.2 Pesticide use proposals (PUPs)

A PUP would be prepared for each proposed pesticide use associated with annual pest management on refuge lands and waters. A PUP would include specific information about the proposed pesticide use including the common and chemical names of the pesticide(s), target pest species, size and location of treatment site(s), application rate(s) and method(s), and federally listed species determinations, where applicable.

In accordance with Service guidelines (Director's memo [December 12, 2007]), a refuge staff may receive up to five-year approvals for Washington Office and field reviewed proposed pesticide uses based upon meeting identified criteria including an approved IPM plan, where necessary (see http://www.fws.gov/contaminants/Issues/IPM.cfm). For a refuge, an IPM plan (requirements described herein) can be completed independently or in association with a CCP or HMP if IPM strategies and potential environmental effects are adequately addressed within appropriate NEPA documentation.

PUPs would be created, approved or disapproved, and stored as records in the Pesticide Use Proposal System (PUPS), which is a centralized database on the Service's intranet (https://systems.fws.gov/pups). Only Service employees can access PUP records in this database.

6.5.3 Pesticide usage

In accordance with 569 FW 1, the refuge Project Leader would be required to maintain records of all pesticides annually applied on lands or waters under refuge jurisdiction. This would encompass pesticides applied by other Federal agencies, State and county governments, non-government applicators including cooperators and their pest management service providers with Service permission. For clarification, pesticide means all insecticides, insect and plant growth regulators, desiccants, herbicides, fungicides, rodenticides, acaricides, nematicides, fumigants, avicides, and piscicides.
The following usage information can be reported for approved PUPs in the PUPS database:

- Pesticide trade name(s)
- Active ingredient(s)
- Total acres treated
- Total amount of pesticides used (lbs or gallons)
- Total amount of active ingredient(s) used (lbs)
- Target pest(s)
- Efficacy (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.

7.0 Evaluating Pesticide Use Proposals

Pesticides would only be used on refuge lands for habitat management as well as croplands/facilities maintenance after approval of a PUP. In general, proposed pesticide uses on refuge lands would only be approved where there would likely be minor, temporary, or localized effects to fish and wildlife species as well as minimal potential to degrade environmental quality. Potential effects to listed and non-listed species would be evaluated with quantitative ecological risk assessments and other screening measures. Potential effects to environmental quality would be based upon pesticide characteristics of environmental fate (water solubility, soil mobility, soil persistence, and volatilization) and other quantitative screening tools. Ecological risk assessments as well as characteristics of environmental fate and potential to degrade environmental quality for pesticides would be documented in Chemical Profiles (see Section 7.5). These profiles would include threshold values for quantitative measures of ecological risk assessments and screening tools for environmental fate that represent minimal potential effects to species and environmental quality. In general, only pesticide uses with appropriate BMPs (see Section 4.0) for habitat management and cropland/facilities maintenance on refuge lands that would potentially have minor, temporary, or localized effects on refuge biological and environmental quality (threshold values not exceeded) would be approved.

7.1 Overview of Ecological Risk Assessment

An ecological risk assessment process would be used to evaluate potential adverse effects to biological resources as a result of a pesticide(s) proposed for use on refuge lands. It is an established quantitative and qualitative methodology for comparing and prioritizing risks of pesticides and conveying an estimate of the potential risk for an adverse effect. This quantitative methodology provides an efficient mechanism to integrate best available scientific information regarding hazard, patterns of use (exposure), and dose-response relationships in a manner that is useful for ecological risk decision-making. It would provide an effective way to evaluate potential effects where there is missing or unavailable scientific information (data gaps) to address reasonable, foreseeable adverse effects in the field as required under 40 CFR Part 1502.22. Protocols for ecological risk assessment of pesticide uses on the refuge were developed through research and established by the US Environmental Protection Agency (USEPA 2004). Assumptions for these risk assessments are presented in Section 6.2.3.

The toxicological data used in ecological risk assessments are typically results of standardized laboratory studies provided by pesticide registrants to the USEPA to meet regulatory requirements under the Federal Insecticide, Fungicide and Rodenticide Act of 1996 (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 7.5.

Table 1. Ecotoxicity tests used to evaluate potential effects to birds, fish, and mammals to establish toxicity endpoints for risk quotient calculations.

Species Group	Exposure	Measurement endpoint
Bird	Acute	Median Lethal Concentration (LC_{50})
	Chronic	No Observed Effect Concentration (NOEC) or No Observed Adverse Effect Concentration (NOAEC)[1]
Fish	Acute	Median Lethal Concentration (LC_{50})
	Chronic	No Observed Effect Concentration (NOEC) or No Observed Adverse Effect Concentration (NOAEC)[2]
Mammal	Acute	Oral Lethal Dose (LD_{50})
	Chronic	No Observed Effect Concentration (NOEC) or No Observed Adverse Effect Concentration (NOAEC)[3]

[1]Measurement endpoints typically include a variety of reproductive parameters (e.g., number of eggs, number of offspring, eggshell thickness, and number of cracked eggs).
[2]Measurement endpoints for early life stage/life cycle typically include embryo hatch rates, time to hatch, growth, and time to swim-up.
[3]Measurement endpoints include maternal toxicity, teratogenic effects, or developmental anomalies, evidence of mutagenicity or genotoxicity, and interference with cellular mechanisms such as DNA synthesis and DNA repair.

7.2 Determining Ecological Risk to Fish and Wildlife

The potential for pesticides used on the Refuge to cause direct adverse effects to fish and wildlife would be evaluated using USEPA's Ecological Risk Assessment Process (US Environmental Protection Agency 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 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 US Environmental Protection Agency (1998 [Table 2]). The LOC represents a quantitative threshold value for screening potential adverse effects to fish and wildlife resources associated with pesticide use. The following are four exposure-species group scenarios that would be used to characterize ecological risk to fish and wildlife on 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 Endangered Species Act of 1973 (16 USC 1531-1544, 87 Stat. 884, as amended-Public Law 93-205). For listed species, potential adverse effects would be assessed at the individual level because loss of individuals from a population could detrimentally impact a species. In contrast, risks to nonlisted species would consider effects at the population level. A RQ<LOC would indicate the proposed pesticide use "may affect, not likely to adversely affect" individuals (listed species) and it would not pose an unacceptable risk for adverse effects to populations (non-listed species) for each taxonomic group (Table 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 2. Presumption of unacceptable risk for birds, fish, and mammals (US Environmental Protection Agency 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	1.0	1.0
	Fish	1.0	1.0
	Mammals	1.0	1.0

7.2.1 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 may be bound to soil particles or organic matter and may be transformed by soil micro-organisms or chemical processes. Pesticides applied directly to the soil may be washed off the soil into nearby bodies of surface water (e.g., surface runoff) or may percolate through the soil to lower soil layers and groundwater (e.g., leaching) (Baker and Miller 1999, Pope et al. 1999, Butler et al. 1998, Ramsay et al. 1995, EXTOXNET 1993*a*). 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).

7.2.1.1 Terrestrial exposure

The estimated environmental concentration (ECC) for exposure to terrestrial wildlife would be quantified using an USEPA screening-level approach (US Environmental Protection Agency 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.

7.2.1.1.1 Terrestrial-spray application

For spray applications, exposure would be determined using the Kanaga nomogram method (US Environmental Protection Agency 2005*a*, US Environmental Protection Agency 2004, Pfleeger et al. 1996) through the USEPA's Terrestrial Residue Exposure model (T-REX) version 1.2.3 (US Environmental Protection Agency 2005*b*). To estimate the maximum (initial) pesticide residue on short grass (<20 cm tall) as a general food item category for terrestrial vertebrate species, T-REX input variables would include the following from the pesticide label: maximum pesticide application rate (pounds active ingredient [acid equivalent]/acre) and pesticide half-life (days) in soil. Although there are other food item categories (tall grasses; broadleaf plants and small insects; and fruits, pods, seeds and large insects), short grass was selected because it would yield maximum EECs (240 ppm per lb ai/acre) for 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 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 3. Average body weight of selected terrestrial wildlife species frequently used in research to establish toxicological endpoints (Dunning 1984).

Species	Body Weight (kg)
Mammal (15 g)	0.015
House sparrow	0.0277
Mammal (35 g)	0.035
Starling	0.0823
Red-winged blackbird	0.0526
Common grackle	0.114
Japanese quail	0.178
Bobwhite quail	0.178
Rat	0.200
Rock dove (aka pigeon)	0.542
Mammal (1000 g)	1.000
Mallard	1.082
Ring-necked pheasant	1.135

7.2.1.1.2 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 3). An adjustment to surface area calculations would be made for broadcast, banded, and in-furrow applications. An adjustment also would be made for applications with and without incorporation of the granules. Without incorporation, it would be assumed that 100 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}/ft^2) for comparison to USEPA Level of Concerns (US Environmental Protection Agency 1998). The T-REX version 1.2.3 (US Environmental Protection Agency 2005b) contains a submodel which 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.

$$\text{mg a.i./ft.}^2 = [(\text{lbs. product/acre})(\%\ \text{a.i.})(453{,}580\ \text{mg/lbs})(1\%\ \text{exposed}))] / \{[(43{,}560\ \text{ft.}^2/\text{acre})/(\text{row spacing (ft.)})] / (\text{row spacing (ft.)}\}$$

or

$$\text{mg a.i./ft}^2 = [(\text{lbs product/1000 ft. row})(\%\ \text{a.i.})(1000\ \text{ft row})(453{,}580\ \text{mg/lb.})(1\%\ \text{exposed})$$

$$EEC = [(\text{mg a.i./ft.}^2)(\%\ \text{of pesticide biologically available})]$$

- Incorporated banded treatments assume that 15% of granules, bait, seeds are unincorporated.

$$\text{mg a.i./ft.}^2 = [(\text{lbs. product/1000 row ft.})(\%\ \text{a.i.})(453{,}580\ \text{mg/lb.})(1\text{-}\%\ \text{incorporated})] / (1{,}000\ \text{ft.})(\text{band width (ft.)})$$

$$EEC = [(\text{mg a.i./ft.}^2)(\%\ \text{of pesticide biologically available})]$$

- Broadcast treatment without incorporation assumes 100 percent of granules, bait, seeds are unincorporated.

$$\text{mg a.i./ft.}^2 = [(\text{lbs. product/acre})(\%\ \text{a.i.})(453{,}590\ \text{mg/lb.})] / (43{,}560\ \text{ft.}^2/\text{acre})$$

$$EEC = [(\text{mg a.i./ft.}^2)(\%\ \text{of pesticide biologically available})]$$

Where:

- % of pesticide biologically available = 100% without species specific ingestion rates
- Conversion for calculating mg a.i./ft.^{2} using ounces: 453,580 mg/lb. /16 = 28,349 mg/oz.

The following equation would 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 3) of the surrogate.

$$RQ = EEC / [LD_{50}\ (\text{mg/kg}) * \text{body weight (kg)}]$$

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.

7.2.1.2 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.

7.2.1.2.1 Habitat treatments

For the worst-case exposure scenario to non-target aquatic habitats, EECs (Table 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 4.2) would likely minimize/eliminate potential drift to non-target aquatic habitats during actual treatments. If there would be unacceptable (acute or chronic) risk to fish and wildlife with the simulated 100 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 4. Estimated Environmental Concentrations (ppb) of pesticides in aquatic habitats (1 foot depth) immediately after direct application (Urban and Cook 1986).

Lbs/acre	EEC (ppb)
0.10	36.7
0.20	73.5
0.25	91.9
0.30	110.2
0.40	147.0
0.50	183.7
0.75	275.6
1.00	367.5
1.25	459.7
1.50	551.6
1.75	643.5
2.00	735.7
2.25	827.6
2.50	919.4
3.00	1103.5
4.00	1471.4
5.00	1839
6.00	2207
7.00	2575
8.00	2943
9.00	3311
10.00	3678

7.2.1.2.2 Cropland/facilities maintenance treatments

Field drift studies conducted by the Spray Drift Task Force, which is a joint project of several agricultural chemical businesses, were used to develop a generic spray drift database. From this database, the AgDRIFT computer model was created to satisfy USEPA pesticide registration spray drift data requirements and as a scientific basis to evaluate off-target movement of pesticides from particle drift and assess potential effects of exposure to wildlife. Several versions of the computer model have been developed (i.e., v2.01 through v2.10). The Spray Drift Task Force AgDRIFT® model version 2.01 (SDTF 2003, AgDRIFT 2001) would be used to derive EECs resulting from drift of pesticides to refuge aquatic resources from ground-based pesticide applications >25 feet from the high water mark. The Spray Drift Task Force AgDRIFT model is publicly available at http://www.agdrift.com. At this website, click "AgDRIFT 2.0" and then click "Download Now" and follow the instructions to obtain the computer model.

The AgDRIFT model is composed of submodels called tiers. Tier I Ground submodel would be used to assess ground-based applications of pesticides. Tier outputs (EECs) would be calculated with AgDRIFT using the following input variables: max application rate (acid basis [see above]), low boom (20 inches), fine to medium droplet size, EPA-defined wetland, and a ≥25-foot distance (buffer) from treated area to water.

7.2.2 Use of information on effects of biological control agents, pesticides, degradates, and adjuvants

NEPA documents regarding biological and other environmental effects of biological control agents, pesticides, degradates, and adjuvants prepared by another Federal agency, where the scope would be relevant to evaluation of effects from pesticide uses on refuge lands, would be reviewed. Possible source agencies for such NEPA documents would include the Bureau of Land Management, US Forest Service, National Park Service, US Department of Agriculture-Animal and Plant Health Inspection Service, and the military services. It might be appropriate to incorporate by reference parts or all of existing document(s). Incorporating by reference (40 CFR 1502.21) is a technique used to avoid redundancies in analysis. It also would reduce the bulk of a Service NEPA document, which only would identify the documents that are incorporated by reference. In addition, relevant portions would be summarized in the Service NEPA document to the extent necessary to provide the decision maker and public with an understanding of relevance of the referenced material to the current analysis.

In accordance with the requirements set forth in 43 CFR 46.135, the Service would specifically incorporate through reference ecological risk assessments prepared by the US Forest Service (http://www.fs.fed.us/r6/invasiveplant-eis/Risk-Assessments/Herbicides-Analyzed-InvPlant-EIS.htm) and Bureau of Land Management (http://www.blm.gov/wo/st/en/prog/more/veg_eis.html). These risk assessments and associated documentation also are available in total with the administrative record for the Final Environmental Impact Statement entitled *Pacific Northwest Region Invasive Plant Program – Preventing and Managing Invasive Plants* (US Forest Service 2005) and *Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic EIS (PEIS)* (Bureau of Land Management 2007). In accordance with 43 CFR 46.120(d), use of existing NEPA documents by supplementing, tiering to, incorporating by reference, or adopting previous NEPA environmental analyses would avoid redundancy and unnecessary paperwork.

As a basis for completing “Chemical Profiles” for approving or disapproving refuge PUPs, ecological risk assessments for the following herbicide and adjuvant uses prepared by the US Forest Service would be incorporated by reference:

- 2,4-D
- 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 Bureau of Land Management would be incorporated by reference:

- Bromacil
- Chlorsulfuron
- Diflufenzopyr
- Diquat
- Diuron
- Fluridone
- Imazapic
- Overdrive (diflufenzopyr and dicamba)
- Sulfometuron methyl
- Tebuthiuron
- Pesticide degradates and adjuvants (*Appendix D – Evaluation of risks from degradates, polyoxyethylene-amine (POEA) and R-11, and endocrine disrupting chemicals*)

7.2.3 Assumptions for ecological risk assessments

There are a number of assumptions involved with the ecological risk assessment process for terrestrial and aquatic organisms associated with utilization of the US Environmental Protection Agency’s (2004) process. These assumptions may be risk neutral or may lead to an over- or under-estimation of risk from pesticide exposure depending upon site-specific conditions. The following describes these assumptions, their application to the conditions typically encountered, and whether or not they may lead to recommendations that are risk neutral, underestimate, or overestimate ecological risk from potential pesticide exposure.

- Indirect effects would not be evaluated by ecological risk assessments. These effects include the mechanisms of indirect exposure to pesticides: consuming prey items (fish, birds, or small mammals), reductions in the availability of prey items, and disturbance associated with pesticide application activities.
- Exposure to a pesticide product can be assessed based upon the active ingredient. However, exposure to a chemical mixture (pesticide formulation) may result in effects that are similar or substantially different compared to only the active ingredient. Non-target organisms may be exposed directly to the pesticide formulation or only various constituents of the formulation as they dissipate and partition in the environment. If toxicological information for both the active ingredient and formulated product are available, then data representing the greatest potential toxicity would be selected for use in the risk assessment process (US Environmental Protection Agency 2004). As a result, this conservative approach may lead to an overestimation of risk characterization from pesticide exposure.
- Because toxicity tests with listed or candidate species or closely related species are not available, data for surrogate species would be most often used for risk assessments. Specifically, bobwhite quail and mallard duck are the most frequently used surrogates for evaluating potential toxicity to federally listed avian species. Bluegill sunfish, rainbow trout, and fathead minnow are the most common surrogates for evaluating toxicity for freshwater fishes. However, sheep's head minnow can be an appropriate surrogate marine species for coastal environments. Rats and mice are the most common surrogates for evaluating toxicity for mammals. Interspecies sensitivity is a major source of uncertainty in pesticide assessments. As a result of this uncertainty, data are selected for the most sensitive species tested within a taxonomic group (birds, fish, and mammals) given the quality of the data is acceptable. If additional toxicity data for more species of organisms in a particular group are available, the selected data 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 which elicited a toxicological response.
- Using maximum EECs for chronic risk estimates may result in an overestimate of risk, particularly for compounds that dissipate rapidly. Conversely, using TWAs for chronic risk estimates may underestimate risk if it is the concentration rather than the duration of exposure that is primarily responsible for the observed adverse effect. The maximum EEC would be used for chronic risk assessments although it may result in an overestimate of risk.

TWAs may be used for chronic risk assessments, but they will be applied judiciously considering the potential for an underestimate or overestimate of risk. For example, the number of days exposure exceeds a Level of Concern may influence the suitability of a pesticide use. The greater the number of days the EEC exceeds the Level of Concern translates into greater the ecological risk. This is a qualitative assessment, and is subject to reviewer's expertise in ecological risk assessment and tolerance for risk.

- The length of time used to calculate the TWA can have a substantial effect on the exposure estimates and there is no standard method for determining the appropriate duration for this estimate. The T-REX model assumes a 21-week exposure period, which is equivalent to avian reproductive studies designed to establish a steady-state concentration for bioaccumulative compounds. However, this does not necessarily define the true exposure duration needed to elicit a toxicological response. Pesticides, which do not bioaccumulate, may achieve a steady-state concentration earlier than 21 weeks. The duration of time for calculating TWAs 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 it can be misleading particularly if the compound is prone to "wash-off." Soil half-life is the most common degradation data available. Dissipation or degradation data that would reflect the environmental conditions typical of refuge lands would be 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 (US Environmental Protection Agency 2004).
- Exposure through incidental ingestion of pesticide contaminated soil is not considered in the USEPA 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 USEPA risk assessment protocols. Such exposure may occur through three potential sources: spray material in droplet form at time of application, vapor phase with the pesticide volatilizing from treated surfaces, and airborne particulates (soil, vegetative matter, and pesticide dusts). The USEPA (1990) reported exposure from inhaling spray droplets at the time of application is not an appreciable route of exposure for birds. According to research on mallards and bobwhite quail, respirable particle size (particles reaching the lung) in birds is limited to maximum diameter of 2 to 5 microns. The spray droplet spectra covering the majority of pesticide application scenarios indicate that less than 1 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 USEPA is currently evaluating protocols for modeling inhalation exposure from pesticides including near-field and near-ground air concentrations based upon equilibrium and kinetics-based models. Risk characterization for exposure with this mechanism is unavailable.
- The effect from exposure to dusts contaminated with the pesticide cannot be assessed generically as partitioning issues related to application site soils and chemical properties of the applied pesticides render the exposure potential from this route highly situation specific.
- Dermal exposure may occur through three potential sources: direct application of spray to terrestrial wildlife in the treated area or within the drift footprint, incidental contact with contaminated vegetation, or contact with contaminated water or soil. Interception of spray and incidental contact with treated substrates may pose risk to avian wildlife (Driver et al. 1991). However, available research related to wildlife dermal contact with pesticides is extremely limited, except dermal toxicity values are common for some mammals used as human surrogates (rats and mice). The USEPA is currently evaluating protocols for modeling dermal exposure. Risk characterization may be underestimated for this route of exposure, particularly with high risk pesticides such as some organophosphates or carbamate insecticides. If protocols are established by the USEPA for assessing dermal exposure to pesticides, they 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 USEPA is actively developing protocols to quantify drinking water exposures from puddles and dew. If and when protocols are formally established by the USEPA for assessing exposure to pesticides through drinking water, these protocols 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 USEPA relies on Fletcher (1994) for setting the assumed pesticide residues in wildlife dietary items. The USEPA (2004) "believes that these residue assumptions reflect a realistic upper-bound residue estimate, although the degree to which this assumption reflects a specific percentile estimate is difficult to quantify." Fletcher's (1994) research suggests that the pesticide active ingredient residue assumptions used by the USEPA represent a 95th percentile estimate. However, research conducted by Pfleeger et al. (1996) indicates USEPA residue assumptions for short grass was not exceeded. Behr and Habig (2000) compared USEPA residue assumptions with distributions of measured pesticide residues for the USEPA's UTAB database. Overall residue selection level will tend to overestimate risk characterization. This is particularly evident when wildlife individuals are likely to have selected a variety of food items acquired from multiple locations. Some food items may be contaminated with pesticide residues whereas others are not contaminated. However, it is important to recognize differences in species feeding behavior. Some species may consume whole above-ground plant material, but others will preferentially select different plant structures. Also, species may preferentially select a food item although multiple food items may be present. Without species specific knowledge regarding foraging behavior characterizing ecological risk other than in general terms is not possible.
- Acute and chronic risk assessments rely on comparisons of wildlife dietary residues with 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 USEPA relies on chronic exposure toxicity endpoints based on a finding of no observed effect, the potential for any latent toxicity effects or averaging time assumptions to alter the results of an acceptable chronic risk assessment prediction is limited. The extent to which duration of exposure from water-borne concentrations overestimate or underestimate actual exposure depends on several factors. These include the following: localized meteorological conditions, runoff characteristics of the watershed (e.g., soils, topography), the hydrological characteristics of receiving waters, environmental fate of the pesticide active ingredient, and the method of pesticide application. It should also be understood that chronic effects studies are performed using a method that holds water concentration in a steady state. This method is not likely to reflect conditions associated with pesticide runoff. Pesticide concentrations in the field increase and decrease in surface water on a cycle influenced by rainfall, pesticide

use patterns, and degradation rates. As a result of the dependency of this assumption on several undefined variables, risk associated with chronic exposure may in some situations underestimate risk and overestimate risk in others.

- There are several other factors that can affect non-target species not considered in the risk assessment process. These would include the following: possible additive or synergistic effects from applying two or more pesticides or additives in a single application, co-location of pesticides in the environment, cumulative effects from pesticides with the same mode of action, effects of multiple stressors (e.g., combination of pesticide exposure, adverse abiotic [not pesticides] and biotic factors), and sub-lethal effects such as behavioral changes induced by exposure to a pesticide. These factors may exist at some level contributing to adverse effects to non-target species, but they are not routinely assessed by regulatory agencies. Therefore, information on the factors is not extensive limiting their value for the risk assessment process. As this type of information becomes available, it would be included, either quantitatively or qualitatively, in this risk assessment process.
- USEPA is required by the Food Quality Protection Act to assess the cumulative risks of pesticides that share common mechanisms of toxicity, or act the same within an organism. Currently, USEPA has identified four groups of pesticides that have a common mechanism of toxicity requiring cumulative risk assessments. These four groups are: the organophosphate insecticides, N-methyl carbamate insecticides, triazine herbicides, and chloroacetanilide herbicides.

7.3 Pesticide Mixtures and Degradates

Pesticide products are usually a formulation of several components generally categorized as active ingredients and inert or other ingredients. The term active ingredient is defined by the FIFRA as preventing, destroying, repelling, or mitigating the effects of a pest, or it is a plant regulator, defoliant, desiccant, or nitrogen stabilizer. In accordance with FIFRA, the active ingredient(s) must be identified by name(s) on the pesticide label along with its relative composition expressed in percentage(s) by weight. In contrast, inert ingredient(s) are not intended to affect a target pest. Their role in the pesticide formulation is to act as a solvent (keep the active ingredient 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. FIFRA only requires that inert ingredients identified as hazardous and associated percent composition, and the total percentage of all inert ingredients must be declared on a product label. Inert ingredients that are not classified as hazardous are not required to be identified.

The USEPA (September 1997) issued Pesticide Regulation Notice 97-6 which encouraged manufacturers, formulators, producers, and registrants of pesticide products to voluntarily substitute the term “other ingredients” for “inert ingredients” in the ingredient statement. This change recognized that all components in a pesticide formulation potentially could elicit or contribute to an adverse effect on non-target organisms and, therefore, are not necessarily inert. Whether referred to as “inerts” or “other ingredients,” these constituents within a pesticide product have the potential to affect species or environmental quality. The USEPA categorizes regulated inert ingredients into the following four lists (http://www.epa.gov/opprd001/inerts/index.html):

- List 1 – Inert Ingredients of Toxicological Concern

- List 2 – Potentially Toxic Inert Ingredients
- List 3 – Inerts of Unknown Toxicity
- List 4 – Inerts of Minimal Toxicity

Several of the List 4 compounds are naturally-occurring earthen materials (e.g., clay materials, simple salts) that would not elicit toxicological response at applied concentrations. However, some of the inerts (particularly the List 3 compounds and unlisted compounds) may have moderate to high potential toxicity to aquatic species based on MSDSs or published data.

Comprehensively assessing potential effects to non-target fish, wildlife, plants, and/or their habitats from pesticide use is a complex task. It would be preferable to assess the cumulative effects from exposure to the active ingredient, its degradates, and inert ingredients as well as other active ingredients in the spray mixture. However, it would only be feasible to conduct deterministic risk assessments for each component in the spray mixture singly. Limited scientific information is available regarding ecological effects (additive or synergistic) from chemical mixtures that typically rely upon broadly encompassing assumptions. For example, the US Forest Service (2005) found that mixtures of pesticides used in land (forest) management likely would not cause additive or synergistic effects to non-target species based upon a review of scientific literature regarding toxicological effects and interactions of agricultural chemicals (ATSDR 2004, US EPA-ORD 2000). Moreover, information on inert ingredients, adjuvants, and degradates is often limited by the availability of and access to reliable toxicological data for these constituents.

Toxicological information regarding “other ingredients” may be available from sources such as the following:

- TOMES (a proprietary toxicological database including USEPA’s IRIS, the Hazardous Substance Data Bank, the Registry of Toxic Effects of Chemical Substances [RTECS]).
- USEPA’s ECOTOX database, which includes AQUIRE (a database containing scientific papers published on the toxic effects of chemicals to aquatic organisms).
- TOXLINE (a literature searching tool).
- Material Safety Data Sheets (MSDSs) from pesticide suppliers.
- Other sources such as the Farm Chemicals Handbook.

Because there is a lack of specific inert toxicological data, inert(s) in a pesticide may cause adverse ecological effects. However, inert ingredients typically represent only a small percentage of the pesticide spray mixture, and it would be assumed that negligible effects would be expected to result from inert ingredient(s).

Although the potential effects of degradates should be considered when selecting a pesticide, it is beyond the scope of this assessment process to consider all possible breakdown chemicals of the various product formulations containing an active ingredient. Degradates may be more or less mobile and more or less hazardous in the environment than their parent pesticides (Battaglin et al. 2003). Differences in environmental behavior (e.g., mobility) and toxicity between parent pesticides and degradates would make assessing potential 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 USEPA-approved label specifies whether a product can be mixed with one or more pesticides. Without product-specific toxicological data, it would not possible to quantify the potential effects of these mixtures. In addition, a quantitative analysis could only be conducted if reliable scientific information allowed a determination of whether the joint action of a mixture would be additive, synergistic, or antagonistic. Such information would not likely exist unless the mode of action would be common among the chemicals and receptors. Moreover, the composition of and exposure to mixtures would be highly site- and/or time-specific and, therefore, it would be nearly impossible to assess potential effects to species and environmental quality.

To minimize or eliminate potential negative effects associated with applying two or more pesticides as a mixture, the use would be conducted in accordance with the labeling requirements. Labels for two or more pesticides applied as a mixture should be completely reviewed, where products with the least potential for negative effects would be selected for use on the Refuge. This is especially relevant when a mixture would be applied in a manner that may already have the potential for an effect(s) associated with an individual pesticide (e.g., runoff to ponds in sandy watersheds). Use of a tank mix under these conditions would increase the level of uncertainty in terms of risk to species or potential to degrade environmental quality.

Adjuvants generally function to enhance or prolong the activity of pesticide. For terrestrial herbicides, adjuvants aid in the absorption into plant tissue. Adjuvant is a broad term that generally applies to surfactants, selected oils, anti-foaming agents, buffering compounds, drift control agents, compatibility agents, stickers, and spreaders. Adjuvants are not under the same registration requirements as pesticides and the USEPA does not register or approve the labeling of spray adjuvants. Individual pesticide labels identify types of adjuvants approved for use with it. In general, adjuvants compose a relatively small portion of the volume of pesticides applied. Selection of adjuvants with limited toxicity and low volumes would be recommended to reduce the potential for the adjuvant to influence the toxicity of the pesticide.

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; and/or
- Dissolve in water that can be subjected to runoff or leaching.

As an initial screening tool, selected chemical characteristics and rating criteria for a pesticide can be evaluated to assess potential to enter ground and/or surface waters. These would include the following: persistence, sorption coefficient (K_{oc}), groundwater ubiquity score (GUS), and solubility.

Persistence, which is expressed as half-life ($t_{½}$), 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 the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days (Kerle et al. 1996). Half-life data are usually available for aquatic and terrestrial environments.

Another measure of pesticide persistence is dissipation time (DT_{50}). It represents the time required for 50 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 (µg/g) that can range from near zero to the thousands. Pesticides with higher Koc 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 (US Geological Survey 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.

$$GUS = \log10\ (t½) \times [4 - \log10\ (Koc)]$$

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 http://npic.orst.edu/ppdmove.htm. Many of the values in this database were derived from the SCS/ARS/CES Pesticide Properties Database for Environmental Decision Making (Wauchope et al. 1992).

Soil properties influence the fate of pesticides in the environment. The following six properties are mostly likely to affect pesticide degradation and the potential for pesticides to move off-site by leaching (vertical movement through the soil) or runoff (lateral movement across the soil surface).

- Permeability is the rate of water movement vertically through the soil. It is affected by soil texture and structure. Coarse textured soils (e.g., high sand content) have a larger pore size and they are generally more permeable than fine textured soils (i.e., high clay content). The more permeable soils would have a greater potential for pesticides to move vertically down through the soil profile. Soil permeability rates (inches/hour) are usually available in county soil survey reports.
- Soil texture describes the relative percentage of sand, silt, and clay. In general, greater clay content with smaller the pore size would lower the likelihood and rate water that would move through the soil profile. Clay also serves to adsorb (bind) pesticides to soil particles. Soils with high clay content would adsorb more pesticide than soils with relatively low clay content. In contrast, sandy soils with coarser texture and lower water holding capacity would have a greater potential for water to leach through them. Coarse texture soils permit higher rates of gas exchange than clay soils and may influence microbial transformation rates depending on whether the primary decomposition pathway is aerobic or anaerobic.
- 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 and infiltration rates (related to the composition of different sized particles as well as physical features such as soil density) 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.

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 (ARS) pesticide database.

7.6 Preparing a Chemical Profile

The following instructions would be used by Service personnel to complete Chemical Profiles for pesticides. Specifically, profiles would be prepared for pesticide active ingredients (e.g., glyphosate, imazapic) that would be contained in one or more trade name products that are registered and labeled with USEPA. All information fields under each category (e.g., Toxicological Endpoints, Environmental Fate) would be completed for a Chemical Profile. If no information is available for a specific field, then "No data are available in references" would be recorded in the profile. Available scientific information would be used to complete Chemical Profiles. Each entry of scientific information would be shown with applicable references.

Completed Chemical Profiles would provide a structured decision-making process 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 5.0), the proposed pesticide's use in a PUP would have a scientific basis for approval under any application rate specified on the label that is at or below rates evaluated in a Chemical Profile. In some cases, the Chemical Profile would include a lower application rate than the maximum labeled rate in order to protect refuge resources. As necessary, Chemical Profiles would be periodically updated with new scientific information or as pesticides with the same active ingredient are proposed for use on the Refuge in PUPs.

Throughout this section, threshold values (to prevent or minimize potential biological and environmental effects) would be clearly identified for specific information presented in a completed Chemical Profile. Comparison with these threshold values provides an explicit scientific basis to approve or disapprove PUPs for habitat management and cropland/facilities maintenance on refuge lands. In general, PUPs would be approved for pesticides with Chemical Profiles where there would be no exceedances of threshold values. However, BMPs are identified for some screening tools that would minimize/eliminate potential effects (exceedance of the threshold value) as a basis for approving PUPs.

Date: Service personnel would record the date when the Chemical Profile is completed or updated. Chemical Profiles (e.g., currently approved pesticide use patterns) would be periodically reviewed and updated, as necessary. The most recent review date would be recorded on a profile to document when it was last updated.

Trade Name(s): Service personnel would accurately and completely record the trade name(s) from the pesticide label, which includes a suffix that describes the formulation (e.g., WP, DG, EC, L, SP, I, II or 64). The suffix often distinguishes a specific product among several pesticides with the same active ingredient. Service personnel would record a trade name for each pesticide product with the same active ingredient.

Common chemical name(s): Service personnel would record the common name(s) listed on the pesticide label or material safety data sheet (MSDS) for an active ingredient. The common name of a pesticide is listed as the active ingredient on the title page of the product label immediately following the trade name, and the MSDS, Section 2: Composition/Information on Ingredients. A Chemical Profile is completed for each active ingredient.

Pesticide Type: Service personnel would record the type of pesticide for an active ingredient as one of the following: herbicide, desiccant, fungicide, fumigant, growth regulator, insecticide, piscicide, or rodenticide.

EPA Registration Number(s): This number (EPA Reg. No.) appears on the title page of the label and MSDS, Section 1: Chemical Product and Company Description. It is not the EPA Establishment Number that is usually located near it. Service personnel would record the EPA Reg. No. for each trade name product with an active ingredient based upon PUPs.

Pesticide Class: Service personnel would list the general chemical class for the pesticide (active ingredient). For example, malathion is an organophosphate and carbaryl is a carbamate.

CAS (Chemical Abstract Service) Number: This number is often located in the second section (Composition/Information on Ingredients) of the MSDS. The MSDS table listing components usually contains this number immediately prior to or following the percent composition.

Other Ingredients: From the most recent MSDS for the proposed pesticide product(s), Service personnel would include any chemicals in the pesticide formulation not listed as an active ingredient that are described as toxic or hazardous, or regulated under the Superfund Amendments and Reauthorization Act (SARA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Toxic Substances Control Act (TSCA), Occupational Safety and Health Administration (OSHA), State Right-to-Know, or other listed authorities. These are usually found in MSDS sections titled "Hazardous Identifications," "Exposure Control/Personal Protection," and "Regulatory Information." If concentrations of other ingredients are available for any compounds identified as toxic or hazardous, then Service personnel would record this information in the Chemical Profile by trade name. MSDS(s) may be obtained from the manufacturer, manufacturer's website or from an on-line database maintained by Crop Data Management Systems, Inc. (see list below).

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 are 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, Service personnel would record available data for oral lethal dose (LD_{50}) in mg/kg-bw (body weight) or ppm-bw. 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 1 in Section 7.1).

Mammalian LC_{50}: For test species in the scientific literature, Service personnel would record available data for dietary lethal concentration (LC_{50}) as reported (e.g., mg/kg-diet or ppm-diet). 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 1 in Section 7.1).

Mammalian Reproduction: For test species listed in the scientific literature, Service personnel would record the test results (e.g., Lowest Observed Effect Concentration [LOEC], Lowest Observed Effect Level [LOEL], No Observed Adverse Effect Level [NOAEL], No Observed Adverse Effect Concentration [NOAEC]) in mg/kg-bw or mg/kg-diet for reproductive test procedure(s) (e.g., generational studies [preferred], fertility, new born weight). Most common test species available in scientific literature are rats and mice. The lowest NOEC, NOAEC, NOEL, or NOAEL test results found for a rat would be used as a toxicological endpoint for RQ calculations to assess chronic risk (see Table 1 in Section 7.1).

Avian LD_{50}: For test species available in the scientific literature, Service personnel would record values for oral lethal dose (LD_{50}) in mg/kg-bw or ppm-bw. 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 1 in Section 7.1).

Avian LC_{50}: For test species available in the scientific literature, Service personnel would record values for dietary lethal concentration (LC_{50}) as reported (e.g., mg/kg-diet or ppm-diet). Most common test species available in scientific literature are the bobwhite quail and mallard. The lowest 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 1 in Section 7.1).

Avian Reproduction: For test species available in the scientific literature, Service personnel would record test results (e.g., LOEC, LOEL, NOAEC, NOAEL) in mg/kg-bw or mg/kg-diet consumed for reproductive test procedure(s) (e.g., early life cycle, reproductive). Most common test species available in scientific literature are the bobwhite quail and mallard. The lowest NOEC, NOAEC, NOEL, or NOAEL test results found for an avian species would be used as a toxicological endpoint for RQ calculations to assess chronic risk (see Table 1 in Section 7.1).

Fish LC_{50}: For test freshwater or marine species listed in the scientific literature, Service personnel would record a LC_{50} in ppm or mg/L. Most common test species available in the scientific literature are the bluegill, rainbow trout, and fathead minnow (marine). Test results for many game species may also be available. The lowest 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 1 in Section 7.1).

Fish Early Life Stage (ELS)/Life Cycle: For test freshwater or marine species available in the scientific literature, Service personnel would record test results (e.g., LOEC, NOAEL, NOAEC, LOAEC) in ppm for test procedure(s) (e.g., early life cycle, life cycle). Most common test species available in the scientific literature are bluegill, rainbow trout, and fathead minnow. Test results for other game species may also be available. The lowest test value found for a fish species (preferably freshwater) would be used as a toxicological endpoint for RQ calculations to assess chronic risk (see Table 1 in Section 7.1).

Other: For test invertebrate as well as non-vascular and vascular plant species available in the scientific literature, Service personnel would record $LC_{50,}$ $LD_{50,}$ LOEC, LOEL, NOAEC, NOAEL, or EC_{50} (environmental concentration) values in ppm or mg/L. Most common test invertebrate species available in scientific literature are the honey bee and the water flea (*Daphnia magna*). Green algae (*Selenastrum capricornutum*) and pondweed (*Lemna minor*) are frequently available test species for aquatic non-vascular and vascular plants, respectively.

Ecological Incident Reports: After a site has been treated with pesticide(s), wildlife may be exposed to these chemical(s). When exposure is high relative to the toxicity of the pesticides, wildlife may be killed or visibly harmed (incapacitated). Such events are called ecological incidents. The USEPA maintains a database (Ecological Incident Information System) of ecological incidents. This database stores information extracted from incident reports submitted by various Federal and State agencies and non-government organizations. Information included in an incident report is date and location of the incident, type and magnitude of effects observed in various species, use(s) of pesticides known or suspected of contributing to the incident, and results of any chemical residue and cholinesterase activity analyses conducted during the investigation.

Incident reports can play an important role in evaluating the effects of pesticides by supplementing quantitative risk assessments. All incident reports for pesticide(s) with the active ingredient and associated information would be recorded.

Environmental Fate

Water Solubility: Service personnel would record values for water solubility (S_w), which describes the amount of pesticide that dissolves in a known quantity of water. S_w is expressed as mg/L (ppm). Pesticide S_w values would be categorized as one of the following: insoluble <0.1 ppm, moderately soluble = 100 to 1000 ppm, highly soluble >10,000 ppm (US Geological Survey 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: Service personnel would record available values for soil adsorption coefficient (K_{oc} [μg/g]). It provides a measure of a chemical's mobility and leaching potential in soil. K_{oc} values are directly proportional to organic content, clay content, and surface area of the soil. K_{oc} data for a pesticide may be available for a variety of soil types (e.g., clay, loam, sand).

K_{oc} values would be used in evaluating the potential to degrade groundwater by leaching (see **Potential to Move to Groundwater** below).

Soil Persistence: Service personnel would record values for soil half-life ($t_{½}$), 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 one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days.

Threshold for Approving PUPs:

If soil DT_{50} ≤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: Service 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 one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days (Kerle et al. 1996).

Threshold for Approving PUPs:

If aquatic $t_{½}$ ≤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 one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days.

Threshold for Approving PUPs:

If aquatic DT_{50} ≤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) = $\log_{10}$(soil $t_{½}$) x [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 one of the following categories: extremely low potential<1.0, low - 1.0 to 2.0, moderate - 2.0 to 3.0, high - 3.0 to 4.0, or very high>4.0.

Threshold for Approving PUPs:

If GUS ≤4.0, then a PUP would be approved without additional BMPs to protect water quality.

*If GUS >4.0, then a PUP would only be approved with additional BMPs specifically to protect water quality. One or more BMPs such as the following would be included in the **Specific Best Management Practices (BMPs) section** to minimize potential surface runoff and leaching that can degrade water quality:*

- *Do not exceed one application per site per year.*
- *Do not use on coarse-textured soils where the 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 (ARS) pesticide database (see **References**).

Threshold for Approving PUPs:

If $I \leq 1000$, 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 (US Geological Survey 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 one of the following: low – 0 to 300, moderate – 300 to 1,000, or high >1,000 (Calabrese and Baldwin 1993).

Threshold for Approving PUPs:

If BAF or BCF≤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): Service personnel would record the highest application rate of an active ingredient (ae basis) for habitat management and cropland/facilities maintenance treatments in this data field of a Chemical Profile. These rates can be found in Table CP.1 under the column heading "Max Product Rate – Single Application (lbs/acre – AI on acid equiv basis)". This table would be prepared for a chemical profile from information specified in labels for trade name products identified in PUPs. If these data are not available in pesticide labels, then write "NS" for "not specified on label" in this table.

EECs: An estimated environmental concentration (ECC) represents potential exposure to fish and wildlife (birds and mammals) from using a pesticide. EECs would be derived by Service personnel using an USEPA screening-level approach (US Environmental Protection Agency 2004). For each max application rate [see description under **Max Application Rates (acid equivalent)**], Service personnel would record 2 EEC values in a Chemical Profile; these would represent the worst-case terrestrial and aquatic exposures for habitat management and croplands/facilities maintenance treatments. For terrestrial and aquatic EEC calculations, see description for data entry under **Presumption of Unacceptable Risk/Risk Quotients**, which is the next field for a Chemical Profile.

Presumption of Unacceptable Risk/Risk Quotients: Service personnel would calculate and record acute and chronic risk quotients (RQs) for birds, mammals, and fish using the provided tabular formats for habitat management and/or cropland/facilities maintenance treatments. RQs recorded in a Chemical Profile would represent the worst-case assessment for ecological risk. See Section 7.2 for discussion regarding the calculations of RQs.

For aquatic assessments associated with habitat management treatments, RQ calculations would be based upon selected acute and chronic toxicological endpoints for fish and the EEC would be derived from Urban and Cook (1986) assuming 100 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 Service personnel based upon selected acute and chronic toxicological endpoints for fish and an EEC would be derived from the aquatic assessment in AgDRIFT® model version 2.01 under Tier I ground-based application with the following input variables: max application rate (acid basis [see above]), low boom (20 inches), fine to medium/coarse droplet size, 20 swaths, EPA-defined wetland, and 25-foot distance (buffer) from treated area to water.

See Section 7.2.1.2 for more details regarding the calculation of EECs for aquatic habitats for habitat management and cropland/facilities maintenance treatments.

For terrestrial avian and mammalian assessments, RQ calculations would be done by Service personnel based upon dietary exposure, where the "short grass" food item category would represent the worst-case scenario. For terrestrial spray applications associated with habitat management and cropland/facilities maintenance treatments, exposure (EECs and RQs) would be determined using the Kanaga nomogram method through the USEPA's Terrestrial Residue Exposure model (T-REX) version 1.2.3. T-REX input variables would include the following: max application rate (acid basis [see above]) and pesticide half-life (days) in soil to estimate the initial, maximum pesticide residue concentration on general food items for terrestrial vertebrate species in short (<20 cm tall) grass.

For granular pesticide formulations and pesticide-treated seed with a unique route of exposure for terrestrial avian and mammalian wildlife, see Section 7.2.1.1.2 for the procedure that would be used to calculate RQs.

All calculated RQs in both tables would be compared with Levels of Concern (LOCs) established by USEPA (see Table 2 in Section 7.2). If a calculated RQ exceeds an established LOC value (in brackets inside the table), then there would be a potential for an acute or chronic effect (unacceptable risk) to federally listed (T&E) species and nonlisted species. See Section 7.2 for detailed descriptions of acute and chronic RQ calculations and comparison to LOCs to assess risk.

Threshold for approving PUPs:

If RQs≤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: Service personnel would describe the reason for using the pesticide based control of specific pests or groups of pests. In most cases, the pesticide label will provide the appropriate information regarding control of pests to describe in the section.

Specific Best Management Practices (BMPs): Service personnel would record specific BMPs necessary to minimize or eliminate potential effects to non-target species and/or degradation of environmental quality from drift, surface runoff, or leaching. These BMPs would be based upon scientific information documented in previous data fields of a Chemical Profile. Where necessary and feasible, these specific practices would be included in PUPs as a basis for approval.

If there are no specific BMPs that are appropriate, then Service personnel would describe why the potential effects to refuge resources and/or degradation of environmental quality is outweighed by the overall resource benefit(s) from the proposed pesticide use in the BMP section of the PUP. See Section 4.0 of this document for a complete list of BMPs associated with mixing and applying pesticides appropriate for all PUPs with ground-based treatments that would be additive to any necessary, chemical-specific BMPs.

References: Service personnel would record scientific resources used to provide data/information for a chemical profile. Use the number sequence to uniquely reference data in a chemical profile.

The following on-line data resources are readily available for toxicological endpoint and environmental fate data for pesticides:

1. California Product/Label Database. Department of Pesticide Regulation, California Environmental Protection Agency. (http://www.cdpr.ca.gov/docs/label/labelque.htm#regprods)

2. ECOTOX database. Office of Pesticide Programs, US Environmental Protection Agency, Washington, DC. (http://cfpub.epa.gov/ecotox/)

3. Extension Toxicology Network (EXTOXNET) Pesticide Information Profiles. Cooperative effort of University of California-Davis, Oregon State University, Michigan State University, Cornell University and University of Idaho through Oregon State University, Corvallis, Oregon. (http://extoxnet.orst.edu/pips/ghindex.html)

4. FAO specifications and evaluations for plant protection products. Pesticide Management Unit, Plant Protection Services, Food and Agriculture Organization, United Nations. (http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/Pesticid/)

5. Human health and ecological risk assessments. Pesticide Management and Coordination, Forest Health Protection, US Department of Agriculture, US Forest Service. (http://www.fs.fed.us/foresthealth/pesticide/risk.htm)

6. Pesticide Chemical Fact Sheets. Clemson University Pesticide Information Center. (http://entweb.clemson.edu/pesticid/Document/Labels/factshee.htm)

7. Pesticide Fact Sheets. Published by Information Ventures, Inc. for Bureau of Land Management, Dept. of Interior; Bonneville Power Administration, U.S. Dept. of Energy; and Forest Service, US Department of Agriculture. (http://infoventures.com/e-hlth/pesticide/pest-fac.html)

8. Pesticide Fact Sheets. National Pesticide Information Center. (http://npic.orst.edu/npicfact.htm)

9. Pesticide Fate Database. US Environmental Protection Agency, Washington, DC. (http://cfpub.epa.gov/pfate/home.cfm).

10. Pesticide product labels and material safety data sheets. Crop Data Management Systems, Inc. (CDMS) (http://www.cdms.net/pfa/LUpdateMsg.asp) or multiple websites maintained by agrichemical companies.

11. Registered Pesticide Products (Oregon database). Oregon Department of Agriculture. (http://www.oda.state.or.us/dbs/pest_products/search.lasso)

12. Regulatory notes. Pest Management Regulatory Agency, Health Canada, Ontario, Canada. (http://www.hc-sc.gc.ca/pmra-arla/)

13. Reptile and Amphibian Toxicology Literature. Canadian Wildlife Service, Environment Canada, Ontario, Canada. (http://www.cws-scf.ec.gc.ca/nwrc-cnrf/ratl/index_e.cfm)

14. Specific Chemical Fact Sheet – New Active Ingredients, Biopesticide Fact Sheet, and Registration Fact Sheet. U.S. Environmental Protection Agency, Washington, D.C. (http://www.epa.gov/pestidides/factsheets/chemical_fs.htm)

15. Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas. The Invasive Species Initiative. The Nature Conservancy. (http://tnsweeds.ucdavis.edu/handbook.html)

16. Wildlife Contaminants Online. US Geological Survey, Department of Interior, Washington, D.C. (http://www.pwrc.usgs.gov/contaminants-online/)

17. One-liner database. 2000. US Environmental Protection Agency, Office of Pesticide Programs, Washington, D.C.

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]	Treatment Type[b]	Max Product Rate – Single Application (lbs/acre or gal/acre)	Max Product Rate -Single Application (lbs/acre - AI on acid equiv basis)	Max Number of Applications Per Season	Max Product Rate Per Season (lbs/acre/season or gal/acre/season)	Minimum Time Between Applications (Days)

[a]From each label for a pesticide identified in pesticide use proposals (PUPs), Service personnel would record application information associated with possible/known uses on Service lands.
[b]Treatment type: H – habitat management or CF – cropland/facilities maintenance. If a pesticide is labeled for both types of treatments (uses), then record separate data for H and CF applications.

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Appendix G. Acronyms and Abbrevations

Act	National Wildlife Refuge System Improvement Act of 1997 (also Improvement Act, NWRSIA)
ABC	American Bird Conservancy
ACEC	Area of Critical Environmental Concern (BLM)
ADA	Americans with Disabilities Act
AHPA	Archaeological and Historic Preservation Act
ARPA	Archaeological Resources Protection Act
ATV	All Terrain Vehicle
AUD	Appropriate Use Determination
BCC	Birds of Conservation Concern
BHCA	Bird Habitat Conservation Area
BIDEH	Biological Diversity, Integrity, and Environmental Health
BLM	U.S. Bureau of Land Management
BP	Before Present
CCP	Comprehensive Conservation Plan
CD	Compatibility Determination
CFR	Code of Federal Regulations
cfs	Cubic feet per second
COE	U.S. Army Corps of Engineers
CWCS	Comprehensive Wildlife Conservation Strategy (State)
dbh	Diameter of a tree at breast height
DO	Dissolved oxygen, a measure of water quality
DEQ	Department of Environmental Quality
DM	Departmental Manual (USFWS)
DPS	Distinct Population Segment
EA	Environmental Assessment
EE	Environmental Education
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FRO	Fisheries Resource Office (USFWS)
FWS	U.S. Fish and Wildlife Service (also, Service, USFWS)
GCM	Global Climate Model
GIS	Geographic Information System
GPS	Global positioning system
IAC	Interagency Committee for Outdoor Recreation
IBA	Important Bird Area
IDFG	State of Idaho Department of Fish and Game
Improvement Act	National Wildlife Refuge System Improvement Act of 1997 (also Act, NWRSIA)
INFISH	Inland Native Fish Strategy
IPM	Integrated Pest Management
KTOI	Kootenai Tribe of Idaho
LE	Law Enforcement
MBCC	Migratory Bird Conservation Commission
MMS	Maintenance Management System
MOA	Memorandum of Agreement

MOU	Memorandum of Understanding
NAGPRA	Native American Graves Repatriation Act
NAS	National Audubon Society
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
NTU	Nephelometric turbidity unit, a measure of water turbidity
NVCS	National Vegetation Classification Standard
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System
NWRSIA	National Wildlife Refuge System Improvement Act of 1997
PIF	Partners in Flight
R1	Region 1 of the FWS (WA, OR, ID, HI, and Pacific islands)
ROC	Resource of Concern
RONS	Refuge Operating Needs System
RTK	Real time kinematic GPS
SCORPT	Statewide Comprehensive Outdoor Recreation and Transportation Plan
Service	U.S. Fish and Wildlife Service (also FWS, USFWS)
SGCN	Species of Greatest Conservation Need
TMDL	Total maximum daily load
TNC	The Nature Conservancy
U.S.C.	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
WMA	Wildlife Management Area (State of Idaho)

Appendix H. Glossary

303(d) listed water bodies. Section 303(d) of the Clean Water Act requires states, territories, and authorized tribes to develop lists of impaired waters. These are waters that are too polluted or otherwise degraded to meet the water quality standards set by states, territories, or authorized tribes. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop TMDLs for these waters (USEPA). For example, Deep Creek is 303(d) listed for sediment.

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

Adaptive Management. The rigorous application of management, research, and monitoring to gain information and experience necessary to assess and modify management activities. A process that uses feedback from refuge research and monitoring and evaluation of management actions to support or modify objectives and strategies at all planning levels. (602 FW 1.4)

Alternative. Different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the Refuge System mission, and resolving issues. (602 FW 1.6). The "no action" alternative is current refuge management, while the "action" alternatives are all other alternatives.

Appropriate Use. A proposed or existing use on a refuge that meets at least one of the following four conditions:
(1) The use is a wildlife-dependent recreational use as identified in the Improvement Act.
(2) The use contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the Improvement Act was signed into law.
(3) The use involves the take of fish and wildlife under State regulations.
(4) The use has been found to be appropriate as specified in section 1.11 of the USFWS Appropriate Use Policy (603 FW 1).

Approved Refuge Boundary. A National Wildlife Refuge boundary approved by the National or Regional Fish and Wildlife Service Director. Within this boundary, the Service may negotiate with landowners to acquire lands not already owned by the Service. (modified from Region 1 Landowner Guide, USFWS Division of Refuge Planning)

Archaeology. The scientific study of material evidence remaining from past human life and culture. (Webster's II)

Association or Plant Association: The finest level of biological community organization in the US National Vegetation Classification (NVCS), defined as a plant community with a definite floristic composition, uniform habitat conditions, and uniform physiognomy. With the exception of a few associations that are restricted to specific and unusual environmental conditions, associations generally repeat across the landscape. They also occur at variable spatial scales depending on the steepness of environmental gradients and the patterns of disturbances. (The Nature Conservancy 2003).

B.P. (Before Present). Used as a designation following radiocarbon dates to express the point from which radiocarbon years are measured. This measuring point is arbitrarily taken to be 1950. A date of 5,200±200 B.P. means that it dates to 5,200 (plus or minus 200) years before 1950.

Benefiting resources. Those species, species groups, or resources expected to benefit from actions taken for a Resource of Concern.

Biological Diversity: The variety of living organisms considered at all levels of organization including the genetic, species, and higher taxonomic levels. Biological diversity also includes the variety of habitats, ecosystems, and natural processes occurring therein. (The Nature Conservancy 2003)

Birds of Conservation Concern. A category assembled by the U.S. Fish and Wildlife Service Division of Migratory Birds identifying the migratory and non-migratory species (beyond those already designated as Federally threatened or endangered) that represent the Division's highest conservation priorities. (FWS, Division of Migratory Birds)

Biological Diversity (also Biodiversity). The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and communities and ecosystems in which they occur (601 FW 3). The System's focus is on indigenous species, biotic communities, and ecological processes.

Biological Integrity. Biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms, and communities. (601 FW 3)

Candidate species. Plant or animal species for which FWS or NOAA Fisheries has on file sufficient information on biological vulnerability and threats to support a proposal to list as endangered or threatened. (FWS, Endangered Species Glossary, http://www.fws.gov/endangered/glossary.html)

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

Code of Federal Regulations (CFR). A codification of the regulations published in the Federal Register by the executive departments and agencies of the Federal government. The CFR is divided into 50 titles that represent broad areas subject to Federal regulation. Title 50 contains wildlife and fisheries Regulations (NOAA Fisheries Glossary, 2006).

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

Composition (plant). The inventory of plant species found in any particular area.

Comprehensive Conservation Plan. A document that describes the desired future conditions of a refuge or planning unit and provides long-range guidance and management direction to achieve the purpose(s) of the refuge; helps fulfill the mission of the System; maintains and, where appropriate, restores the biological integrity, diversity, and environmental health of each refuge and the System; helps achieve the goals of the National Wilderness Preservation System, if appropriate; and meets other mandates. (FWS Habitat Management Planning policy, 602 FW 1.4)

Connectivity. The arrangement of habitats that allows organisms and ecological processes to move across the landscape; patches of similar habitats are either close together or linked by corridors of appropriate vegetation. The opposite of **fragmentation.**

Conservation Target or Target (also see **Resources of Concern; Priority Species, Species Groups,** and **Communities).** Term used by land management agencies and conservation organizations to describe the resources (ecological systems, ecological communities, species, species groups, or other natural resources) selected as the focus of conservation planning or actions. (adapted from Low, Functional Landscapes, 2003)

Consumptive use. Recreational activities, such as hunting and fishing that involve harvest or removal of wildlife or fish, generally to be used as food by humans.

Contaminants or **Environmental contaminants.** Chemicals present at levels greater than those naturally occurring in the environment resulting from anthropogenic or natural processes that potentially result in changes to biota at any ecological level. (USGS, assessing EC threats to lands managed by USFWS) Pollutants that degrade other resources upon contact or mixing. (Adapted from Webster's II)

Cooperative Agreement. An official agreement between two parties.

Cover. The estimated percent of an area, projected onto a horizontal surface, occupied by a particular plant species.

Critical Habitat. Those areas that support rare, threatened or endangered species, or serve as sensitive spawning and rearing areas for aquatic life as designated by the U.S. Fish and Wildlife Service or NOAA Fisheries pursuant to the Endangered Species Act (16 USC 1531).

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

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

Decadence. Marked by decay or decline. For plants, showing little or no new growth. (Adapted from Merriam-Webster online dictionary)

Deciduous. Describes trees and shrubs which shed all of their leaves each year.

Distinct population segment (DPS). A subdivision of a vertebrate species that is treated as a species for purposes of listing under the Endangered Species Act. To be so recognized, a potential distinct population segment must satisfy standards specified in a FWS or NOAA Fisheries policy statement (See the February 7, 1996, Federal Register, pages 4722-4725). The standards require it to be separable from the remainder of and significant to the species to which it belongs. (FWS, Endangered Species Glossary, http://www.fws.gov/endangered/glossary.html)

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

Drawdown. A lowering of the ground-water surface caused by pumping.

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

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

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

Endangered Species (Federal). An animal or plant species in danger of extinction throughout all or a significant portion of its range. (FWS, Endangered Species Glossary)

Environmental Education Study Sites. Outdoor locations where groups of students engage in hands-on activities within an environmental education curriculum.

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. (601 FW 3)

Enhance. To improve the condition of an area or habitat, usually for the benefit of certain native species.

Extirpated species. A species that no longer survives in regions that were once part of its range, but that still exists elsewhere in the wild or in captivity. (FWS, Endangered Species Glossary)

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

Fee hunt (also reservation hunt; regulated hunt). Areas containing designated blinds for waterfowl hunting, which are allocated via a lottery system and available for a fee.

Floodplain. Mostly level land along rivers and streams that may be submerged by floodwater. A 100-year floodplain is an area which can be expected to flood once in every 100 years.

Fluvial processes. Referring to the physical interaction of flowing water and the natural channels of rivers and streams. (Adapted from Britannica Online Encyclopedia)

Global positioning system (GPS). A location determination network that uses satellites to act as reference points for the calculation of position information. These man-made reference points can be viewed as aerial lighthouses that are visible to user equipment and can also transmit additional information that can provide extremely accurate location information to the GPS function within location determination devices. (The Wireless Dictionary)

Goal. Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units. (620 FW 1.6)

Habitat. The place or type of site where species and species assemblages are typically found and/or are successfully reproducing. They are named according to the features that provide the underlying structural basis for the community. (The Nature Conservancy 2003)

Habitat Management Plan. A plan that provides refuge managers a decision-making process; guidance for the management of refuge habitat; and long-term vision, continuity, and consistency for habitat management on refuge lands. (620 FW 1.4)

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

Historic Conditions. Composition, structure, and functioning of ecosystems resulting from natural processes that we believe, based on sound professional judgment, were present prior to substantial human related changes to the landscape. (601 FW 3). Also see Presettlement Conditions.

Hydrograph. The annual flow pattern of a river.

Hydrologic Regime. The normal pattern of precipitation (snow and/or rainfall) and runoff occurring in an area.

Important Bird Area (IBA). A site that provides essential habitat for one or more species of birds; program coordinated by The American Bird Conservancy and The National Audubon Society.

Indicator. A measurable characteristic of a key ecological attribute that strongly correlates with the status of the key ecological attribute.

Indicator Species. A species used as a gauge for the condition of a particular habitat, community, or ecosystem. A characteristic or surrogate species for a community or ecosystem (The Nature Conservancy 2003).

Inholding. Refers to lands within an Approved Refuge Boundary that are not owned by the U.S. Fish and Wildlife Service. These can be private lands or lands owned by city, county, state, or other federal agencies.

Integrated Pest Management (IPM). The use of pest and environmental information in conjunction with available pest control technologies to prevent unacceptable levels of pest damage by the most economical means and with the least possible hazard to persons, property, and the environment. (U.S. EPA Pesticide Glossary)

Interpretation. A teaching technique that combines factual information with stimulating explanation (yourdictionary.com). Frequently used to help people understand natural and cultural resources.

Introduced species. With respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem.

Introduced species often compete with and cause problems for native species. Introduced species are also called exotic, nonnative, and alien species. (see Invasive Species)

Invasive species. An introduced species that out-competes native species for space and resources.

Inventory. A survey of the plants or animals inhabiting an area.

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. (620 FW 1.6)

Key ecological attribute. Those aspects of the environment, such as ecological processes or patterns of biological structure and composition that are critical to sustain the long-term viability of the target. These key ecological attributes are further divided into measurable indicators.

Keystone species. A species whose impacts on its community or ecosystem are large; much larger than would be expected from its abundance (for example, cottonwoods, beavers, gray wolves). Their removal initiates changes in ecosystem structure and often loss of diversity. (Adapted from The Nature Conservancy 2003)

Lacustrine wetlands. Those areas that are generally permanently flooded and lacking trees, shrubs, or emergent vegetation with greater than 30% areal coverage and measuring greater than 20 acres. Smaller areas than this can be included if the water depth in the deepest part of the basin exceeds 6.6 feet at low water. (National Wetlands Inventory)

Landform. A natural feature of a land surface. (yourdictionary.com)

Maintenance. The upkeep of constructed facilities, structure, and capitalized equipment necessary to realize the originally anticipated useful life of a fixed asset. Maintenance includes preventative maintenance; cyclic maintenance; repairs; replacement of parts, components, or items of equipment, periodic condition assessment; periodic inspections, adjustment, lubrication and cleaning (non-janitorial) of equipment; painting, resurfacing, rehabilitation; special safety inspections; and other actions to assure continuing service and to prevent breakdown.

Maintenance Management System (MMS). A national database of refuge maintenance needs and deficiencies. It serves as a management tool for prioritizing, planning, and budgeting purposes. (RMIS descriptions)

Managed seasonal or **semipermanent wetlands.** Those wetlands which have existing infrastructure (pumps, culverts, water control structures) to manipulate water levels on a seasonal basis, relatively independent of water conditions in the surrounding watershed.

Mesic. Habitats characterized by or requiring a moderate amount of moisture, as compared to hydric (wet) or xeric (dry) habitats. (Adapted from Merriam-Webster online).

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

Migratory birds. Those species of birds listed under 50 CFR 10.13. (720 FW 1)

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

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

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. (601 FW 3)

National Register of Historic Places. The Nation's master inventory of known historic properties administered by the National Park Service. Includes buildings, structures, sites, objects, and districts that possess historic, architectural, engineering, archeological, or cultural significance at the national, state, and local levels. (USFWS, Considering Cultural Resources)

National Vegetation Classification Standard (NVCS). A hierarchical list of vegetation types and their descriptions intended to produce uniform statistics about vegetation resources across the United States, based on data gathered at local, regional, or national levels. (Adapted from Federal Geographic Data Committee).

National Wildlife Refuge. A designated area of land, water, or an interest in land or water within the Refuge System, excluding coordination areas. (601 FW 1.3)

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

National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). A federal law that amended and updated the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668).

Nephelometric turbidity unit (NTU). Unit of measure for the turbidity of water. Essentially, a measure of the cloudiness of water as measured by a nephelometer. Turbidity is based on the amount of light that is reflected off particles in the water. (USGS Water Science Glossary of Terms)

Nonconsumptive recreation. Recreational activities that do not involve harvest, removal, or consumption of fish, wildlife, or other natural resources.

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

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. Make objectives attainable, time-specific, and measurable. (620 FW 1.6)

Operations. Activities related to the normal performance of the functions for which a facility or item of equipment is intended to be used. Costs such as utilities (electricity, water, sewage) fuel, janitorial services, window cleaning, rodent and pest control, upkeep of grounds, vehicle rentals, waste management, and personnel costs for operating staff are generally included within the scope of operations.

Pacific Flyway. One of several major north-south travel corridors for migratory birds. The Pacific Flyway is west of the Rocky Mountains. Other flyways include the Central, Mississippi, and Atlantic.

Palatable grass. Short (generally less than 6 inches tall) actively growing grass preferred by Canada geese and certain other waterfowl (e.g. American wigeon).

Palustrine Wetlands. Wetlands that may or may not be permanently flooded and typically recognized by the presence of trees, shrubs, or herbaceous emergent vegetation. May include non-vegetated areas measuring less than 20 acres in extent and with water depths shallower than 6.6 feet in the deepest part of the basin at low water (Cowardin et al. 1979).

Planning Team. The primary U.S. Fish and Wildlife staff and others who played a key role in developing and writing the CCP. Planning teams are interdisciplinary in membership and function. Teams generally consist of a Planning Team Leader, Refuge Manager and staff biologists, a state natural resource agency representative, and other appropriate program specialists (e.g., social scientist, ecologist, recreation specialist). Other Federal and Tribal natural resource agencies are asked to provide team members, as appropriate. The planning team prepares the CCP and appropriate NEPA documentation. (620 FW 1.6)

Plant Association. A classification of plant communities based on the similarity in dominants of all layers of vascular species in a climax community (e.g. black cottonwood/red-osier dogwood plant association).

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

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

Prescribed Fire. Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements (where applicable) must be met, prior to ignition (National Wildfire Coordinating Group Glossary of Wildland Fire Terminology)

Presettlement conditions: The state of the environment at the time of European settlement or 1850 (Kootenai Tribe of Idaho and MT Dept of Fish, Wildlife and Parks 2004). Also see Historic Conditions.

Priority Public Uses. Hunting, fishing, wildlife observation and photography, environmental education and interpretation, where compatible, are identified under the National Wildlife Refuge System Improvement Act of 1997 as the six priority public uses of the National Wildlife Refuge System.

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

Real time kinematic GPS (RTK). A position location process whereby signals received from a reference device (such as a GPS receiver) can be compared using carrier phase corrections transmitted from a reference station to the user's roving receiver. Using the correction information, RTK systems can provide real time accuracy below 5 cm. (The Wireless Dictionary)

Refuge Operating Needs System (RONS). A national database of unfunded refuge operating needs required to meet and/or implement station goals, objectives, management plans, and legal mandates. It is used as a planning, budgeting, and communication tool describing funding and staffing needs of the Refuge System.

Refuge Purpose(s). The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit. For refuges that encompass congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the refuge. (620 FW 1.6).

Residual cover. In pastures or grasslands, tall decadent grass and/or forbs left standing through the fall and winter seasons.

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

Restore. To bring back to a former or original condition. (Webster's II).

Revenue Sharing. Service payments (government lands are exempt from taxation) made to counties in which national wildlife refuges reside. These payments may be used by the counties for any governmental purpose such as, but not limited to, roads and schools. (USFWS Revenue sharing pamphlet).

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

Shorebirds. Sandpipers, plovers, and their close relatives of similar size and ecology, often associated with coastal and inland wetlands. (Sibley Guide to Birds 2000).

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

Source. An extraneous factor that causes a stress (the most proximate cause). (The Nature Conservancy 2000)

Species of concern (Federal). An informal term referring to a species that might be in need of conservation action. This may range from a need for periodic monitoring of populations and threats to the species and its habitat, to the necessity for listing as threatened or endangered. Such species receive no legal protection and use of the term does not necessarily imply that a species will eventually be proposed for listing. (FWS, Endangered Species Glossary).

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. (620 FW 1.6).

Strategy. A specific action, tool, technique, or combination of actions, tools, and techniques used to meet unit objectives. (620 FW 1.6)

Stress. Something which impairs or degrades the size, condition, or landscape context of a conservation target, resulting in reduced viability. (The Nature Conservancy 2003)

Target. See Conservation Target.

Thatch. The dense covering of cut grass that remains after mowing of haying. Thatch inhibits growth of new grass and also inhibits goose foraging.

Threat. The combined concept of ecological stresses to a target and the sources of that stress to the target. (The Nature Conservancy 2003)

Threatened Species (Federal). An animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range. (FWS, Endangered Species Glossary)

Total maximum daily load (TMDL). A calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and an allocation of that amount to the pollutant’s sources (US EPA). Pollutants may include sediment, nutrients (e.g. nitrogen and phosphorus), pathogens (e.g. E. coli bacteria), pesticides, and heavy metals (e.g. mercury).

Turbidity. The amount of particulate matter that is suspended in water, measured in NTUs (nephelometric turbidity units). Clear water generally measures less than 10 NTU.

Vegetation Type (Also **Habitat Type**, **Forest Cover Type, Association, NVCS**). A land classification system based upon the concept of distinct plant associations.

Vision Statement. A concise statement of what the planning unit should be, or what we hope to do, based primarily upon the Refuge System mission and specific refuge purposes, and other mandates. The vision statement for the refuge is tied to the mission of the Refuge System; the purpose(s) of the refuge; the maintenance or restoration of the ecological integrity of each refuge and the Refuge System; and other mandates. (620 FW 1.6)

Waterfowl. Resident and migratory ducks, geese, and swans.

Water quality. A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.

Watershed. The land area that drains water to a particular stream, river, or lake. It is a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge. Large watersheds, like the Mississippi River basin contain thousands of smaller watersheds.

Wetlands. Wetlands are 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 at some time during the growing season of each year. (660 FW 2; Cowardin et al. 1979)

Permanent wetland. A wetland basin or portion of a basin that is covered with water throughout the year in all years except extreme drought.

Semi-permanent wetland. A wetland basin or portion of a basin where surface water persists throughout the growing season of most years.

Seasonal wetland. A wetland basin or portion of a basin where surface water is present in the early part of the growing season but is absent by the end of the season in most years.

Wet meadows. Shallowly flooded wetland edges with little to no slope. Flooding is generally of short duration.

Wildfire. An unplanned, unwanted wildland fire including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fires where the objective is to put the fire out (National Wildfire Coordinating Group, Glossary of Wildland Fire Terminology)

Wildland Fire. Any non-structure fire that occurs in the wildland. Three distinct types of wildland fire have been defined and include wildfire, wildland fire use (allowing naturally ignited fires to burn to benefit natural resources) and prescribed fire (National Wildfire Coordinating Group Glossary of Wildland Fire Terminology)

Wildlife-dependent recreational use. A use of a refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation. These are the six priority public uses of the Refuge System as established in the National Wildlife Refuge System Administration Act, as amended. Wildlife-dependent recreational uses, other than the six priority public uses, are those that depend on the presence of wildlife. The Service will also consider these other uses in the preparation of refuge CCPs; however, the six priority public uses always will take precedence. (620 FW 1.6)

Appendix I. Statement of Compliance

STATEMENT OF COMPLIANCE
for Implementation of the
Kootenai National Wildlife Refuge, Boundary County, Idaho
Comprehensive Conservation Plan

The following executive orders and legislative acts have been reviewed as they apply to implementation of the Comprehensive Conservation Plan for the Kootenai National Wildlife Refuge, located in Idaho.

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 Implementing Procedures, Department of the Interior and Service procedures, and has been performed in coordination with the affected public. The requirements of the National Environmental Policy Act (NEPA)(42 U.S.C. 4321 et seq.) and its implementing regulations in 40 CFR Parts 1500-1508 have been satisfied in the procedures used to reach this decision. These procedures included: the development of a range of alternatives for the 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 shall be released for a 30-day public comment period. The affected public shall be notified of the availability of these documents through a Federal Register notice, news releases to local newspapers, the Service's refuge planning website, and a planning update. Copies of the Draft CCP/EA and/or planning updates shall be distributed to an extensive mailing list. The CCP shall be 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 the Refuge will comply with the regulations of Sections 106 and 110 of the National Historic Preservation Act. The Refuge contains a number of prehistoric and historic sites, one site included in the National Register of Historic Places (NRHP), and one site eligible for inclusion in the NRHP. 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 National Historic Preservation Act if any management actions have the potential to affect any historic properties which 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 Kootenai Tribe of Idaho regarding the proposed action. Specifically, the Service coordinated with the Kootenai Tribe of Idaho throughout the Service's planning process over the past 3 years in

developing the Refuge's Comprehensive Conservation Plan. The Tribe 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 Indian Tribes in the United States. The CCP was evaluated and no adverse human health or environmental effects were identified for minority or low-income populations, Indian Tribes, or anyone else.

6. **Wilderness Act.** The Service has evaluated the suitability of the Refuge for wilderness designation and concluded that the Refuge does not meet the basic criteria for inclusion into the National Wilderness Preservation System (see Appendix D, Wilderness Review).

7. **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 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. Appropriate Use determinations were prepared for jogging and dog walking (Appendix A).

Compatibility Determinations have been prepared for the following uses: waterfowl hunting, upland game bird hunting, big game hunting, sport fishing, nonconsumptive uses (wildlife observation and photography, interpretation, and environmental education), jogging, dog walking (on leash), crop production, and research. All of these were found to be compatible with refuge purposes and the System mission with stipulations specified in each of the compatibility determinations (Appendix B).

8. **EO 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 Fish and Wildlife 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 of all alternatives to refuge habitats used by migratory birds were assessed within the Draft CCP and EA.

9. **Endangered Species Act. (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 Act requires consultation before initiating projects which affect or may affect endangered species. One federally listed species currently occurs on the Refuge, bull trout (*Salvelinus confluentus*, federally threatened). Bull trout occur in low

numbers in Myrtle Creek, and Myrtle Creek has been designated critical habitat for bull trout. Proposed management is more protective to bull trout than current management. Consultation on specific projects will be conducted prior to implementation to avoid any adverse impacts to this species and its habitat.

10. **Executive Order 11990. Protection of Wetlands.** The CCP is consistent with Executive Order 11990 because CCP implementation would protect and enhance existing wetlands.

11. **Executive Order 11988. Floodplain Management.** Under this order Federal agencies "shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains." The CCP is consistent with Executive Order 11988 because CCP implementation would protect floodplains from adverse impacts as a result of modification or destruction.

12. **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 US Environmental Protection Agency (USEPA) in full compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and as provided in regulations, orders, or permits issued by USEPA may be applied on lands and waters under refuge jurisdiction.

Chief, Division of Planning, Visitor Services, and Transportation	Date

Appendix J. CCP Team Members

The CCP was developed primarily by core team members. The core planning team consisted of persons responsible for the preparation and completion of the Comprehensive Conservation Plan and Environmental Assessment. They are the primary strategists, analysts, and writers, and attended all team meetings. To avoid scheduling and logistical conflicts, the core team had a limited number of participants. Core and extended team members are listed below.

Table J.1 Kootenai NWR CCP/EA Core Team Members

Name	Title (Team Role)	Address
Lisa Langelier	Project Leader (May 14, 2007-present) (Main Refuge Contact/Lead)	U.S. Fish and Wildlife Service Inland NW NWR Complex 26010 S. Smith Road Cheney, WA 99004
Dianna M. Ellis	Refuge Manager	U.S. Fish and Wildlife Service Inland NW NWR Complex Kootenai NWR 287 Westside Road Bonners Ferry, ID 83805
Mike Rule	Turnbull Wildlife Biologist (Refuge Resources)	Same as Lisa Langelier
Jerry Cline	Refuge Manager (Refuge Resources)	Inland NW NWR Complex Little Pend Oreille NWR 1310 Bear Creek Road Colville, WA 99114
Sandra Rancourt	Complex Visitor Services Manager (Refuge Resources and Visitor Services Programs)	Same as Lisa Langelier
Ken Morris	Conservation Planner (Team Leader)	U.S. Fish and Wildlife Service Division of Planning, Visitor Services and Transportation 911 NE 11th Ave Portland, OR 97213

Table J.2 Extended Team Members

Name	Title	Address
Fred Paveglio	Regional Biologist	U.S. Fish and Wildlife Service 1211 SE Cardinal Ct., Suite 100 Vancouver, WA 98683
Kevin Kilbride	Assistant Regional Biologist (Regional IPM Coordinator, Regional I&M Biologist)	Same as Fred Paveglio
Joe Engler	Assistant Regional Biologist (October 2007-present)	Same as Fred Paveglio
Ray Jones, Mike Faler	Fishery Biologist Idaho Fishery Resource Office	U.S. Fish and Wildlife Service Fishery Resource Office P.O. Box 18 Ahshaka, ID 83520

Name	Title	Address
Mike Marxen	Chief, Branch of Visitor Services	U.S. Fish and Wildlife Service Division of Planning, Visitor Services and Transportation 911 NE 11th Ave Portland, OR 97213
Liz Cruz	Geographer/GIS Specialist (through 9/29/10)	U.S. Fish and Wildlife Service Division of Realty and Refuge Information, Refuge Information Branch 911 NE 11th Ave Portland, OR 97232
Dan Craver	Geographer (9/29/10-present)	U.S. Fish and Wildlife Service Division of Realty and Refuge Information, Refuge Information Branch 911 NE 11th Ave Portland, OR 97232
Dar Crammond	Hydrologist (through May 2010)	U.S. Fish and Wildlife Service Water Resources Branch U.S. Fish and Wildlife Service Region 1 and Region 8 911 NE 11th Avenue 2W-EN Portland, OR 97232-4181
Jim Tucker, Wayne Wilkerson	Engineering Equipment Operators	Same as Dianna Ellis
Jan Rose	Biological Technician	Same as Dianna Ellis
Talina Richards	Clerk	Same as Dianna Ellis
Dan Matiatos	Deputy Project Leader, Turnbull Refuge Manager	Same as Lisa Langelier

J.3 Content Specialists (Infrequently contacted by core and extended team members for specific planning needs)

Scott Bacon, Idaho Dept. of Lands, Bonners Ferry, ID
Brad Bortner, Chief, Division of Migratory Birds and Habitat Programs, USFWS, Portland, OR
Tyson Clyne, Idaho Department of Environmental Quality, Coeur d'Alene, ID
Chip Corsi, Panhandle Regional Supervisor, Idaho Dept. of Fish and Game, Coeur d'Alene, ID
Tim Cusack, Complex Refuge Law Enforcement Officer, Inland NW NWRC, USFWS, Cheney, WA
Scott Deeds, Upper Columbia Fish and Wildlife Office, USFWS Region 1, Spokane, WA
Shanda Dekome, USDA Forest Service, Idaho Panhandle National Forests
Joe Dupont, Idaho Department of Fish and Game, Coeur d'Alene, ID
Michael Gondek, USDA-NRCS, Bonners Ferry, ID
Pat Hart, Bonners Ferry Ranger District, US Forest Service, Bonners Ferry, ID
Sue Ireland, Kootenai Tribe of Idaho, Bonners Ferry, ID
Kelly Knutson, Zone Law Enforcement Officer, USFWS, Colville, WA
Brett Lyndaker, Biologist, US Forest Service, Bonners Ferry, ID
Colleen Triese, Wildlife Habitat Biologist, Boundary Creek Wildlife Management Area, IDFG
Vaughn Paragamian, Senior Fisheries Biologist, IDFG, Coeur d'Alene, ID
Virginia Parks, Archaeologist, Branch of Cultural Resources, USFWS Region 1, Sherwood, OR
Patty Perry, Kootenai Tribe of Idaho, Bonners Ferry, ID

Appendix K. Public Involvement

Public involvement was sought throughout the development of the Draft CCP, starting in October 2008 with the preparation of a Communications Plan. Public involvement strategies included face-to-face meetings with key agencies, Tribal representatives, and community organizations. The Refuge also held open houses, sent planning updates, and gave presentations to community organizations to inform the public, invite discussion and solicit feedback.

A mailing list of approximately 270 persons and organizations is maintained at the Refuge and was used to distribute planning updates and public meeting announcements. Below is a brief summary of the events, meetings, and outreach tools that were used in our public involvement efforts.

Meetings with Congressional Representatives and/or their Aides:

- February 23, 2009. Refuge Manager Dianna Ellis provided an overview of the CCP process and the preliminary issues identified by the Planning Team at a meeting of the Kootenai Valley Resource Initiative (KVRI). Participants at the meeting included staffers from Senator Michael Crapo and Congressman Walter Minnick's offices; representatives from the Kootenai Tribe of Idaho (KTOI); the City of Bonners Ferry and Boundary County; IDFG; U.S. Forest Service and Army Corps of Engineers; and representatives from local businesses and industries, as well as local citizens. The KVRI is a community-based, collaborative effort in the Kootenai River Basin. "The mission of the KVRI is to improve coordination of local, state, federal, and Tribal programs to restore and maintain social, cultural, economic, and natural resources." Location: Boundary County Cooperative Extension Office, 6447 Kootenai Street, Bonners Ferry, ID 83805.
- January 24, 2011. Refuge Manager Dianna Ellis attends meeting of the Kootenai Valley Resource Initiative (KVRI), meets Aaron Calkins, Regional Director of Northern Idaho for Congressman Raul Labrador (Idaho, 1st District), and invites input into CCP. Location: Boundary County Cooperative Extension Office, 6447 Kootenai Street, Bonners Ferry, ID 83805.

Meetings with Tribal Officials:

- May 19, 2008. Refuge Manager Dianna Ellis provided an overview of the CCP process at the monthly meeting of the Kootenai Valley Resource Initiative (KVRI) (see above). Participants at the meeting included representatives of the Kootenai Tribe of Idaho. Location: Boundary County Cooperative Extension Office, 6447 Kootenai Street, Bonners Ferry, ID 83805.
- February 23, 2009. Refuge Manager Dianna Ellis provided an overview of the CCP process and the preliminary issues identified by the Planning Team at a meeting of the Kootenai Valley Resource Initiative (KVRI). Kootenai Tribe of Idaho representatives were present at the meeting. Location: Boundary County Cooperative Extension Office, 6447 Kootenai Street, Bonners Ferry, ID 83805.
- March 30, 2010. Refuge Manager Dianna Ellis and Deputy Inland Northwest Complex Leader Dan Matiatos met with representatives of the Kootenai Tribe of Idaho. Present at the meeting were Gary Aitken, Tribal Chairman; Gary Aitken Jr., Tribal Council member; Patty Perry, Tribal Chair; and Susan Ireland, Scott Soults, Norm Merz, and Kevin Greenleaf of the natural resource/environmental staff. The Tribe considered this an informal government to

government meeting. Manager Ellis outlined the Kootenai CCP process and responded to questions. Topics included a general discussion of Tribal rights, breaching the Kootenai River dike, fisheries restoration projects, fishing on Myrtle Creek, and big game hunting. Location: Kootenai Tribe of Idaho, Tribal Office, 100 Circle Drive, Bonners Ferry, ID 83805.

Meetings with Local Elected Officials:

- January 27, 2009. Refuge Manager Dianna Ellis met with Boundary County Commissioners Dan Dinning and Walt Kerby (Ron Smith was absent) as requested. Manager Ellis provided details on the CCP process and the preliminary goals as outlined in Planning Update #1. Location: Boundary County Court House, Bonners Ferry, ID 83805.
- February 23, 2009. Refuge Manager Dianna Ellis provided an overview of the CCP process and the preliminary issues identified by the Planning Team at a meeting of the Kootenai Valley Resource Initiative (KVRI) (see above). Boundary County representatives were present at the meeting. Location: Boundary County Cooperative Extension Office, 6447 Kootenai Street, Bonners Ferry, ID 83805.
- September 27, 2010. Refuge Manager Dianna Ellis and Office Clerk Talina Richards met with the Boundary County Commissioners. Commissioners Walt Kerby and Ron Smith (Dan Dinning was absent) were in attendance. Purpose of meeting: discuss and answer questions about preliminary draft alternatives. Location: Boundary County Court House, Bonners Ferry, ID 83805.

Meetings with Local Community Organizations Involving CCP Issues:

- June 7, 2010. Refuge Manager Dianna Ellis and Biological Technician, Jan Rose, attended the June meeting of the Kootenai Valley Sportsmen Association. Manager Ellis gave a presentation on the CCP process and background information on the Refuge. Planning Updates # 1 and 2 were provided to the attendees and Ellis encouraged them to provide comments. Location: Kootenai Valley Sportsmen Association Clubhouse, Highway 2, Bonners Ferry, ID 83805.
- September 13, 2010. Refuge Manager Dianna Ellis attended the September meeting of the Kootenai Valley Sportsmen Association to discuss the Draft Alternatives. Manager Ellis summarized the alternatives and answered questions from the 18 attendees, and encouraged comments/questions. Location: Kootenai Valley Sportsmen Association Clubhouse, Highway 2, Bonners Ferry, ID 83805.

Meetings with Agency Representatives:

- May 7, 2008. National Wildlife Refuge System/Idaho Department of Fish and Game Comprehensive Conservation Planning Coordination Meeting. Representatives from the Service's Pacific Region met with representatives from the Idaho Department of Fish and Game (IDFG) in Boise, Idaho to provide a briefing on all of the national wildlife refuges located in Idaho and the CCP process.
- May 13-14, 2008. Representatives from IDFG participated in Kootenai Refuge's Wildlife and Habitat Review (Review). Purpose: To identify wildlife and habitat management issues, develop recommendations for future refuge management to be considered during CCP development.

Public Open Houses/Scoping Sessions:

- January 23, 2009. Two public scoping meetings at the Bonners Ferry Visitors Center, 6373 Bonner Street (City Parking Lot), Bonners Ferry, ID 83805 at 3:00-5:00 p.m. and 6:00-8:00 p.m.
  Format: The public scoping meetings were in an open house format. Refuge staff and the lead planner explained the CCP process; refuge purposes, vision, and management; and preliminary management issues, concerns and opportunities that had been identified early in the planning process. The public was invited to submit comments either in writing or verbally. The attendees then had the opportunity to visit four tables staffed by Complex and refuge staff and the lead planner to ask questions and submit comments. Each table had a scribe to record verbal comments.
  Attendance: A total of 23 private citizens and representatives from various organizations attended the open houses, providing comment on the issues and opportunities presented.
  Comments Received: A total of 43 submittals were received during the public scoping period, which ended on March 25, 2009. 24 verbal submittals were transcribed at the open houses. 19 written submittals were received, 7 by email and the remainder mailed, faxed, or hand delivered to the Refuge. Organizations submitting comments included the US EPA, Idaho Dept. of Parks and Recreation, the Idaho Dept. of Environmental Quality, and the Idaho Department of Lands.

Other Meetings:

- March 4, 2010. Preliminary draft alternatives briefing for Region 1 Refuges Chief and staff, USFWS Regional Office, Portland, OR.
- September 28, 2010. Project Leader, Refuge Manager, and Lead Planner meet with Regional Office staff to obtain approval on draft alternatives, in order to proceed with CCP development, USFWS Regional Office, Portland, OR.

Press Coverage:

- January 9, 2009. News release, "Kootenai National Wildlife Refuge Initiates Plan for the Future," announcing public scoping meetings, was sent to 27 television, radio, and print media contacts, including the *Spokesman-Review* (Idaho edition), the *Boundary County Digest*, and the *Bonners Ferry Herald*.
- January 9, 2009. "Kootenai National Wildlife Refuge Initiates Plan for the Future." – ruralnorthwest.com
- January 15, 2009. "Kootenai Wildlife Refuge seeks comment on plans"– *Bonners Ferry Herald*.
- January 28, 2009. "Kootenai National Wildlife Refuge Initiates Plan for the Future." – *Boundary County Digest.*
- Feb 9, 2009. Refuge Manager interviewed for KBFI Blue Sky Radio News. (Program aired on Feb 11, 2009).
- February 23, 2009. News release extending the comment period to March 25, 2009 was sent to above contacts.
- August 12, 2010. "Comment sought on refuge plan"– *Bonners Ferry Herald*. The article summarized the three preliminary draft alternatives for the CCP, described how to submit comments, and provided refuge contact information.

Planning Updates:

- January 2009. Planning Update 1 sent to a mailing list of approximately 270 recipients, including private individuals, government agencies, and non-governmental organizations. The planning update included a comment form. In addition, the Planning Update was posted on the refuge website, and copies were available at the CCP open houses, and the refuge office.
- June 2009. Planning Update 2, summarizing the results of public scoping, was distributed to a mailing list of approximately 270 recipients. In addition, the Planning Update and a detailed report on the results of public scoping were posted on the refuge website.
- July 2010. Planning Update 3, summarizing preliminary draft alternatives, was distributed to a mailing list of approximately 270 recipients. In addition, the Planning Update was posted on the refuge website.

Other Tools:

- March 31, 2008. Notices sent to the Idaho Department of Fish and Game and the Kootenai Tribe of Idaho, inviting them to participate in Kootenai Refuge's Wildlife and Habitat Review on May 13-14, 2008.
- April 6, 2009. Letters to representatives of the Idaho Department of Fish and Game and the Kootenai Tribe of Idaho were emailed, to request their participation on the extended planning team and throughout the CCP process.
- January 2009: Comment form sent to approx. 270 people in conjunction with Planning Update 1. Comment form was also posted on refuge website, and distributed during public scoping meetings.
- April 20, 2010: Follow-up email to Kootenai Tribe of Idaho to obtain comments on preliminary draft alternatives.
- April 29, 2010: Follow-up call to Idaho Dept. of Fish and Game to obtain comments on preliminary draft alternatives.

Federal Register Notices:

- February 23, 2009: Federal Register published Notice of Intent to Prepare a Draft Comprehensive Conservation Plan and Environmental Assessment (74 FR 8102).

Appendix L. Wildlife and Plants of Kootenai National Wildlife Refuge

Birds

(Names and taxonomic order conform to American Ornithologists' Union Check-List of North American Birds, 7th edition with recent updates, http://www.aou.org/checklist/north/full.php)

Common Name	Scientific Name
Greater White-fronted Goose	*Anser albifrons*
Snow Goose	*Chen caerulescens*
Ross's Goose	*Chen rossii*
Brant	*Branta bernicla*
Canada Goose	*Branta canadensis*
Trumpeter Swan	*Cygnus buccinator*
Tundra Swan	*Cygnus columbianus*
Wood Duck	*Aix sponsa*
Gadwall	*Anas strepera*
Eurasian Wigeon	*Anas penelope*
American Wigeon	*Anas americana*
Mallard	*Anas platyrhynchos*
Blue-winged Teal	*Anas discors*
Cinnamon Teal	*Anas cyanoptera*
Northern Shoveler	*Anas clypeata*
Northern Pintail	*Anas acuta*
Green-winged Teal	*Anas crecca*
Canvasback	*Aythya valisineria*
Redhead	*Aythya americana*
Ring-necked Duck	*Aythya collaris*
Greater Scaup	*Aythya marila*
Lesser Scaup	*Aythya affinis*
Surf Scoter	*Melanitta perspicillata*
White-winged Scoter	*Melanitta fusca*
Bufflehead	*Bucephala albeola*
Common Goldeneye	*Bucephala clangula*
Barrow's Goldeneye	*Bucephala islandica*
Hooded Merganser	*Lophodytes cucullatus*
Common Merganser	*Mergus merganser*
Red-breasted Merganser	*Mergus serrator*
Ruddy Duck	*Oxyura jamaicensis*
Ring-necked Pheasant	*Phasianus colchicus*
Ruffed Grouse	*Bonasa umbellus*
Spruce Grouse	*Falicipennis canadansis*
Blue/Dusky Grouse	*Dendragapus obscurus*
Wild Turkey	*Meleagris gallopavo*
California Quail	*Callipepla californica*
Common Loon	*Gavia immer*

Common Name	Scientific Name
Pied-billed Grebe	*Podilymbus podiceps*
Horned Grebe	*Podiceps auritus*
Red-necked Grebe	*Podiceps grisegena*
Eared Grebe	*Podiceps nigricollis*
Western Grebe	*Aechmophorus occidentalis*
American White Pelican	*Pelecanus erythrorhynchos*
Double-crested Cormorant	*Phalacrocorax auritus*
American Bittern	*Botaurus lentiginosus*
Great Blue Heron	*Ardea herodias*
White-faced Ibis	*Plegadis chihi*
Turkey Vulture	*Cathartes aura*
Osprey	*Pandion haliaetus*
Bald Eagle	*Haliaeetus leucocephalus*
Northern Harrier	*Cricus cyaneus*
Sharp-shinned Hawk	*Accipiter striatus*
Cooper’s Hawk	*Accipiter cooperii*
Northern Goshawk	*Accipiter gentilis*
Ferruginous Hawk	*Buteo regalis*
Swainson’s Hawk	*Buteo swainsonis*
Red-tailed Hawk	*Buteo jamaicensis*
Rough-legged Hawk	*Buteo lagopus*
Golden Eagle	*Aquila chrysaetos*
American Kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Peregrine Falcon	*Falco peregrinus*
Prairie Falcon	*Falco mexicanus*
Virginia Rail	*Rallus limicola*
Sora	*Porzana carolina*
American Coot	*Fulica americana*
Sandhill Crane	*Grus canadensis*
Black-bellied Plover	*Pluvialis squatarola*
Semipalmated Plover	*Charadrius semipalmatus*
Killdeer	*Charadrius vociferus*
Black-necked Stilt	*Himantopus mexicanus*
American Avocet	*Recurvirostra americana*
Greater Yellowlegs	*Tringa melanoleuca*
Lesser Yellowlegs	*Tringa flavipes*
Solitary Sandpiper	*Tringa solitaria*
Spotted Sandpiper	*Actitis macularius*
Whimbrel	*Numenius phaeopus*
Long-billed Curlew	*Numenius americanus*
Marbled Godwit	*Limosa fedoa*
Sanderling	*Calidris alba*
Semipalmated Sandpiper	*Calidris pusilla*
Western Sandpiper	*Calidris mauri*
Least Sandpiper	*Calidris minutilla*
Baird’s Sandpiper	*Calidris bairdii*

Common Name	Scientific Name
Pectoral Sandpiper	*Calidris melanotos*
Stilt Sandpiper	*Calidris himantopus*
Short-billed Dowitcher	*Limnodromus griseus*
Long-billed Dowitcher	*Limnodromus scolopaceus*
Common Snipe	*Gallinago gallinago*
Wilson's Phalarope	*Steganopus tricolor*
Red-necked Phalarope	*Phalaropus lobatus*
Franklin's Gull	*Leucophaeus pipixcan*
Bonaparte's Gull	*Larus philadelphia*
Ring-billed Gull	*Larus delawarensis*
California Gull	*Larus californicus*
Herring Gull	*Larus argentatus*
Caspian Tern	*Hydroprogne caspia*
Common Tern	*Sterna hirundo*
Forster's Tern	*Sterna forsteri*
Black Tern	*Chlidonias niger*
Rock Dove	*Columba livia*
Mourning Dove	*Zenaida macroura*
Western Screech-Owl	*Megascops kennicottii*
Great Horned Owl	*Bubo virginianus*
Snowy Owl	*Bubo scandiacus*
Northern Hawk Owl	*Surnia ulula*
Northern Pygmy-Owl	*Glaucidium gnoma*
Barred Owl	*Strix varia*
Long-eared Owl	*Asio otus*
Short-eared Owl	*Asio flammeus*
Northern Saw-whet Owl	*Aegolius acadicus*
Common Nighthawk	*Chordeiles minor*
Black Swift	*Cypseloides niger*
Vaux's Swift	*Chaetura vauxi*
Black-chinned Hummingbird	*Archilochus alexandri*
Calliope Hummingbird	*Stellula calliope*
Rufous Hummingbird	*Selasphorus rufus*
Belted Kingfisher	*Ceryle alcyon*
Lewis's Woodpecker	*Melanerpes lewis*
Red-naped Sapsucker	*Sphyrapicus nuchalis*
Downy Woodpecker	*Picoides pubescens*
Hairy Woodpecker	*Picoides villosus*
American Three-toed Woodpecker	*Picoides dorsalis*
Black-backed woodpecker	*Picoides arcticus*
Northern Flicker	*Colaptes auratus*
Pileated Woodpecker	*Dryocopus pileatus*
Olive-sided Flycatcher	*Contopus cooperi*
Western Wood-Pewee	*Contopus sordidulus*
Willow Flycatcher	*Empidonax traillii*
Least Flycatcher	*Empidonax minimus*
Hammond's Flycatcher	*Empidonax hammondii*

Common Name	**Scientific Name**
Dusky Flycatcher	*Empidonax oberholseri*
Cordilleran Flycatcher	*Empidonax occidentalis*
Say's Phoebe	*Sayornis saya*
Western Kingbird	*Tyrannus verticalis*
Eastern Kingbird	*Tyrannus tyrannus*
Loggerhead Shrike	*Lanius ludovicianus*
Northern Shrike	*Lanius excubitor*
Cassin's Vireo	*Vireo cassinii*
Warbling Vireo	*Vireo gilvus*
Red-eyed Vireo	*Vireo olivaceus*
Gray Jay	*Perisoreus canadensis*
Steller's Jay	*Cyanocitta stelleri*
Clark's Nutcracker	*Nucifraga columbiana*
Black-billed Magpie	*Pica hudsonia*
American Crow	*Corvus brachyrhynchos*
Common Raven	*Corvus corax*
Horned Lark	*Eremophila alpestris*
Tree Swallow	*Tachycineta bicolor*
Violet-green Swallow	*Tachycineta thalassina*
N. Rough-winged Swallow	*Stelgidopteryx serripennis*
Bank Swallow	*Riparia riparia*
Cliff Swallow	*Petrochelidon pyrrhonota*
Barn Swallow	*Hirundo rustica*
Black-capped Chickadee	*Poecile atricapilla*
Mountain Chickadee	*Poecile gambeli*
Chestnut-backed Chickadee	*Poecile rufescens*
Boreal Chickadee	*Poecile hudsonica*
Red-breasted Nuthatch	*Sitta canadensis*
Rock Wren	*Salpinctes obsoletus*
House Wren	*Troglodytes aedon*
Winter Wren	*Troglodytes troglodytes*
Marsh Wren	*Cistothorus palustris*
American Dipper	*Cinclus mexicanus*
Golden-crowned Kinglet	*Regulus satrapa*
Ruby-crowned Kinglet	*Regulus calendula*
Western Bluebird	*Sialia mexicana*
Mountain Bluebird	*Sialia currucoides*
Townsend's Solitaire	*Myadestes townsendi*
Veery	*Catharus fuscescens*
Swainson's Thrush	*Catharus ustulatus*
Hermit Thrush	*Catharus guttatus*
American Robin	*Turdus migratorius*
Varied Thrush	*Ixoreus naevius*
Gray Catbird	*Dumetella carolinensis*
European Starling	*Sturnus vulgaris*
American Pipit	*Anthus rubescens*
Bohemian Waxwing	*Bombycilla garrulus*

Common Name	Scientific Name
Cedar Waxwing	*Bombycilla cedrorum*
Orange-crowned Warbler	*Vermivora celata*
Nashville Warbler	*Vermivora ruficapilla*
Yellow Warbler	*Dendroica petechia*
Yellow-rumped Warbler	*Dendroica coronata*
Townsend's Warbler	*Dendroica townsendi*
American Redstart	*Setophaga ruticilla*
Northern Waterthrush	*Seiurus noveboracensis*
MacGillivray's Warbler	*Oporornis tolmiei*
Common Yellowthroat	*Geothlypis trichas*
Wilson's Warbler	*Wilsonia pusilla*
Yellow-breasted Chat	*Icteria virens*
Western Tanager	*Piranga ludoviciana*
Spotted Towhee	*Pipilo maculatus*
American Tree Sparrow	*Spizella arborea*
Chipping Sparrow	*Spizella passerina*
Brewer's Sparrow	*Spizella breweri*
Vesper Sparrow	*Pooecetes gramineus*
Savannah Sparrow	*Passerculus sandwichensis*
Grasshopper Sparrow	*Ammodramus savannarum*
Fox Sparrow	*Passerella iliaca*
Song Sparrow	*Melospiza melodia*
Lincoln's Sparrow	*Melospiza lincolnii*
White-crowned Sparrow	*Zonotrichia leucophrys*
Golden-crowned Sparrow	*Zonotrichia atricapilla*
Dark-eyed Junco	*Junco hyemalis*
Lapland Longspur	*Calcarius lapponicus*
Snow Bunting	*Plectrophenax nivalis*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Lazuli Bunting	*Passerina amoena*
Bobolink	*Dolichonyx oryzivorus*
Red-winged Blackbird	*Agelaius phoeniceus*
Western Meadowlark	*Sturnella neglecta*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Brewer's Blackbird	*Euphagus cyanocephalus*
Brown-headed Cowbird	*Molothrus ater*
Bullock's Oriole	*Icterus bullockii*
Gray-crowned Rosy-Finch	*Leucisticte tephrocotis*
Pine Grosbeak	*Pinicola enucleator*
Purple Finch	*Carpodacus purpureus*
Cassin's Finch	*Carpodacus cassinii*
House Finch	*Carpodacus mexicanus*
Red Crossbill	*Loxia curvirostra*
White-winged Crossbill	*Loxia leucoptera*
Common Redpoll	*Carduelis flammea*
Pine Siskin	*Carduelis pinus*
American Goldfinch	*Carduelis tristis*

Common Name	Scientific Name
Evening Grosbeak	*Coccothraustes vespertinus*
House Sparrow	*Passer domesticus*

Mammals

Common Name	Scientific Name
Masked shrew	*Sorex cinereus*
Vagrant shrew	*Sorex vagrans*
American water shrew	*Sorex palustris*
Little brown bat	*Myotis lucifugus*
Yuma brown bat	*Myotis yumanensis*
Long-eared brown bat	*Myotis evotix*
California brown bat	*Myotis californicus*
Silver-haired bat	*Lasionycteris noctivagans*
Big brown bat	*Eptesicus fuscus*
Hoary bat	*Lasiurus cinereus*
Townsend’s big-eared bat	*Corynorhinus townsendii*
Snowshoe hare	*Lepus americanus*
Yellow pine chipmunk	*Tamias amoenus*
Red-tailed chipmunk	*Tamias ruficaudus*
Red squirrel	*Tamiasciurus hudsonicus*
Northern flying squirrel	*Glaucomys sabrinus*
Northern pocket gopher	*Thomomys talpoides*
Beaver	*Castor canadensis*
Deer mouse	*Peromyscus maniculatus*
Bushy-tailed wood rat	*Neotoma cinerea*
Gapper’s red-backed mouse	*Myodes gapperi*
Common meadow mouse	*Microtus pennsylvanicus*
Richardson’s water vole	*Microtus richardsoni*
Muskrat	*Ondatra zibethicus*
House mouse*	*Mus musculus*
Western jumping mouse	*Zapus princeps*
Porcupine	*Erethizon dorsatum*
Coyote	*Canis latrans*
Black bear	*Ursus americanus*
Raccoon	*Procyon lotor*
American marten	*Martes americana*
Short-tailed weasel	*Mustela erminea*
Long-tailed weasel	*Mustela frenata*
American mink	*Mustela vison*
American badger	*Taxidea taxus*
Striped skunk	*Mephitis mephitis*
River otter	*Lontra canadensis*
Mountain lion	*Puma concolor*
Bobcat	*Lynx rufus*
Rocky Mountain elk	*Cervus elaphus*
Mule deer	*Odocoileus hemionus*

Common Name	Scientific Name
White-tailed deer	*Odocoileus virginianus*
Moose	*Alces alces*

*=Introduced species

Reptiles and Amphibians

Common Name	Scientific Name
Tiger salamander	*Ambystoma tigrinum*
Long-toed salamander	*Ambystoma macrodactylum*
Western toad	*Bufo boreas*
Pacific treefrog	*Pseudacris regilla*
Bullfrog*	*Rana catesbeiana* (No observations since 1979)
Wood frog**	*Rana sylvatica* (one report from 1972)
Spotted frog	*Rana lutriventris*
Leopard frog**	*Rana pipiens* (reported in early annual narratives, no recent reports)
Western painted turtle	*Chrysemys picta*
Western skink	*Eumeces skiltonianus*
Northern alligator lizard	*Elgaria coerulea*
Rubber boa	*Charina bottae*
Common garter snake	*Thamnophis sirtalis*
W. terrestrial garter snake	*Thamnophis elegans*

*=Introduced species
***=potential breeder based on range and habitat requirements*

Fish

Common Name	Scientific Name	Verified Occurrence
White sturgeon	*Acipenser transmontanus*	KR
Mountain whitefish	*Prosopium williamsoni*	MC
Pygmy whitefish	*Prosopium coulteri*	
Westslope cutthroat trout	*Oncorhynchus clarkii lewisi*	MC
Rainbow trout (possibly native redband trout; not verified)	*Oncorhynchus mykiss*	MC, CC
Rainbow-cutthroat hybrid	*Oncorhynchus mykiss x clarkii*	MC
Brook trout*	*Salivelinus fontinalis*	MC
Bull trout	*Salivelinus confluentus*	MC, DC, KR
Bull-brook trout hybrid	*Salivelinus confluentus x fontinalis*	MC
Sockeye salmon (kokanee)	*Oncorhynchus nerka*	MC (adult returns from egg plants)
Lake chub	*Couseius plumbeus*	
Peamouth	*Mylocheilus caurinus*	
Northern pikeminnow	*Ptychocheilus oregonensis*	MC
Longnose dace	*Rhinichthys cataractae*	MC
Redside shiner	*Richardsonius balteatus*	MC

Common Name	Scientific Name	Verified Occurrence
Longnose sucker	*Catostomus catostomus*	
Largescale sucker	*Catostomus macrocheilus*	
Brown bullhead*	*Ameiurus nebulosus*	RW
Burbot	*Lota lota*	KR
Western mosquitofish*	*Gambusia affinis*	
Largemouth bass*	*Micropterus salmoides*	
Pumpkinseed*	*Lepomis gibbosus*	
Yellow perch*	*Perca flavescens*	RW
Slimy sculpin	*Cottus cognatus*	MC
Torrent sculpin	*Cottus rhotheus*	MC

*=Introduced species
RW=Refuge ponds and wetlands
MC=Myrtle Creek
KR=Kootenai River (outside Refuge)
DC=Deep Creek (outside Refuge)
CC=Cascade Creek

Plants

Common Name	Scientific Name
Vascular Plants	
Aquatic Plants	
Common Name	**Scientific Name**
Northern (American) water plantain	*Alisma triviale* (Syn: *Alisma plantago-aquatica* var. *americanum)*
Beggarticks	*Bidens* sp.
Nodding beggartick (stick-tight)	*Bidens cernua*
Sedges	*Carex* spp.
Bebb’s sedge	*Carex bebbii*
Shore sedge	*Carex lenticularis*
Knotsheath sedge	*Carex retrorsa*
Beaked sedge	*Carex rostrata*
Sawbeak sedge	*Carex stipata*
Coon’s tail	*Ceratophyllum demersum*
Spikerushes	*Eleocharis* spp.
Needle spikerush	*Eleocharis acicularis*
Beautiful spikerush	*Eleocharis bella*
Ovate spikerush	*Eleocharis ovata*
Common spikerush	*Eleocharis palustris*
Rushes	*Juncus* spp.
Taper-tip rush	*Juncus acuminatus*
Dagger-leaf rush	*Juncus ensifolius*
Poverty (slender) rush	*Juncus tenuis*
Duckweed	*Lemna* sp.
Common duckweed	*Lemna minor*
Waterclover	*Marsilea* sp.
Watermilfoil	*Myriophyllum* sp.
Rocky Mountain pond-lily	*Nuphar lutea* ssp. *polysepala*
Smartweeds (knotweeds)	*Polygonum* spp.

Common Name	Scientific Name
Water smartweed	*Polygonum amphibium* (Syn: *P. coccineum*)
Erect knotweed	*Polygonum erectum*
Swamp smartweed	*Polygonum hydropiperoides*
Spotted ladysthumb*	*Polygonum persicaria**
Pondweeds	*Potamogeton* spp.
Largeleaf pondweed	*Potamogeton amplifolius*
Variableleaf pondweed	*Potamogeton gramineus*
White-stemmed pondweed	*Potamogeton praelongus*
Wapato, arrowhead	*Sagittaria latifolia*
Hardstem bulrush	*Scirpus acutus*
Woolgrass	*Scirpus cyperinus*
Panicled (small-fruited) bulrush	*Scirpus microcarpus*
Bur-reed	*Sparganium* spp.
Common duckmeat	*Spirodela polyrrhiza*
Sago pondweed	*Stuckenia (Potamogeton) pectinatus*
Narrow-leaved cattail	*Typha angustifolia*
Broadleaf cattail	*Typha latifolia*
Lesser bladderwort	*Utricularia minor*
Water speedwell	*Veronica anagallis-aquatica*
Horned pondweed	*Zannichellia palustris*
Grasses	
Crested wheatgrass*	*Agropyron cristatum**
Redtop*	*Agrostis gigantea**
Redtop* (creeping bentgrass)	*Agrostis stolonifera**
Meadow foxtail*	*Alopecurus pratensis**
Wild oat*	*Avena fatua**
American sloughgrass	*Beckmannia syzgachne*
Bromes	*Bromus* spp.
Smooth brome	*Bromus inermis*
Mountain brome P	*Bromus marginatus P*
Meadow brome*	*Bromus riparius**
Cheatgrass*	*Bromus tectorum**
Orchardgrass* (Latar)	*Dactylis glomerata**
Large crabgrass*	*Digitaria sanguinalis**
Barnyardgrass*	*Echinochloa crus-galli**
Japanese millet*	*Echinochloa esculenta**
Quackgrass*	*Elymus repens**
Slender wheatgrass P	*Elymus trachycaulus P*
Stinkgrass	*Eragrostis cilianensis*
Buckwheat*	*Fagopyrum esculentum**
Fescues	*Festuca* spp.
Hard fescue	*Festuca brevipila*
Idaho fescue P	*Festuca idahoensis P*
Sheep fescue	*Festuca ovina*
Red fescue (creeping red fescue)	*Festuca rubra*
Small floating mannagrass	*Glyceria borealis*

Common Name	Scientific Name
Common barley*	*Hordeum vulgare**
Basin wildrye (Magnor, Trailhead) P	*Leymus cinereus P*
Annual ryegrass*	*Lolium* sp.*
Perennial ryegrass*	*Lolium perenne* ssp. *perenne**
Proso or wild millet*	*Panicum miliaceum**
Witchgrass*	*Panicum capillare**
Western wheatgrass P	*Pascophyllum smithii P*
Reed canarygrass*	*Phalaris arundinacea**
Timothy*	*Phleum pratense**
Bluegrass	*Poa* spp.
Bulbous bluegrass	*Poa bulbosa*
Fowl bluegrass	*Poa palustris*
Kentucky bluegrass*	*Poa pratensis**
Big bluegrass (Sherman Big) P	*Poa secunda P*
Annual rabbitfoot grass	*Polypogon monseliensis*
Beardless (bluebunch) wheatgrass P	*Psedoroegneria spicata P*
Tall fescue*	*Schedonorus phoenix** (Syn: *Festuca arundinacea*)
Yellow foxtail	*Setaria glauca*
Bristly foxtail	*Setaria verticillata*
Tall wheatgrass*	*Thinopyrum ponticum**
Intermediate wheatgrass*	*Thinopyrum intermedium**
Winter wheat*	*Triticum**
American eelgrass (water celery, tapegrass)	*Vallisneria americana*
Wild rice* P	*Zizania aquatica* P*
Trees and Shrubs	
Grand fir	*Abies grandis*
Rocky Mountain maple	*Acer glabrum*
Spotted alder	*Alnus incana*
Mountain alder	*Alnus viridis*
Sitka alder	*Alnus viridis* ssp. *sinuata*
Saskatoon serviceberry	*Amelanchier alnifolia*
Tall Oregongrape	*Berberis aquifolium*
Cascade Oregongrape	*Berberis nervosa*
Scrub birch	*?? not in USDA plants database*
Water (Swamp) birch	*Betula occidentalis*
Paper birch	*Betula papyrifera*
Siberian pea*	*Caragana arborescens**
Ceanothus (buckbrush)	*Ceanothus* sp.
Red-osier dogwood	*Cornus stolonifera*
Black hawthorn	*Crataegus douglasii*
Russian-olive*	*Eleagnus angustifolia**
Oceanspray	*Holodiscus discolor*
Western larch	*Larix occidentalis*
Hollyleaved barberry (Oregon-grape)	*Mahonia aquifolium*
Indian plum (wild plum)	*Oemleria cerasiformus*

Common Name	Scientific Name
Wild crabapple	*Peraphyllum ramosissimum*
Pacific ninebark	*Physocarpus capitatus*
Mallow ninebark	*Physocarpus malvaceus*
Lodgepole pine	*Pinus contorta*
Western white pine	*Pinus monticola*
Ponderosa pine	*Pinus ponderosa*
Plains cottonwood*	*Populus deltoides* *
Quaking aspen	*Populus tremuloides*
Black cottonwood	*Populus trichocarpa*
Chokecherry	*Prunus virginiana*
Douglas-fir	*Pseudotsuga menziesii*
Nootka rose	*Rosa nutkana*
Wood's rose	*Rosa woodsii*
Thimbleberry	*Rubus parviflorus*
White willow*	*Salix alba**
Bebb's willow	*Salix bebbiana*
Drummond's willow	*Salix drummondiana (not confirmed)*
Narrowleaf willow	*Salix exigua*
Geyer's willow	*Salix geyeriana (not confirmed)*
Pacific willow (whiplash willow)	*Salix lucida* ssp. *lasiandra*
Yellow willow	*Salix lutea*
Sitka willow	*Salix sitchensis (not confirmed)*
Blue elderberry	*Sambucus nigra* ssp. *caerula*
Red elderberry	*Sambucus racemosa*
Mountain ash	*Sorbus sitchensis*
Rose spiraea (Douglas' spiraea)	*Spiraea douglasii*
Common snowberry	*Symphoricarpos albus*
Western redcedar	*Thuja plicata*
Western hemlock	*Tsuga heterophylla*
Herbaceous Plants, Wildflowers	
Common yarrow	*Achillea millefolium*
Russian knapweed* NOX	*Acroptilon repens (Syn:C. repens)* * NOX
Mat amaranth (prostrate pigweed)	*Amaranthus blitoides*
Redroot amaranth (pigeweed)	*Amaranthus retroflexus*
Tarweed fiddleneck	*Amsinckia lycopsoides*
Pearly everlasting	*Anaphalis margaritacea*
Stinking chamomile* (mayweed)	*Anthemis cotula**
Bur chervil*	*Anthriscus caucalis**
Spreading dogbane	*Apocynum androsaemifolium*
Indianhemp (hemp dogbane)	*Apocynum cannabinum*
Lesser (common) burdock*	*Arctium minus**
Biennial wormwood	*Artemisia biennis*
Canadian milkvetch	*Astragalus canadensis*
Arrowleaf balsamroot	*Balsamorhiza sagittata*
Wild mustard*	*Brassica kaber**
Shepherd's purse*	*Capsella bursa-pastoris**

Common Name	Scientific Name
Whitetop cress* (hoary cress) NOX	*Cardaria draba** NOX
Spotted knapweed* NOX	*Centaurea stoebe* ssp. *micranthos* (Syn: *C. maculosa*)* NOX
Fireweed	*Chamerion angustifolium*
Pitseed goosefoot (Netseed lambsquarters)	*Chenopodium berlandeieri*
Canada thistle* NOX	*Cirsium arvense** NOX
Bull thistle*	*Cirsium vulgare**
Poison hemlock* NOX	*Conium maculatum** NOX
Canadian horseweed	*Conyza canadensis*
Golden tickseed (coreopsis)	*Coreopsis tinctoria*
Common crupina* NOX	*Crupina vulgaris** NOX
Houndstongue* NOX	*Cynoglossum officinale** NOX
Queen Anne's lace*	*Daucus carota**
Larkspur ("Tall larkspur")	*Delphinium occidentale (pro sp) [barbeyi x glaucum]*
Herb Sophia* (flixweed)	*Descurania sophia**
Fuller's (common) teasel*	*Dipsacus fullorum** (Syn: *D. sylvestris*)
Field horsetail	*Equisetum arvense*
Water horsetail	*Equisetum fluvatile*
Smooth horsetail	*Equisetum laevigatum*
Fleabane	*Erigeron* sp.
Sulphur-flower buckwheat	*Eriogonum umbellatum*
Common gaillardia (Blanketflower)	*Gaillardia aristata*
Fragrant bedstraw	*Galium triflorum*
American licorice	*Glycyrrhiza lepidota*
Western marsh cudweed	*Gnaphalium palustre*
Clammy hedgehyssop	*Gratiola neglecta*
Orange hawkweed NOX	*Hieracium aurantiacum* NOX
Yellow hawkweed NOX	*Hieracium caespitosum* NOX
Showy goldeneye	*Heliomeris multiflora*
Common St. Johnswort* NOX	*Hypericum perforatum** NOX
Tall morning-glory*	*Ipomoea purpurea**
Henbit deadnettle*	*Lamium amplexicaule**
Prickly lettuce	*Latuca serriola*
Oxeye daisy* NOX	*Leucanthemum vulgare* (Syn: *Chrysanthemum leucanthemum)** NOX
Dalmatian toadflax* NOX	*Linaria dalmatica** NOX
Butter and eggs* (yellow toadflax) NOX	*Linaria vulgaris** NOX
Lewis flax (blue flax)	*Linum lewisi*
Fernleaf biscuitroot	*Lomatium dissectum*
Bird's-foot trefoil*	*Lotus corniculatus**
Meadow bird's-foot trefoil	*Lotus denticulatus*
Silvery lupine	*Lupinus argenteus*
Silvery lupine (mountain lupine)	*Lupinus argenteus* ssp. *rubricaulis*
Silky lupine	*Lupinus sericeus*
Wyeth's lupine	*Lupinus wyethii*
Northern bugleweed	*Lycopus uniflorus*

Common Name	Scientific Name
American skunkcabbage	*Lysichiton americanus*
Purple loosestrife* NOX	*Lythrum salicaria** NOX (not observed in many years)
Hoary tansyaster (purple aster)	*Machaeranthera canescens*
Common mallow*	*Malva neglecta**
Disc mayweed* (pineapple weed)	*Matricaria discoidea** (Syn: *M.matricarioides*)
Black medick*	*Medicago lupulina**
Alfalfa*	*Medicago sativa**
Yellow sweetclover*	*Melilotus officinalis**
Wild bergamot	*Monarda fistulosa*
Sanfoin*	*Onobrychis vicifolia**
Rydberg's penstemon	*Penstemon rydbergii*
Phacelia	*Phacelia campanularia*
Common plantain*	*Plantago major**
Black bindweed* (wild buckwheat)	*Polygonum convlvulus**
White water crowfoot (buttercup)	*Ranunculus aquatilis*
Orange coneflower*	*Rudbeckia fulgida**
Blackeyed Susan	*Rudbeckia hirta*
Curly dock*	*Rumex crispus**
Small burnet*	*Sanguisorba minor**
Marsh skullcap	*Scutellaria galericulata*
Stinking willie* (tansy ragwort) NOX	*Senecio jacobaea** NOX
Tall tumblemustard*	*Sisymbrium altissimum**
Canada goldenrod	*Solidago canadensis*
Marsh sowthistle*	*Sonchus* sp.*
Corn spurry*	*Spergula arvensis**
Munro's globemallow	*Sphaeralcea munroana*
Common (mouseear) chickweed*	*Stellaria media**
Aster	*Symphiotrichum (Aster)* sp.
Common tansy* NOX	*Tanacetum vulgare** NOX
Common dandelion*	*Taraxacum officinale**
Field pennycress*	*Thlaspi arvense**
Yellow salsify* (western salsify)	*Tragopogon dubius**
Alsike clover*	*Trifolium hybridum**
Red clover*	*Trifolium praetense**
White clover* (white sweet clover)	*Trifolium repens**
Common mullein*	*Verbascum thapsus**
Winter vetch* (hairy vetch)	*Vicia villosa**
Mule-ears	*Wyethia amplexicaulis*
Ferns	
Western brackenfern	*Pteridium aquilinum* (N/weedy)

*Introduced species
NOX=Listed as noxious weed in state of Idaho
P=native to Idaho/US, planted on Refuge

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Mallard pair
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